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RESEARCH HANDBOOKS IN INTERNATIONAL LAW

EE Edward Elgar PUBLISHING

Cheltenham, UK • Northampton, MA, USA

Published by

Edward Elgar Publishing Limited
The Lypiatts
15 Lansdown Road
Cheltenham
Glos GL50 2JA
UK

Edward Elgar Publishing, Inc.
William Pratt House
9 Dewey Court
Northampton
Massachusetts 01060
USA

A catalogue record for this book
is available from the British Library

Library of Congress Control Number: 2014950972

This book is available electronically in the **Elgar**online
Law subject collection
DOI 10.4337/9781781000366

MIX
Paper from
responsible sources
FSC® C013056
FSC
www.fsc.org

ISBN 978 1 78100 035 9 (cased)
ISBN 978 1 78100 036 6 (eBook)

Typeset by Columns Design XML Ltd, Reading
Printed and bound in Great Britain by T.J. International Ltd, Padstow

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An Honorary Board Member of the IISL, he received the Allan D. Emil Memorial Award for International Cooperation in Astronautics in 1981, and the Social Sciences Award of the IAA in 2001. A commander of the *Legion d'Honneur*, he also holds numerous other awards.

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Between 2009 and 2011 she was involved in the drafting of the Austrian Outer Space Act, which entered into force on 28 December 2011. From 2008 to 2012 she was the chair of the Working Group on National Space Legislation of the Legal Subcommittee of the UN Committee for the Peaceful Uses of Outer Space, which led to the formulation of 'Recommendations on national legislation relevant to the peaceful exploration and use of outer space' adopted by the United

Nations General Assembly as Resolution A/AC.105/RES/68/74 on 11 December 2013.

She is the editor of the book *Soft Law in Outer Space – The Function of Non-Binding Norms in International Space Law* (Vienna 2012). Other publications in the area of space law deal with telecommunications and space, national space legislation, and the return of space objects and the rescue and return of astronauts. Further research focuses include international investment law, international arbitration, culture and religion in international law as well as Islam and international law. She has been invited as a speaker to numerous international symposia and workshops and teaches international law and space law at the University of Vienna and other universities.

Russell Louis 'Rusty' Schweickart is a former US astronaut, research scientist, US Air Force fighter pilot, and business and government executive. He earned a B.S. and M.S. in Aeronautics/Astronautics from the Massachusetts Institute of Technology in 1956 and 1963 respectively.

Chosen in NASA's third astronaut group, he is best known as the Lunar Module pilot on the Apollo 9 mission, the first manned flight test of the Lunar Module, on which he performed the first in-space test of the Portable Life Support System used by the Apollo astronauts who walked on the Moon. As backup commander of the first Skylab mission, he was responsible for developing the hardware and procedures used by the Skylab crews to perform critical in-flight repairs of the Skylab station. After Skylab, he served for a time as Director of User Affairs in NASA's Office of Applications.

He left NASA in 1977 to serve for two years as California governor Jerry Brown's assistant for science and technology, then was appointed by Brown to California's Energy Commission for five-and-a-half years, serving as chairman for three. He took the initiative to establish the Association of Space Explorers in 1984 with the support of several other astronauts and cosmonauts. As part of his activities there, he also initiated the ASE NEO Committee and chaired it for its first seven years. He is furthermore co-founder and currently Chairman Emeritus of the Board of the B612 Foundation, a group that aims to defend earth from asteroid impacts.

In addition, he *inter alia* was Executive Vice President of CTA Commercial Systems and Director of Low Earth Orbit Systems, where he led CTA's efforts in developing a second generation LEO communication satellite constellation designed to provide regular commercial electronic messaging services on a global basis. Prior to his CTA work he had founded and was president of Courier Satellite Services, a global satellite communications company, which developed LEO satellites to provide worldwide affordable data services.

His satellite and telecommunications work involved him in the development of international communications regulations and policies, including participation in the 1992 and 1995 World Radiocommunications Conferences of the International Telecommunication Union (ITU). He also served at the 1995 WRC as a US delegate. Finally, he worked extensively in Russia and the former Soviet Union on scientific and telecommunications matters.

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He currently teaches (part-time) at McGill University, and frequently lectures on air and/or space law and policy at other institutions worldwide. He is a member of the Board of Editors of *Air and Space Law*, a bi-monthly published by Kluwer Law International. On behalf of the Netherlands Civil Aviation Authorities he was appointed Air Transport Expert for Mediation/Dispute Resolution at ICAO, Montreal. He is a member of the European Aviation Club, the European Air Law Association (EALA), the International Institute of Space Law (IISL) and the European Centre for Space Law (ECSL). He is also the author of a number of articles on both air and space law and policy, and is active as a consultant in these fields.

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Professor Dr Frans von der Dunk has held the Harvey and Susan Perlman Alumni/Othmer Chair of Space Law at the University of Nebraska-Lincoln’s LL.M. Programme on Space, Cyber and Telecommunication Law since January 2008. He also is Director of Black Holes BV Consultancy in space law and policy, based in Leiden. He was awarded the Distinguished Service Award of the International Institute of Space Law (IISL) in Vancouver, in October 2004, and the Social Science Award of the International Academy of Astronautics (IAA) in Valencia, in October 2006. He defended his dissertation on ‘Private Enterprise and Public Interest in the European “Spacescape”’ in 1998 at the University of Leiden.

He has written more than 130 articles and published papers, given more than 140 presentations at international meetings and has been visiting professor at over 30 universities and other academic institutions across the world on subjects of international and national space law and policy, international air law and public international law. He has (co-)organised some 20 international symposia, workshops and other events, and has been (co-)editor of a number of publications and proceedings. As of 2006, he is the Series Editor of ‘Studies in Space Law’, published by Brill.

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Professor Dr Maureen Williams was educated at the Universities of Buenos Aires, Paris, Oxford and London (UCL) and has been visiting professor at the Lauterpacht Centre for International Law (Cambridge), Tulane University (New Orleans) and the Max Planck Institute (Heidelberg). Her doctoral thesis on Telecommunication Satellites was awarded first class honours. She holds chairs of international law in Argentina at the University of Buenos Aires and Belgrano University (Buenos Aires) and is currently a Senior Career Scientist (*investigadora superior*) at the National Council for Scientific Research of Argentina (CONICET) and Director of Research Projects in International Law (www.conicet.gob.ar).

She is Chair of the Space Law Committee of the International Law Association (ILA) and Council member thereof, Member of the Board of Directors of the International Institute of Space Law (IISL) and the Ibero-American Institute of Air and Space Law in Madrid. She is full member of the International Academy of Astronautics and the Royal Institute of International Affairs in London and formed part of the Group of Experts of the Permanent Court of Arbitration for the drafting of rules for dispute settlement in space law.

She is part of the Group of Experts on the Teaching of Space Law, UNOOSA, Vienna. In June 2013 she represented the legal area in a Panel of Experts commemorating 50 years of women in space (COPUOS). She is author of various books and around 250 articles on international law/space law in the United Kingdom, Argentina, the United States, Germany, Spain and Brazil, among others.

Foreword

As an astronaut I never expected to be interested in, let alone involved in, space law – which is of course what this book is all about. But that was back when I was the payload and not the purveyor. I got my big toe wet back in the 1970s when my responsibility shifted to remote sensing and I began brushing up against the permissible/impermissible boundaries of image resolution, access and ownership. Recently my work in protecting earth from asteroid impacts led me into the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and a full body dunking into the deep waters of international space law. The shifting of impact zones across the earth's surface in the process of removing them from the planet, the inherent liabilities in the event of a malfunction during deflection, the potential use of weapons of mass destruction technologies to avoid a global catastrophe, and the contending geopolitical self-interests of the nations involved sent me screaming for a legal life preserver!

And there, via intermediary friends, was Frans von der Dunk, calmly, with great Dutch dignity, standing on the legal shoreline prepared to hurl me a bright orange life preserver. We became close friends and Frans, with his thoughtful insights and great depth in space law became an essential and increasingly productive member of our planetary defence team.

Our 'team' is a bit too glib a descriptor perhaps. Back in 2001 a number of scientists, engineers and astronauts gathered at the Johnson Space Center to wrestle with the frightening fact that astronomers were discovering increasing numbers of asteroids whose earth-crossing orbits made them potential impact threats. Yet no one was addressing whether anything could be done when we inevitably discovered one on an impact trajectory. After concluding that indeed current space technology could enable, with adequate early warning, the deflection of an asteroid from such an impact, we formed a non-profit public charity (B612 Foundation) to explore the technical issues involved and hopefully develop concepts and techniques to materialize the capability.

It was almost immediately obvious, as our research illuminated the physical (especially geographical) implications of asteroid deflection that there were huge geopolitical consequences unavoidably embedded in the process. Difficult social and political choices, including the need for threshold criteria involving public safety, liability and cost needed to be addressed. And how to ensure that the interests of individual states, or even private space entrepreneurs, would be properly aligned in the process? Most choices, however, rested well outside the technical arena. It slowly became obvious to those of us involved that preventing an asteroid impact would indeed properly be a collective worldwide action. Ultimately I came to understand that this unprecedented yet inevitable act would be the first instance of humanity collectively reordering (ever so slightly) the shape of the solar system in order to enhance human survival. Taking the difficult choices which lie ahead to the United Nations became mandatory.

In 2005 I realized that my best shot for gaining the necessary attention of the international community to the sticky decisions necessary to initiate a deflection campaign was to enrol the Association of Space Explorers (ASE) in garnering high-level political attention. While astronauts and cosmonauts are wonderful keys to opening otherwise-locked political doors, one needs to be prepared with impressive substance in order to prevent those doors from (politely) slamming shut, shortly thereafter, in one's face. Hence, in 2006 we enrolled, *inter alia*, Peter Jankowitsch, Frans von der Dunk, and other eminently qualified international diplomatic and legal experts in organizing and illuminating the geopolitical choices and decisions which would confront the international community when an impact threat materialized.

It was in the process of developing our report (www.space-explorers.org/ATACGR.pdf) to the UN COPUOS action team on Near Earth Objects (NEOs) that I came to appreciate the depth of the international legal challenges of the issue and the wisdom and collective experience of the Panel on Asteroid Threat Mitigation (PATM) that we pulled together to sound the trumpet within COPUOS. That report, delivered to the Scientific and Technical Subcommittee of COPUOS in 2009, has slowly worked its way to the General Assembly (December 2013) and now back to COPUOS for growing flesh on the skeletal bones thus far assembled.

Science fiction has a wonderful record of early warning for later realization in the space biz. Albeit perhaps grossly simplified, the early insights and ideas of Arthur Clarke *et al* nevertheless opened the minds of future scientists, engineers, and yes, even lawyers (!) – at least to the extent they understood and were able to communicate with the scientists and the engineers – to the reality of current and future human use of our space environment. Thus far, while providing military benefits to many nations, space has proven to be a questionable venue for the positioning of weapons. But the spectre ever lurks in the near background, and my work in planetary defence (preventing asteroid impacts) hovers on that threshold. Asteroids, in human scale, are massive objects and tweaking their orbits to protect life on earth requires the use of energy levels in space that, directed otherwise, potentially threaten that same life. Nuclear explosions and directed energy devices may well be required to divert an earthward-bound asteroid, and assuring the wise and judicious use of such powerful instruments is a challenge for the international regime, political and legal.

Nor is planetary defence the only emerging challenge for the field. Asteroids have become something of a space hula hoop. The United States is currently leading an initiative to bring a small asteroid, or a boulder from a larger one, back to earth/moon space for astronauts and researchers to meddle with. A mini-space version of bringing the mountain to Mohammed, as it were. Inherent in this Asteroid Redirect Mission of NASA's, likely with international participation, rests a bundle of asteroid-associated benefits: human exploration, science, planetary defence, and space resource utilization. Each of these, with the possible exception of science, is brimming with legal unknowns and precedents. And though no single book, legal or otherwise, will be able to address all those comprehensively, I would hope this particular book at least will provide a major tool in the legal toolkit and point the lawyers – as well as some scientists, engineers or politicians – in the right directions.

Beyond the 'official' (read governmental) programmes lies the boiling sea of private space initiatives. And the tide is rising … fast! Private launch vehicles and spacecraft of many kinds for both people and cargo are proliferating. Equally diverse and innovative are the people devising, funding and participating in all this turmoil. The simmering soup of future space objects ranges from one-way human missions to Mars to international passengers popping up to the edge of space; from private, deep space telescopes in solar orbit, to flocks of mini-telescopes spying the ground below and even swarms of pico-sats controlled by university students. With all the hyperactive, entrepreneurial minds generating this Bolero-like crescendo, international space law seems destined for exciting times indeed!

In homage to the collection of nations which made possible my flight into space on Apollo 9 in the spring of 1969 I carried with me copies of the Outer Space Treaty, the UN Declaration of Human Rights and (a bit more self-serving) the Return of Astronauts ('Rescue') Agreement. I knew little at the time of the intensive collective effort that went into producing these seminal agreements of the early space years. In the years since my astronaut days ended I have come to appreciate the subtle, powerful influence the work of many creative legal minds imprinted on our collective understanding of the 'common heritage' of humanity … the space environment into which we were born and now operate. But like all frontiers in the past, this one will be filled to the brim with surprises.

The intellectual front lines of the coming skirmishes along this new frontier will doubtless be populated by the readers of this *Handbook of Space Law*. Just as the book offers a multi-angular approach to the various main issues involved, the increasing diversity and audaciousness of the entrepreneurs in the emerging space arena will require a matching multi-dimensional cast of space lawyers. Hopefully they will be more credibly prepared for the challenges ahead than the lawyer-statistician who advised his client to always carry a bomb when he flew since the probability of encountering two bombs on any single flight was incredibly remote. Wise and thoughtful, sometimes out-of-the-box, but pragmatic thinking will definitely be in order and welcomed.

Standing philosophically above the fray one can surely anticipate that the opening of space exploration to a younger and less entrenched set of creative minds will inevitably result in dramatic leaps forward … and backward. The human future will doubtless be powerfully shaped, perhaps enabled by, the manner in which the inevitable intersections of limited interests are handled in this process. At its core the practice of law, space law included, brings to human evolution the collective wisdom of enabling experience. We are all in this together. Our future will clearly be shaped by the collective integrity of our actions as we move outward into the cosmic environment. My conviction is that the essence of insights into historic human behaviour represented in the law, applied with imagination to the present, will enable an exciting and open-ended human evolution.

Rusty Schweickart
Apollo 9

Preface

ABOUT THIS BOOK

Before you lies the result of a multi-authored process, a *Handbook of Space Law*, which is meant to provide fundamental guidance to all those interested in studying, in a comprehensive yet still comprehensible fashion, the legal aspects of mankind's main activities in outer space, directed toward outer space or directly benefiting from outer space.

When I started writing this Preface, the combination of my manual clumsiness and the computer's precocious urge to auto-correct first resulted in the heading 'prospect' – which in this case I'd actually like to look upon as a Freudian slip of the pen. A *Handbook of Space Law* can no longer just address the legal state of affairs 'as is'; 'space law' is a body of law perhaps more than any other body of law moving (hopefully) forward. Ongoing developments continuously seem to call for the adaptation or even dismissal of existing parts of space law and/or creating novel parts altogether, and any Handbook worth its salt should not only outline the *lex lata* but also the underlying structures and approaches allowing for a true understanding of the *lex ferenda*, what it should address and how it should address it.

Presuming a considerable knowledge and understanding of law, especially general public international law, the Handbook is first of all aimed at graduate and post-graduate students at faculties and schools of law, including doctoral, JSD and PhD students studying space law as a comprehensive academic discipline. Secondly, however, it also aims to provide fundamental support to those researching space law or a particular area thereof in the context of an academic, governmental, industry or law firm-career – or even merely on their own account. How that is supposed to work in such a new and complex context as that of 'space law' perhaps requires a bit more explanation – notably *why* the project of the Handbook was initiated, *what* it addresses and *how* it then does address that.

WHY

When I was approached more than three years ago by Edward Elgar Publishers to consider editing a (Research) *Handbook of Space Law*, the most fundamental question was of course why such a book might be necessary or even merely desirable. 'Space law' is not exactly perceived as a field of law critical to the millions of active lawyers, law students and other law experts around the world on a day-to-day basis. As a consequence, there are not (yet!) hundreds of law schools teaching it or hundreds of other institutions undertaking research in the area. And to the extent that 'space law' was perceived to merit its special niche in higher education and research, there were high-quality publications around which would surely allow proper navigation within this niche.

Indeed, there are a few books around that, explicitly or implicitly, were seen to cover all of space law in a coherent scheme. Most of them, however, were written fairly long ago, such as the epochal treatise of Manfred Lachs (which also was fairly succinct), the joint work of Myres McDougal, Harold Lasswell and Ivan Vlasic, and the books of Wilfred Jenks and Carl Christol. Others were, in addition, only available (at least originally) in their own languages, such as Gennadi Zhukov and Yuri Kolosov's Russian introduction, the multi-author German volume edited by Karl-Heinz Böckstiegel, French books edited by Jacqueline Dutheil de la Rochère respectively written by Pierre-Marie Martin and an Italian one by Elisabeth Back-Impallomeni. Thus, they all pre-dated the most fundamental paradigm change in space law so far: the fundamental shift of focus from largely strategy- and science-dominated state-run space activities to specific almost day-to-day terrestrial applications and the attendant fundamental inroads which the private and commercial sector made into the space arena.

The above was also true for a number of treatises that each tackled space law from a very specific vantage point, such as Nandasiri Jasentuliyana, due to his UN career addressing space law from the UN perspective, Nicholas Matte, who was Director of one of the leading institutes of air and space law addressing space law as a body of law adjacent to air law, Henri Wassenbergh, who wished to address – and reform – space law from his own philosophical angle, and Bin Cheng, very much focusing on the five UN space treaties and a few intergovernmental organizations. The latter also holds true for the Cologne Commentary on Space Law, whereas by contrast the Projects 2001 and 2001-Plus have focused in great depth on commercialization and privatization as such, taking substantial knowledge and understanding of the *corpus juris spatialis internationalis* for granted whilst much of the analysis moreover was not officially published and remains difficult to access.

For many years the only book coming close to a handbook and at least updated a few times, was the truly introductory one by Isabella Diederiks-Verschoor, most recently revised by Vladimir Kopal. As with the technology underlying space activities, however, updating an introductory volume or handbook can only go so far, and at some point a more fundamental overhaul or even a total rethinking of the approach to the subject matter would become necessary.

Of course, the moment I had decided to tackle the challenge put before me by Edward Elgar, more books started appearing which addressed, at least in principle, all of space law. Many were by younger authors, offering a fresh look at the substance and structure, although by their very nature often too succinct to serve as proper handbooks. Other recent, more voluminous efforts by contrast either tied space law into the broader fabric of space politics, policies and economics, focused on the Outer Space Treaty as the source also of all future space law, or were modestly but purposefully labelled a 'treatise'.

In short: I still felt it worthwhile to develop a (Research) *Handbook of Space Law* as the publisher proposed, while insisting, however, that it could also serve as a Handbook proper for higher-level students of space law (almost by definition, in view of the nature of the discipline, such students are in the later stages of their university career or even beyond) – hence the title as it now lies before you.

WHAT

This Handbook addressing 'space law', the most important question is then: what *is* 'space law'? In view of the multi-dimensional character of space law, at the outset a broad definition is required, even if it would then be commensurately less likely that the – *any* – Handbook could cover 'space law' comprehensively in any appreciable detail. Yet, 'space law' should be defined as 'every legal or regulatory regime having a significant impact, even if implicitly or indirectly, on at least one type of space activity or major space application', which in principle encompasses both international and national law and regulation, as well as regional and institutional arrangements as appropriate. In conformity with this definition, the multi-faceted approach to the Handbook means it comprises a few main sections, which address their respective subject-matter from a few fundamentally different and cross-cutting angles.

First, following a general introduction to the history and background of space law in Chapter 1, the next four chapters address the various main fields of law and regulation from a ‘formal’ perspective: Chapter 2 international space law properly speaking (with an obvious focus on the UN space treaties, still the most fundamental set of legal documents pertaining to space activities); Chapter 3 national law (mainly as an instrument to implement international law vis-à-vis non-governmental entities); Chapter 4 the specific ‘legal order’ pertinent to European space activities; and Chapter 5 the special context of intergovernmental organizations and their role in international space law.

Secondly, Chapter 6 addresses the main military, defence- and security-related aspects of space activities, implying that the major focus of the legal analyses conducted elsewhere in the book would be on non-military, read civil and commercial uses – even as certain particular aspects of military use also are discussed by some other chapters.

Thirdly, a set of six chapters focuses on substantive categories of space activities and applications currently crucial from a global perspective, and analyses each of those in turn: Chapter 7 launch activities; Chapter 8 satellite communications; Chapter 9 satellite remote sensing; Chapter 10 satellite navigation; and Chapters 11 and 12 manned spaceflight – subdividing it further into public manned spaceflight and private manned spaceflight respectively.

Fourthly, Chapter 13 addresses a major aspect intersecting with all formal and substantive areas tackled before – the growing concerns about environmental effects of space activities and how to address them, which are then juxtaposed with the discussion in Chapter 14 of a major future threat to – *inter alia* – such environmental interests: the possibilities for, parameters for and consequences of the exploitation of celestial resources. Other similarly cross-cutting analyses follow, largely focusing on the commercial and private aspects of space activities: Chapter 15 on the international trade aspects thereof; Chapter 16 on the financing of space ventures; Chapter 17 on insurance aspects; and Chapter 18 on intellectual property rights.

Fifthly and finally, the procedural subject of dispute settlement in the context of space activities and their major applications is addressed by Chapter 19 – as a conceptually logical capstone of the overarching legal analysis also considerably looking into the future: what are the possibilities in the legal realm to address disputes which may arise in any of the above legal and regulatory regimes or sectors?

HOW

Further to the definition of 'space law' and all it entails, at least in my view as laid out above, at the same time as subdividing the analyses into five main parts, the Handbook addresses 'space law' essentially at three levels at the same time – which in the end also is responsible for its extended size.

The first level constitutes an effort to address, analyse and explain particular fields as fitting within the larger 'structure' of 'space law' as a multi-faceted discipline, requiring in many respects a multi-angular and multi-dimensional approach. Space law involves several regimes that were developed for space in particular (notably, of course, the five UN-originating space treaties) but even more that were only partly or not at all so targeted, yet in the course of the space era did become relevant for at least one category of space activities or space applications.

The reader should thus obtain an understanding of how such various regimes interact. How the space treaties, the ITU regime, and the developments in the WTO context are all of overriding importance for satellite communications. How launching activities give rise both to application of those space treaties and of general treaties and law on security-sensitive technology, or on military applications – as well as requiring a licence under national law. How undertaking remote sensing requires not only compliance with the space treaties and the UN resolution on remote sensing, but also the appropriate use of intellectual property rights – as do ISS operations, albeit rather differently. How international liability and insurance for space activities are interconnected. How environmental concerns may interfere with exploitation, and vice versa. And so on.

The result of this first-level approach materializes in the introductory paragraphs and conclusions, pointing out the inter-regime relationships at a certain level of abstraction, and even more so in the very frequent cross-referencing to the other chapters relevant for a certain issue, development or sector. It is hoped in particular that this structural level of analysis will allow the reader to easily understand also how future developments that give rise to legal parameters, consequences or considerations and/or future legal regimes that become relevant for space activities and applications would fit into this multi-dimensional discipline of 'space law'.

The second level refers to the actual substance of the various regimes or sets of regimes (in the case of national space law), where obviously choices had to be made, but by and large the key regimes as of today of major importance for space activities and applications have been covered – in sufficient depth and detail so as to allow a fairly comprehensive understanding of both the particular regime itself and where to look for further details, if needed. In many respects not all details of a particular regime at issue could actually be addressed (also here, choices had to be made), so instead the most salient, telling or practically important details or examples have been singled out for treatment.

In other words, it is hoped that at this substantial level of analysis the reader will not only obtain a fairly comprehensive high-level overview of the particular regime at issue, but if studying or researching it further, will also be able to properly discern and relate other specific details or examples to this overarching survey.

The third level is of a more prospective character: I have challenged the various contributors as well as myself to also cast a look into the future and dare to make some provisional predictions of future problems and/or future solutions. There is no doubt that within a few years some of those 'predictions' will prove wrong, and that others which have hardly been expected will become reality instead, but also in the selection of such 'forward-looking analyses' an effort has been made to analyse and explain how they would result from, or otherwise relate to, the existing structure and substance of the various legal regimes comprising 'space law' in its broader sense.

Hopefully, therefore, these third-level prospective analyses will above all challenge also the reader to think about future developments in mankind's space endeavour and what they might or should mean for space law, as well as about future developments in space law and what they might mean for mankind's space endeavour.

THANK YOU

In view of the broad scope of this undertaking – the epithet '*cosmic*' naturally comes to mind – it is inevitable that this project could not have been (more or less) successfully concluded without the help of a great number of people. At the risk of omitting names also entitled to being mentioned, I want to express my gratitude to all concerned.

Whilst the undersigned remains, as Editor, ultimately responsible for any flaws that the Handbook may show, many of the actual contributions have been provided by specialists in respective special areas within space law as a whole, as long-standing authorities, leading young minds thinking out of the box – or, in most cases, both. It is wonderful how they kept up with my constant bugging and tinkering – and then finding they had to wait for the final result much longer than anticipated. I sincerely hope they are not disappointed.

Most specifically, in this regard, thanks are due to the Assisting Editor Dr Fabio Tronchetti, who not only himself contributed various chapters, but also double-checked my comments and proposals regarding the various chapters of the others as well as my own chapters, and kept a check on my more fundamental and structural approaches as well. Also my research assistants at UNL have provided invaluable support in collecting all the details I insisted on being included – Robin Scott, Dammy Oluyole and especially Sandra Teichert: thank you for that! More generally, the environment at the University of Nebraska-Lincoln College of Law has been very supportive for this kind of undertaking – which in today's academic world unfortunately is not always a given anymore.

Personally, I take great pride also in the willingness of Rusty Schweickart, as an ultimate representative of 'practitioners' of space activities, to express his views of space law and its relevance for space activities in the Foreword to this book. To me, it confirms once more that in spite of the many lawyer jokes going around – many of which are really great – there is indeed a place under the sun for space law and space lawyers.

Finally, of course, I owe gratitude to Edward Elgar Publishing: by allowing me to live out my idiosyncratic ideas and approaches and ultimately come up with a book almost double the intended size, it is clear that Ben Booth, Megan Ballantyne and David Fairclough, in particular, valued quality over velocity – and I can only hope they are also pleased with the result of the process, seeing this as a major step forward, if perhaps not for all mankind, at least for all (space) lawyers.

Frans von der Dunk
Lincoln/Leiden,
April 2014

Abbreviations

ABM	Anti-Ballistic Missile
ADR	Active debris removal
APRSAF	Asia-Pacific Regional Space Agency Forum
APSCO	Asia-Pacific Space Cooperation Organization
ASEAN	Association of Southeast Asian Nations
ASETA	Asociación de Empresas de Telecomunicaciones de la Comunidad Andina
ATC	Air traffic control
ATV	Automated Transfer Vehicle
BNSC	British National Space Centre
BSS	Broadcasting-satellite services
CCL	Commerce Control List
CD	Conference on Disarmament
CEE	Colombian Commission of Space
CGEA	Community General Export Authorisation
CNES	Centre National d'Etudes Spatiales
CNSA	Chinese National Space Administration
COMESA	Common Market for Eastern and Central Southern Africa
COPUOS	Committee on the Peaceful Uses of Outer Space
CORS	Continuously Operating Reference Stations
COSPAR	Committee on Space Research
COSTIND	Chinese Commission of Science, Technology and Industry
COTS	Commercial Orbital Transportation Services
COUP	Consolidated Operations and Utilization Plan
CRAF	Committee on Radio Frequencies
CS	Commercial Service
CSA	Canadian Space Agency

CSG	Centre Spatial Guyanais
DSB	Dispute Settlement Body
EARC	Extra-ordinary Administrative Radio Conference
EASA	European Aviation Safety Agency
EC	European Community
ECAC	European Civil Aviation Conference
ECSL	European Centre for Space Law
ECSS	European Cooperation for Space Standardization
EEC	European Economic Community
EGAS	European Guaranteed Access to Space
EGNOS	European Geo-stationary Navigation Overlay System
ELDO	European Launcher Development Organisation
ELV	Expendable launch vehicle
ESA	European Space Agency
ESF	European Science Foundation
ESOC	European Space Operations Centre
ESPLS	European Space Products Liability Scheme
ESRO	European Space Research Organisation
ESSP	European Satellite Services Provider
ETG	European Tripartite Group
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAA	US Federal Aviation Administration
FAI	Fédération Aéronautique Internationale
FANS	Future Air Navigation Systems
FCC	Federal Communications Commission
FMS	Foreign Military Sales
FSS	Fixed satellite services
GAGAN	GPS-Aided Geo Augmented Navigation
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GBAS	Ground-Based Augmentation Systems

GCC	Gulf Cooperation Council
GEO	Geostationary orbit
GEOSS	Global Earth Observation System of Systems
GJU	Galileo Joint Undertaking
GLONASS	Global Navigation Satellite System
GMDSS	Global Maritime Distress and Safety System
GMES	Global Monitoring for Environment and Security
GMPCS	Global Mobile Personal Communications by Satellite
GNP	Gross National Product
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GNSS Supervisory Authority
GSLV	Geostationary Satellite Launch Vehicle
HEO	Highly elliptical orbit
HP	High Precision
IAA	International Academy of Astronautics
IADC	Inter-Agency Space Debris Coordination Committee
IAF	International Astronautical Federation
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IGA	Intergovernmental Agreement
IGO	Intergovernmental organization
IISL	International Institute of Space Law
ILA	International Law Association
IMO	International Maritime Organization
IMSO	International Mobile Satellite Organization
INF	Intermediate Nuclear Forces
IOV	In-Orbit Validation
IPR	intellectual property rights
ISRO	Indian Space Research Organization
ISS	International Space Station
ITARs	International Traffic in Arms Regulations

ITSO	International Telecommunications Satellite Organization
ITU	International Telecommunication Union
JAXA	Japan Aerospace Exploration Agency
LAAS	Local Area Augmentation System
LEO	Low earth orbit
LRG	Launch risk guarantee
MCB	Multilateral Control Board
MEO	Medium earth orbit
MFN	Most Favoured Nation
MLM	Multipurpose Laboratory Module
MOU	Memorandum of understanding
MSC	Meteorological Satellite Center
MSS	Mobile satellite services
MTCR	Missile Technology Control Regime
MTSAT	Multifunctional Transport Satellites
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration
NDGPS	Nationwide Differential GPS System
NEO	Near-Earth Object
NGO	Non-governmental organization
NGS	National Geodetic Survey
NPS	Nuclear power source
NT	National Treatment
OOS	On-orbit satellite servicing
OOSA	UN Office for Outer Space Affairs
OSCE	Organization for Security and Co-operation in Europe
PAROS	Prevention of an Arms Race in Outer Space
PCA	Permanent Court of Arbitration
PLN	Pre-launch notification
PPP	Public–Private Partnership
PPS	Precise Positioning Service
PRS	Public Regulated Service

PSLV	Polar Satellite Launch Vehicle
PTO	Public Telecom Operators
RIISO	Residual International Intergovernmental Satellite Organization
RLV	Reusable launch vehicle
Roscosmos	Space Agency of the Russian Federation
SADC	Southern African Development Community
SAPOS	Satellite Positioning Service
SATMS	Space and Air Traffic Management System
SBAS	Satellite-Based Augmentation Systems
SES	Société Européenne des Satellites
SiS	Signal in Space
SLASO	Australian Space Licensing and Safety Office
SNS	Space Network Systems
SOL	Safety-of-Life
SOP	Systems Operations Panel
SP	Standard Precision
SPAC	Satellite Positioning Research and Application Center
SPS	Standard Positioning Service
SSN	Space Surveillance Network
STSC	Scientific and Technical Sub-Committee
TAA	Technical Assistance Agreement
TT&C	Telemetry, Tracking, and Command
UCC	Uniform Commercial Code
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNIDIR	UN Institute for Disarmament Research
UNIDROIT	International Institute for the Unification of Private Law
UOP	User Operations Panel
USML	United States Munitions List
WAAS	Wide Area Augmentation System
WARC	World Administrative Radio Conferences

WDA	Warehouse and Distribution Agreement
WIPO	World Intellectual Property Organization
WRC	World Radio Conferences
WTO	World Trade Organization

1. The background and history of space law

Peter Jankowitsch

1.1 A POLITICAL OVERVIEW

Space law, much like other branches of public international law and indeed international law itself, has its origins in the need to establish a certain number of more or less simple rules to govern relations between members of an increasingly organized international community, primarily the community of states. In this effort a widening number of areas on land, sea and finally air as well as new subjects, such as humanitarian ones, were covered by an ever larger body of law and treaties.

While the human mind, science, but also early examples of science fiction turned their attention early on to the space enveloping earth, outer space, there was no legal dimension to this sphere. It was only with the appearance of new technologies, in particular the development of rocket technology from theoretical beginnings to its first use as a means of warfare during the Second World War, that the possible legal aspects of this new kind of human activity began to stimulate legal thinking on this subject. As Vladimir Kopal has pointed out, many of the early writers on space law, including the author of a first comprehensive monograph on the subject, Vladimir Mandl, had a background in air law.[1] Mandl, however, points out in his study, published in Germany as early as 1932, that reaching outer space by rockets would raise a variety of new issues not settled by air law and therefore needing the creation of a new body of law.[2]

[1] See V. Kopal, Origins of Space Law and the role of the United Nations, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 221 ff. Cf. also S.E. Doyle, *Origins of International Space Law and the International Institute of Space Law of the International Astronautical Federation* (2002), 1–20.

[2] See V. Mandl, *Das Weltraum-Recht: Ein Problem der Raumfahrt* (1932), 48 ff.; see further e.g. V. Kopal & M. Hofmann, Vladimír Mandl (20.3.1899–8.1.1941), in *Pioneers of Space Law* (Ed. S. Hobe) (2013), 57 ff.; N. Jasentuliyana, *Space Law: Development and Scope* (1992), 18–9.

These writings became more numerous as the 1950s progressed and the International Geophysical Year of 1958 approached, in which a growing number of authors such as John Cobb Cooper,[3] Rolando Quadri,[4] Charles Chaumont,[5] Nicolas Matte,[6] Eugene Pépin[7] and others argued for legal regulation of this issue. Although they could not yet produce the new international rules they were calling for, their importance resided in the fact that they already produced some kind of consensus on the nature and content of such a law.

The most powerful drive towards creating such a new branch of international law finally came from geopolitical considerations, namely the opening, in outer space, of a new field of competition and possibly confrontation of the two superpowers of the day, the United States and the Soviet Union. Their confrontation had already become much more dangerous and global as it successively left the European theatre in which, beginning with the emergence of an Iron Curtain, it had started

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[3] See e.g. J.C. Cooper, The Boundary between Territorial Airspace and International Outer Space, in *Explorations in Aerospace Law: Selected Essays by John Cobb Cooper, 1946–1966* (Ed. I.A. Vlasic) (1968), 298; J.C. Cooper, Legal Problems of Spacecraft in Airspace, in *ibid.*, 308.

[4] See e.g. R. Quadri, *Diritto Internazionale Pubblico* (5th edn., 1968), 685–7; R. Quadri, Droit international cosmique, in 98 *Recueil des Cours* (1959), 505–98; further e.g. S. Marchisio, Rolando Quadri (22.12.1907–2.4.1976), in *Pioneers of Space Law* (Ed. S. Hobe) (2013), 151 ff.

[5] See e.g. C. Chaumont, Les problèmes du droit international de l'espace extra-atmosphérique, in *Institut des Hautes Études Internationales de l'Université de Paris* (1958), 3 ff.; C. Chaumont, Les perspectives que doit adopter le droit de l'espace', in 7-2 *Revue de Droit Contemporain* (1960), 5–12; C. Chaumont, Die Brüsseler Entschließung des Institut de Droit International zum Weltraumrecht, in 15 *Zeitschrift für Luft- und Weltraumrecht* (1966), 20–35.

[6] See e.g. N.M. Matte, *Aerospace Law* (1969); also N.M. Matte, The Law of the Sea and Outer Space: A Comparative Survey of Specific Issues, in 3 *Ocean Yearbook* (1982), 13–37; N.M. Matte, *Deux Frontières Invisibles: De la Mer Territoriale à l'Air 'Territorial'* (1965), 157–240; N.M. Matte, Aerospace Law: Telecommunications Satellites, in 166 *Recueil des Cours* (1980), 119–249.

[7] See e.g. E. Pépin, Legal Problems Created by the Sputnik, Lecture given on 6 November 1957 to the Canadian Bar Association (Quebec Maritime and Air Law Section), reprinted in *Legal Problems of Space Exploration, A Symposium* (1961), 187 ff.; also E. Pépin, Introduction to Space Law, 4 *New York Law Forum* (1958), 258–61; E. Pépin, The Legal Status of the Airspace in the Light of Progress in Aviation and Astronautics, 3 *McGill Law Journal* (1956), 70–7; E. Pépin, Les Problèmes Juridiques De L'Espace, 6 *McGill Law Journal* (1959), 30–42; E. Pépin, Legal Problems Created by the Sputnik, 4 *McGill Law Journal* (1957), 66–72. Further e.g. A. Kerrest de Rozavel, Eugène Pépin (27.06.1887–27.04.1988), in *Pioneers of Space Law* (Ed. S. Hobe) (2013), 21 ff.

and rapidly developed into a worldwide contest. Its major players were constantly in search of new areas and fields where military, political or technological advantage over the adversary could be gained. Military technology was one of the foremost areas of their competition.

The rapid development of nuclear arms was also a clear sign that in this confrontation no avenue would be left unexplored and that few limits would be respected. While, thus, land, air and sea were already theatres of an unending arms race, the question remained to what extent it might also reach into new spheres. Here, early ballistic weapons developed by a desperate Nazi Germany towards the end of the Second World War pointed in an ominous new direction. When, thus, in October of 1957, the Soviet Union managed to launch a first man-made object into outer space, it became clear that a new area of competition between the two superpowers of the day had been opened, especially as the United States had been caught quite unawares and were certain to react in one way or another.

It is not easy to speculate, even today, on the motives and ultimate reasons that made the two superpowers refrain from such an arms race and instead engage in a different sort of competition whose first, largely civilian high points were the first venture of a human being into outer space and later the peaceful landing on the moon. If in the end, therefore, such a more peaceful turn of events occurred, we can assume that next to political considerations there must also have been powerful economic ones such as the cost, even more prohibitive in those early days than today, of moving large military structures into outer space and maintaining them. Finally, space technology was still in its infant stage, lacking powerful launchers, sophisticated means of communications and intelligence.

As early as 1963, therefore, and well before the conclusion of the first major outer space treaty, general understandings were reached between the United States and the Soviet Union to ban the deployment of nuclear weapons and other weapons of mass destruction in outer space.[8] Originally in the form of a bilateral agreement, it was later welcomed by the General Assembly of the United Nations in Resolution 1884(XVIII), unanimously adopted on 17 October 1963.[9]

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[8] This would be the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (hereafter Partial Test Ban Treaty), Moscow, done 5 August 1963, entered into force 10 October 1963; 480 UNTS 43; TIAS No. 5433; 14 UST 1313; UKTS 1964 No. 3; ATS 1963 No. 26.

[9] Question of general and complete disarmament, UNGA Res. 1884(XVIII), of 17 October 1963; UN Doc. A/RES/18/1884. See further e.g. M.

The way was thus opened for entering into a much wider agreement on the principles that should henceforth govern the activities of states in the exploration and peaceful uses of outer space, and here again the General Assembly set out these principles in its historic Resolution 1962(XVIII) of 13 December 1963.[10] This led to the negotiation and signing in January 1967 of the Outer Space Treaty in London, Moscow and New York.[11]

While geopolitical motives have thus had the strongest impact on the willingness of the international community during these otherwise highly controversial and conflict-stricken years to arrive at such a wide-reaching agreement, this should not obscure other factors which promoted this innovative process.

For the origins of air law, technological factors also had a large part to play and here interesting parallels between air and space law exist. Thus, as Isabella Diederiks-Verschoor notes in her now classic *Introduction to Space Law*,[12] it was the Wright brothers' engine-powered flight in 1903 that eventually led to a first series of international conferences and agreements on rules and regulations for air traffic, in particular the famous Paris Convention of 1919,[13] preceding the later Chicago Convention of 1944.[14]

Similarly, the first flights of man-made objects into outer space beginning with Sputnik called for an urgent need to develop the legal principles which the academic world had already requested earlier.

Dauses, Bestehen und Inhalt von Weltraumgewohnheitsrecht – Ein Beitrag zur Lehre von den Rechtsquellen des Weltraumrechts, in 20 *Zeitschrift für Luft- und Weltraumrecht* (1971), 267–79; A.E. Gotlieb, Nuclear Weapons in Outer Space, 3 *Canadian Yearbook of International Law* (1965), 3–35.

[10] Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, UNGA Res. 1962(XVIII), of 13 December 1963; UN Doc. A/AC.105/572/Rev.1, at 37.

[11] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[12] See I.H.P. Diederiks-Verschoor & V. Kopal, *Introduction to Space Law* (3rd edn., 2008), 2.

[13] Convention Relating to the Regulation of Aerial Navigation (Paris Convention), Paris, done 13 October 1919, entered into force 11 July 1922; 11 LNTS 173; UKTS 1922 No. 2; ATS 1922 No. 6.

[14] Convention on International Civil Aviation (Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300.

Contrary to air law, however, the time span between a first technological breakthrough and a first legal reaction was cut by half.

As another leading expert on air and space law, Bin Cheng remarked in an essay published on the 30th anniversary of the Outer Space Treaty, 'the treaty was drawn up not only in some haste within the space of less than 12 months but also less than ten years after the launch of the earth's first artificial satellite'.[15]

The signing and entry into force, shortly thereafter, of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (usually referred to as the Outer Space Treaty) thus signifies the creation of an entirely new branch of public international law, the law of outer space. This law is and remains of an original and innovative nature in many respects.

In subjecting the exercise of state sovereignty in outer space to new rules rarely to be found in the traditional pages of international law, much more strongly marked by *Realpolitik*, the Outer Space Treaty creates a new ethic and an entirely new spirit in the cold relations between states. Most importantly perhaps, unlike the continents and seas newly discovered by European empires and their navies in previous centuries, outer space, including the moon and all other celestial bodies, is not subject to national appropriation.[16] And unlike the high seas, which since Salamis and Actium, have been among the preferred theatres of war and military, naval engagements, the exploration and uses of outer space were to be reserved for peaceful purposes only.[17] It is innovative also in the sense that to this day it has attempted, albeit not always successfully, to move ahead of technological developments and to try to create a secure legal environment for future scientific or economic activities.

This ambitious design is perhaps best exemplified by the visionary dispositions of such follow-up treaties as the 1979 Moon Agreement.[18] By designating in its Article 11 the moon itself, as well as its natural resources, as the 'Common Heritage of Mankind' (echoing, incidentally, a similar disposition for natural resources in the deep sea-bed contained in the new

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15 B. Cheng, Space Objects and Their Various Connecting Factors, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 203.

16 See Art. II, Outer Space Treaty, *supra* n. 11.

17 *Cf.* e.g. Art. III, Outer Space Treaty, *supra* n. 11.

18 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979).

law of the sea[19]) a step was certainly made towards a future, more broadly designed regime for such resources. The scope for such a regime would even be wider as the provisions of the Moon Agreement are also applicable to other celestial bodies within the solar system other than the earth.[20] Not surprisingly, this treaty has, although adopted unanimously by the General Assembly of the United Nations and although it could enter into force some years later, found to this day only a handful of states willing to ratify it and thus endorse the principles it contains.

Among the many new and path-breaking principles contained in the 1967 Outer Space Treaty special attention is due to its Article VI which incorporated the principle of international responsibility of states for national space activities, whether such activities are carried out by governmental agencies or by non-governmental entities. It also stipulates that national space activities are carried out in conformity with the provisions of the Outer Space Treaty. The wording of this principle emerged as a compromise formula which reconciled the then strongly opposed views of those, like the Soviet Union, wishing to reserve space activities to states only, and those, like the United States and other Western powers, advocating and allowing access to space and space activities to non-state actors as well.

During the period of 12 years that followed the entry into force of the 1967 Outer Space Treaty four other major space treaties were concluded at the United Nations. Here the finalization and signature of an Agreement on the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched into Outer Space, in short the 1968 Rescue Agreement,[21] was accelerated by a tragic space event that occurred just on the day of the signature of the Outer Space Treaty.[22]

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[19] See in particular Art. 136, United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 & 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39.

[20] See Art. 1(1), Moon Agreement, *supra* n. 18.

[21] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968).

[22] On 27 January 1967 the crew of Apollo 1, Roger Chaffee, Ed White and Gus Grissom, were killed by a fire that broke out during a ‘plugs-out-test’ of their spacecraft in their space capsule.

The next and third of the space treaties originating from within the United Nations, the 1972 Liability Convention,[23] is considered to be one of the most interesting instruments from a purely legal point of view. The Liability Convention is based on two different legal principles: the principle of absolute liability of the launching state, which shall be obliged to pay compensation for damage caused by its space object on the surface of the earth or to aircraft in flight;[24] on the other hand it also contains the principle of liability based on fault in the event of damage caused elsewhere.[25]

The fourth UN treaty, the 1975 Registration Convention,[26] had as its main objective the implementation of the principles that had already been spelled out in less detail in Article VIII of the Outer Space Treaty.[27]

When drafting the terms of the fifth legal instrument, the 1979 Moon Agreement, in the late 1970s negotiators again elaborated on a number of principles already found in the 1967 Outer Space Treaty. But when negotiating this Agreement, the drafters, in dealing with the status of the natural resources of the moon, were not in a position to rely on the Outer Space Treaty as, in this respect, the Treaty remains mostly silent.

As opinions on this matter diverged, a generally acceptable compromise was found by joining confirmation of the freedom of scientific investigation, the exploitation and use of the moon as a right of all states with the stipulation to establish an international regime governing the

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23 Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).

24 See esp. Art. II, IV(1.a), Liability Convention, *supra* n. 23.

25 See esp. Art. III, IV(1.b), Liability Convention, *supra* n. 23.

26 Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

27 Art. VIII, Outer Space Treaty, *supra* n. 11, provided in relevant part: 'A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body … Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.'

exploitation of the natural resources of the moon, as such exploitation might become feasible.[28]

With the conclusion of the Moon Agreement the early and dynamic phase of UN law making by treaties in the field of outer space had come to an end. This did, not, however, mean that efforts of the world organization to create multilateral rules for this new dimension of human activity had totally ceased.[29] The United Nations now turned or rather returned to the practice of declaring legal principles for space by Resolutions of the General Assembly, a practice it had already employed in the period that preceded the adoption of the five outer space treaties.

But while the first of these Resolutions, in particular Resolution 1962(XVIII) of 13 December 1963, had the objective of launching the process of international cooperation in space and thus creating a basis for a space legislation process later, now the establishment of a number of sets of principles by UN General Assembly Resolutions had to regulate more special and more technical categories of space activities. In this way the sets of principles elaborated and adopted by the General Assembly included principles governing television broadcasting (1982),[30] remote sensing of the earth from space (1986),[31] the use of nuclear power sources in outer space (1992)[32] and a Declaration on international cooperation for the benefit and in the interest of all states, taking into particular account the needs of developing countries (1996).[33]

These sets of principles, while based to a large degree on the previous space treaties, particularly the Outer Space Treaty, are not legally binding – Resolutions of the General Assembly, which are simply recommendations to member states lacking this force.[34] Principles thus adopted,

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[28] See esp. Art. 6(1) resp. Art. 11(5), Moon Agreement, *supra* n. 18.

[29] See further *infra*, § 1.3.

[30] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, UNGA Res. 37/92, of 10 December 1982; UN Doc. A/AC.105/572/Rev.1, at 39.

[31] Principles Relating to Remote Sensing of the Earth from Outer Space, UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986).

[32] Principles Relevant to the Use of Nuclear Power Sources in Outer Space, UNGA Res. 47/68, of 14 December 1992; UN Doc. A/AC.105/572/Rev.1, at 47.

[33] Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries, UNGA Res. 51/122, of 13 December 1996; UN Doc. A/RES/51/122.

[34] See A.D. Terekhov, UN General Assembly Resolutions and Space Law, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 14; V.

however – most of them by consensus – still form a code of conduct and reflect a wide legal conviction of the present international space community on special categories of space activities.

These General Assembly Resolutions if followed, as is the case, by a constant practice of states and international organizations, may play a significant role either in establishing customary rules of international law[35] or serve as a basis for future international negotiations on treaties to regulate the same subjects but this time in a legally binding manner.

1.2 SPACE LAW AND THE NEW MAJORITY IN THE UNITED NATIONS

While it was earlier the security concerns of the major space powers that overshadowed and influenced the development of space law, the 'new majority' of developing countries from Africa, Asia and Latin America that became dominant in the United Nations from the 1960s onwards brought a different kind of concern to these deliberations. Developing nations saw a need to use this new technology for the benefit of their economic and social advancement. There was, in particular, a fear that space benefits would remain limited to a small number of advanced, industrialized countries. This view was clearly echoed by U Thant who, as Secretary-General of the United Nations, submitted to the 1968 Vienna Conference on the Exploration and Peaceful Uses of Outer Space a Memorandum in which he warned participants that 'the space age was increasing the gap between the developed and the developing areas at an alarming rate'.[36]

An effort was therefore made to give space law or basic principles of space law a direction that would also benefit developing countries. One of the best reflections of this effort can be seen in a Declaration adopted in 1996 whose lengthy title is an appeal, couched in some legal terms, to conduct the exploration and uses of outer space 'for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of

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Kopal, The Role of United Nations Declarations of Principles in the Progressive Development of Space Law, 16 *Journal of Space Law* (1988), 5 ff.

[35] See V. Vereshchetin & G.M. Davilenko, Custom as a Source of International Law of Outer Space, 13 *Journal of Space Law* (1985), 113; A. Cassese, *International Law* (2005), 168.

[36] P. Jankowitsch, The Role of the United Nations in Outer Space Law Development: Past Achievements and New Challenges, 26 *Journal of Space Law* (1998), 105.

Developing Countries'.[37] It certainly reflects a further stage of the North–South debate on space cooperation, without, however, marking, as some authors believe,[38] an end to it, and the role of space law in this regard.

What it certainly does do is to combine the principle of the freedom of the exploration and utilization of outer space with a reminder to space powers to fulfil their obligation to conduct these activities for the benefit of all countries.[39] Space powers should foster international cooperation on an equitable and mutually acceptable basis. Developing countries newly interested in space activities might thus be motivated to pool their energies so as to develop common strategies towards outer space, that could also include efforts towards better legal regulations.

1.3 SPACE LAW AND THE UNITED NATIONS

In apparent contrast to the creation of other, earlier bodies of international law, an international organization with a broad, all-encompassing mandate like the United Nations, established to 'maintain international peace and security' and to encourage the 'progressive development of international law and its codification' became the first and primary source of space law.[40] This was also obvious in view of the global reach of space activities, which from their onset required a high degree of international cooperation that, by its nature, could only be found and practised in a universal organization like the United Nations.

It was therefore a natural course of events that as early as 1958, shortly after the launch of the first man-made space object, the General Assembly created an Ad Hoc Committee on the Peaceful Uses of Outer Space, made up of 18 members who were to study the technical, legal and other aspects brought about by the appearance of the first satellites.[41] The Ad

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[37] Preamble, 10th para., UN GA Res. 51/122, *supra* n. 33; see also Annex, *sub* 1.

[38] *Cf.* e.g. V. Liebig & K.U. Schrogl, *Space Applications and Policies for the New Century* (2000), 137.

[39] *Cf.* also Art. I, Outer Space Treaty, *supra* n. 11.

[40] Art. 1(1) resp. Art. 13(1.a), Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1.

[41] See Question of the peaceful use of outer space, UNGA Res. 1348(XIII), of 13 December 1958; Resolutions adopted on the reports of the First Committee, General Assembly – Thirteenth Session, at 5.

Hoc Committee met for the first time on 6 May 1959, and it established two Sub-Committees – one scientific and technical, and one legal – and submitted a report which became part of a final report of the Ad Hoc Committee approved on 25 June 1959.[42]

The Ad Hoc Committee became permanent by General Assembly Resolution 1472(XIV) of 12 December 1959,[43] but not without Cold War controversies marring its beginnings. The Soviet Union first boycotted the Committee for not being sufficiently representative, also asking that its decisions be made by consensus rather than by majority vote as the West had suggested. An agreement was finally reached to create a Committee of 24 members that was designed as a subsidiary body of the General Assembly, to which it was to report, thus underlining its strongly political character.

Cold War politics were also decisive in attributing leadership in a Committee in which a careful balance between East and West was to be achieved. Austria, a neutral country, was chosen to take the chair of the main Committee, now called COPUOS; the other members of the bureau being Romania as Vice-Chair and Brazil as Rapporteur.[44] A certain balance between East and West was also maintained in attributing the chairs of the two Sub-Committees of COPUOS, the Legal Sub-Committee long having been chaired by a representative of Eastern countries, while the chair of the Scientific and Technical Sub-Committee remained in the hands of the Western group of countries.

A special case was China, which, for a number of years, after the People's Republic had had its membership of the United Nations restored, had refused to join the Committee, which it considered to be too strongly dominated by a Soviet-American tandem. However, it later took its seat as Chinese space programmes began to develop and as more and more member states of the United Nations took part in its work.

Still, the Cold War configuration of COPUOS was to remain unchanged well into the period after the end of the Cold War, when ultimately the usual system of rotating chairmanships was adopted by the Committee. The Committee, after some protracted negotiations, had

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42 See Document A/4141, Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space, of 14 July 1959, www.oosa.unvienna.org/pdf/gadocs/A_4141E.pdf, last accessed 12 April 2014.

43 International co-operation in the peaceful uses of outer space, UNGA Res. 1472(XIV) A, of 12 December 1959; Resolutions adopted on the reports of the First Committee, General Assembly – Fourteenth Session, at 5.

44 See e.g. I. Seidl-Hohenveldern & G. Hafner, *Liber Amicorum Professor Ignaz Seidl-Hohenveldern: In Honour of His 80th Birthday* (1998), 73.

finally adopted the practice of consensus for its decision making in 1962 when the Chair of COPUOS, Ambassador Franz Matsch of Austria, read the following statement into its record:

> I should like to place on record that through informal consultations it has been agreed among the members of the Committee that it will be the aim of all members of the Committee and its sub-Committees to conduct the Committee's work in such a way that the Committee will be able to reach agreement in its work without need for voting.[45]

The UN Committee on the Peaceful Uses of Outer Space was the first UN standing body to use this procedure in its purest form. The fact that all the space law agreements drafted in its Legal Sub-Committee were therefore adopted by consensus, although this methodology sometimes slowed down negotiations, provided them with broad international acceptance, particularly from the major space powers, who could thus identify with the compromise solutions found in the Committee. The fact that today – with one exception – the majority of outer space treaties are accepted by a large number of states also testifies to this.

Thus the Outer Space Treaty itself today has 102 states parties, 26 others having already signed it.[46] The Rescue Agreement has 92 states parties and has been signed by 24 additional states, while two international organizations have declared their acceptance of the rights and obligations established under this Agreement.[47] Similarly, 89 states are now parties to the Liability Convention and 60 states are parties to the Registration Convention.[48] In both cases there are also numerous additional signatory states and international organizations accepting rights and obligations deriving from them. The only exception so far is the Moon Agreement with a meagre 15 states parties and four more states signatories to it.[49]

The importance of the legislative work of the Committee and particularly its Legal Sub-Committee was also underlined by the fact that its proceedings were recorded verbatim until 1985, a privilege only enjoyed by such important organs of the General Assembly as its First Committee and of course the Assembly itself.

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[45] UN Doc. A/AC.105/OR.2, of 19 March 1962, at 5. See also UN Doc. A/518l, of 27 September 1962, at 3–4.

[46] See www.unoosa.org/oosa/en/SpaceLaw/treatystatus/index.html, last accessed 2 January 2014.

[47] *Ibid.*

[48] *Ibid.*

[49] *Ibid.*

The adoption and consequential practice of the consensus rule was, however, not the main reason why the legislative functions of the Committee and its legal sub-body have been grinding almost to a complete halt in recent years. One major reason for this development was a new ideology, triggering a massive political movement that first surfaced in some major, mostly Western, parts of the developed world and then became more general. Under various brand names and slogans like 'supply-side economics', its principal aim was to liberalize and deregulate national and international markets and as a consequence reduce the influence of states and governments in economic and social matters. Not by coincidence, these policies were generally also referred to as the 'Washington Consensus'.[50]

Such an atmosphere was certainly not conducive to the acceptance of new rules and regulations in outer space, which at the same time experienced the massive entry of particularly aggressive private sector players, motivated by expectations of rapid growth and quick economic benefit. Much of the resistance to the introduction of new legal frameworks therefore came from these new players as well as from governments displaying an ever higher degree of reluctance to enter into new treaty commitments of a multilateral character.

One of the best examples to illustrate this change in political atmosphere was the lamentable fate of the Moon Agreement. Although first adopted unanimously by the General Assembly of the United Nations in Resolution 34/68 of 5 December 1979,[51] the United States and all other Western powers joining in this consensus, this later change in political atmosphere created new and unforeseen barriers to its ratification, many of its provisions now seeming to be in contrast to a more market-friendly world.

Next to a changed economic philosophy, more assertive national interests have also played their part: more powerful national space agencies, not least those operating in some of the most technologically advanced countries, apparently saw little merit in accepting new legal obligations of an international character and preferred to cast their international relations in bilateral form. This was also true, for instance, as far as responsibilities to support efforts of developing countries to become users of space technology were concerned.

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[50] See http://en.wikipedia.org/wiki/Washington_Consensus, last accessed 12 April 2014.

[51] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, UNGA Res. 34/68, of 5 December 1979; UN Doc. A/34/20.

The clearest rejection of new multilateral treaty making came from the United States, which, in its new National Space Policy adopted in 2006, stated that 'the United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit US access to or use of Outer Space'.[52]

At the same time, however, technological progress as well as new and multiple uses of outer space continued, creating new problems and challenges for which legal solutions were just as important as technical ones. And in the same way that it remains beyond doubt that economic globalization, particularly after the experience of the last great crisis, cannot safely and successfully function without some degree of regulation, the global nature of space cooperation certainly required a minimum of universally accepted rules to stay on course and to avoid lawlessness, chaos and conflict in outer space.

1.4 SPACE LAW AND SPACE ARMS CONTROL[53]

The Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (better known as the Partial Test Ban Treaty[54]) concluded in August 1963, which has since attracted 126 states parties (a few more having just signed it),[55] was the first legally binding international instrument that clearly acknowledged the fact that outer space constitutes a new dimension in international security, deserving attention no less than that given to other, more terrestrial ones.

An even clearer link of that kind was created by the Outer Space Treaty of 1967. Prohibiting the placing in orbit around the earth or stationing in outer space of any objects carrying nuclear weapons or other weapons of mass destruction, the installation of such weapons on celestial bodies or the stationing of such weapons in outer space in any

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[52] National Space Policy of the United States of America, of 31 August 2006, Section II, Principles, para. 7, available at www.whitehouse.gov/sites/default/files/microsites/ostp/national-space-policy-2006.pdf, last accessed 2 January 2014.

[53] This section draws in its substance from a paper 'Arms Control in Outer Space: The Need for New Legal Action' which the author presented to an SIPRI Symposium 'Outer Space – can Militarization be checked', held in Stockholm, 21–23 September 1983; see Space Weapons – The Arms Control Dilemma (Ed. B. Jasani) (1984), 173 ff.

[54] Partial Test Ban Treaty, *supra* n. 8.

[55] See http://en.wikipedia.org/wiki/List_of_parties_to_the_Partial_Test_Ban_Treaty, last accessed 2 January 2014.

other manner,[56] it subjected outer space – in a manner relevant to its special nature – to a new body of arms control measures designed to exclude the use of nuclear weapons or other weapons of mass destruction.

While these treaty commitments certainly go some way towards creating a special status for outer space and could be seen as a first element in the building of a new and at least nuclear weapon-free 'sanctuary', they are first and foremost not much more than an extra-terrestrial extension of arms control measures designed for more traditional theatres of warfare. They are therefore only to a minor degree addressed to the new possibilities offered by this medium.

A somewhat larger perspective is offered by the further provisions of Article IV of the 1967 Outer Space Treaty, which explicitly outlaws 'the establishment of military bases, installations and fortifications, the testing of any kind of weapons and the conduct of military manoeuvres on celestial bodies'. These provisions – although limited to celestial bodies and in particular the moon – constitute a somewhat rudimentary but conceptually more hopeful design of an outer space environment placed outside terrestrial battlegrounds.

These provisions are strengthened by the arms control article of the Moon Agreement, which not only repeats the prohibitions concerning nuclear weapons and weapons of mass destruction contained in Article IV of the Outer Space Treaty, but also prohibits 'any threat or use of force or any other hostile act or threat of hostile act on the Moon'.[57] It likewise prohibits 'use [of] the Moon in order to commit any such act or to engage in any such threat in relation to the Earth, the Moon, spacecraft, the personnel of spacecraft or man-made space objects'.[58] The importance and weight of these provisions is also underscored by the fact that the 1967 Outer Space Treaty as well as the 1979 Moon Agreement were the fruit of an intensive international legislative effort, conceived and negotiated multilaterally in the Committee on the Peaceful Uses of Outer Space and later adopted unanimously by the General Assembly of the United Nations.

In contrast to it, two further international agreements that had added to these beginnings of arms control provisions for outer space have resulted from bilateral arms control negotiations between the United States and the Soviet Union. These are the 1972 US–Soviet Treaty on the limitation

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56 See Art. IV, Outer Space Treaty, *supra* n. 11.
57 Art. 3(2), Moon Agreement, *supra* n. 18.
58 *Ibid*.

of anti-ballistic missile systems, the ABM Treaty,[59] which also prohibited the deployment of ABM systems in outer space, and the Strategic Arms Limitation Treaty (SALT I) Agreement.[60] Both treaties established the principle of 'non-interference' with the so-called 'national technical means of verification'.[61]

The provisions contained in these two bilateral agreements constituted, at the time they were passed, a further step in arms control for outer space as for the first time they addressed themselves not only to the extension of weapons systems existing on earth to outer space but also to the protection of technologies which – if we assume that national technical means of verification included satellites – are typical for the space environment only. Although their scope was limited due to the fact that at the time of their adoption there were only these two countries able to deploy such space objects, and although the United States later withdrew from the ABM Treaty,[62] they provided important indications on the direction and extensions a more complete system of arms control provisions for outer space would have to take.

Indeed the principle of non-interference with national technical means of verification[63] was not only incorporated in other bilateral US–Soviet arms control treaties such as the 1987 Intermediate Nuclear Forces (INF) Treaty,[64] but also remained on the agenda of subsequent discussions

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59 Treaty Between the United States of America and the Union of Socialist Soviet Republics on the Limitation of Anti-Ballistic Missile Systems (hereafter ABM Treaty), Moscow, done 26 May 1972, entered into force 3 October 1972, no longer in effect 13 June 2002; 944 UNTS 13; TIAS No. 7503; 23 UST 3435.

60 Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Arms (hereafter SALT I Agreement), Moscow, done 26 May 1972, entered into force 3 October 1972; TIAS 7504; 23 UST 3462.

61 See Art. XII(2), ABM Treaty, *supra* n. 59, resp. Art. V(2), SALT I Agreement, *supra* n. 60.

62 On 13 December 2001 US President George W. Bush notified Russia of the US withdrawal from the ABM Treaty in accordance with the clause that required six months' notice before terminating the agreement. President Bush stated that 'I have concluded the ABM treaty hinders our government's ability to develop ways to protect our people from future terrorist or rogue state missile attacks'; *cf.* http://articles.cnn.com/2001-12-13/politics/rec.bush.abm_1_abm-treaty-rogue-state-missile-attacks-anti-ballistic-missile-treaty?_s=PM:ALLPOLITICS, last accessed 2 January 2014. The US withdrawal took effect from June 2002.

63 *Cf.* http://en.wikipedia.org/wiki/National_technical_means_of_verification, last accessed 2 January 2014; further *infra*, § 6.4.

64 Treaty Between the United States of America and the Union of Socialist Soviet Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (hereafter INF Treaty), Washington, done 8 December 1987,

under the Strategic Arms Reduction Treaty (START I),[65] as well as others like the Comprehensive Test Ban Treaty.[66]

A look at this existing body of space arms control provisions shows a picture that is certainly incomplete and lacks a coherent approach. This becomes even more obvious when one considers that none of the treaties and agreements mentioned above is specifically and exclusively directed at arms control in space but contains such provisions rather as a by-product of other concepts. An analysis of this body of law will also have to focus on the philosophy and motivations that lie behind these provisions. Here again it appears difficult to identify a unifying concept.

As pointed out above, some elements of these provisions suggest that there may indeed have been some effort towards the concept of a fully demilitarized 'sanctuary', moving well beyond terrestrial concepts of arms control, deterrence or military balance. While also incomplete and not devoid of loopholes, the provisions relating to the moon and other celestial bodies bear closest resemblance to the concept of 'sanctuarization'.[67] Other provisions, however, rather suggest the idea that outer space is being regarded as a kind of support area for earth-based military – and of course civilian – activities, but that at least some specific rules and regulations should serve to govern its use.

This conceptual ambiguity is hardly surprising given the diversity of the actors concerned, a diversity clearest not perhaps among the architects of the multilateral treaties, but between the two major space powers of the times who pursued hugely different interests and policies. Difficult as it may be to identify some coherent concept or philosophy behind these various provisions, it appears all the same that – with all caution that has to be exercised in offering judgement on these matters – they all suggest a measure of restraint in the military uses of outer space as even the incomplete measures adopted originally were certainly supposed to avoid the conversion of outer space into one of the full-scale battlefields of the future.

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entered into force 1 June 1988; UST LEXIS 211; 27 ILM 90 (1988); S. Treaty Doc. No. 100-11.

65 Treaty on the Reduction and Limitation of Strategic Offensive Arms (hereafter START I Treaty), Moscow, done 31 July 1991, not entered into force; S. Treaty Doc. No. 102-20.

66 Comprehensive Test Ban Treaty, New York, done 24 September 1996, not yet entered into force; Cm. 3665; 35 ILM 1439 (1996); S. Treaty Doc. No. 105-28 (1997).

67 *Cf.* e.g. Art. IV(2), Outer Space Treaty, *supra* n. 11; Art. 3, Moon Agreement, *supra* n. 18.

As in other fields concerning basic rules of space law, however, progress in devising new pages of space law to maintain its peaceful character and limit its military uses was just as slow and hesitating and no new agreements could therefore be concluded. In particular, talks between the United States and the Soviet Union on anti-satellite (ASAT) weapons, which were conducted in three rounds from June 1978 to June 1979, were suspended without any tangible success, although it was hoped at the time that an ASAT agreement would be reached and could be signed at the same time as the SALT II Treaty.[68] While the suspension of these talks perhaps owed more to the world political situation of the times – in particular to the freezing of East–West relations after the Soviet invasion of Afghanistan – than to the subject matter itself, the fact remains that no serious effort was made in the following years to reopen these negotiations.

The same lack of progress characterized the various multilateral bodies in which the problems of arms control in outer space were to be addressed. Chief among them, the first two Special Sessions of the General Assembly of the United Nations devoted to disarmament held in 1978 and 1982, while not failing to recognize the dangers of a potential arms race in outer space and while calling for further measures to be taken and international negotiations to be held in order to prevent such a development, did not produce any new agreements on the matter.[69]

In view of the remarkable reluctance of many of those concerned to seriously tackle the issue of arms control in outer space, it was not surprising that it was only in 1982 and after protracted negotiations that the Committee on Disarmament of the United Nations, the predecessor of the current UN Conference on Disarmament (CD), finally came to the conclusion that the prevention of an arms race in outer space should be put on its agenda.[70] The Committee on the Peaceful Uses of Outer Space, while inhibited by its mandate from taking up matters of arms control in outer space and putting them on its agenda, thus became one of the main

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[68] Treaty Between the United States of America and the Union of Socialist Soviet Republics on the Limitation of Strategic Offensive Arms (hereafter SALT II Treaty), Vienna, signed 18 June 1979, not entered into force; UST LEXIS 220; 18 ILM 1112 (1979); S. Exec. Doc. Y, 96-1.

[69] See Final Document of the Special Session of the General Assembly on Disarmament, 17 ILM 4, July 1978, 1016–37.

[70] See Report of the Disarmament Commission, Official Records of the General Assembly, Thirty-sixth Session, Supplement No. 42 (UN Doc. A/36/42), para. 19.

fora for the expression of international movements of concern on developments threatening the uses of outer space for peaceful purposes.

Similarly, the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held in Vienna in August 1982, urged in its report 'all nations, in particular those with major space capabilities … to contribute actively to the goal of preventing an arms race in Outer Space and to refrain from any action contrary to that aim'.[71] However, all these appeals, including a host of General Assembly resolutions to prevent an arms race in space, did not produce any new agreements in the only UN body legitimated to engage in multilateral talks on disarmament and arms control. Although it finally entered into negotiations on the prevention of an arms race in space, now generally referred to as the PAROS issue,[72] these negotiations, which had made some progress, collapsed in 1995 after a disagreement between China and the United States. At that time the CD had been negotiating a Fissile Material Cut-off Treaty (FMCT),[73] which was near completion and in which the United States had shown great interest. China insisted that it would support that item only if the PAROS issue was to be considered at the same time. The United States, then under the Bush administration, had, however, argued consistently that there was no space race and that there was therefore no need to negotiate on the prevention of an arms race in outer space.[74]

This conflict was carried forward into the new century, the CD having been blocked by this as well as many other issues and regularly unable to even agree on an agenda for its annual meetings in Geneva.[75]

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[71] Report of UNISPACE 82, UN Doc. A/CONF.101/10, of 31 August 1982, para. 15, at 5.

[72] 'PAROS' stands for 'Prevention of an Arms Race in Outer Space'.

[73] On this point see T. Hitchens, Saving Space: Threat Proliferation and Mitigation, Paper commissioned by the International Commission on Nuclear Non-Proliferation and Disarmament, http://icnnd.org/Documents/Hitchens_Saving_Space.pdf, last accessed 2 January 2014. See for the text of the 2009 draft plus explanations http://fissilematerials.org/library/2009/02/draft_fissile_material_cutoff_.html, last accessed 2 January 2014.

[74] See N.L. Remuss, Space and Security, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 524.

[75] See further *infra*, § 6.7; concerns towards a progressive weaponization of outer space and attacks against space objects have grown in the past years, resulting in discussions with the CD and COPUOS and also in legal proposals, such as the Russo-Chinese Draft PPWT Treaty (Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against

As this short history shows, initial efforts to use space law and ambitious multilateral treaties like the Moon Agreement to create a secure space environment, prevent an arms race in space and provide outer space with a special status, have been aborted at a rather early moment and left space arms control provisions as an unfinished torso. While it is certainly a kind of 'Nuclear Free Zone' similar to such zones on earthly continents, few further steps to shield it from armed conflict of a non-nuclear character have been accomplished.

The reasons why states were and to a large extent still are reluctant to discuss and accept an arms control treaty covering outer space can be found first and foremost in unwillingness to abandon or expose the technical and military advantages that the uses of outer space generate and that have generally been acquired at the cost of huge financial investments, especially as far as advanced military technology in space is concerned. Such concerns obviously make a global agreement complicated.

What actually exists in the form of rudimentary arms control provisions appears all the more outdated and near-obsolete in the face of the dynamic development of space uses, space technology and the concurrent total dependence of the contemporary world system on space-based technology for its functioning and even survival.

1.5 NEW BRANCHES OF SPACE LAW: AN UNFINISHED HISTORY

If the history of the development of space law and the emergence of new rules to govern space activities as well as relations between old and new actors in space, particularly private actors as opposed to the original state actors, did not stop after 1979, the year of the adoption of the last of the great space treaties, the reason was the growing importance of space and space technologies in world affairs and the interests of a growing number of states and international organizations. These interests led to the adoption by a variety of new actors of new norms, which of course took somewhat different forms from the traditional sources of space law, much as their influence made itself felt. The development of such norms also became necessary as space law as it was originally conceived was only

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Outer Space Objects, presented 12 February 2008 to the Conference on Disarmament, www.cfr.org/space/treaty-prevention-placement-weapons-outer-space-threat-use-force-against-outer-space-objects-ppwt/p26678, last accessed 18 March 2014).

considered as an instrument regulating relations between states with no other actors present in space, originally for mainly economic but also military reasons.[76]

The opening of space for many other activities than those of states using them originally for their political or military purposes made it necessary to specify new types of regulations and frameworks, many of them technical and scientific, that were not covered by the space treaties. First among such new norms, creating also some legal obligations, were the wide varieties of bilateral treaties regulating space cooperation between states and governmental space agencies. The United States alone had already then concluded, following a count made in the late 1990s by Eileen Galloway,[77] more than 1,000 technical and scientific agreements with some 100 countries and international organizations, and the number keeps increasing.

Such norms also emanated from a variety of new space cooperation departures such as INTELSAT[78] or INMARSAT,[79] formerly public satellite operators that are now privatized, or INTERSPUTNIK,[80] which from the 1970s onwards concluded agreements that created not only legal obligations among its members but could also be seen as addressing the regulation of specific aspects of space uses and space cooperation. In a similar manner such rules and regulations concerning specific areas of space uses and cooperation also originated from the International Telecommunication Union (ITU).[81]

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76 *Cf.* further *infra*, § 2.2.2.2.

77 As per P. Jankowitsch, A Historical Perspective of the Outer Space Treaties, www.iip.at/publications/ps/0303jankowitsch.htm, last accessed 12 April 2014.

78 INTELSAT was originally established as an intergovernmental satellite operator, until its operations were privatized in the early 2000s; see further *infra*, § 5.4.

79 INMARSAT was originally established as an intergovernmental satellite operator, until its operations were privatized in the early 2000s; see further *infra*, § 5.5.

80 INTERSPUTNIK was established in 1971 by the Agreement on the Establishment of the 'INTERSPUTNIK' International System and Organization of Space Communications (hereafter INTERSPUTNIK Agreement), Moscow, done 15 November 1971, entered into force 12 July 1972; 862 UNTS 3; TIAS 859 (1973) No. 12343; *Space Law – Basic Legal Documents*, C.VIII.1; see further *infra*, § 5.7.

81 The ITU is currently based on the Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No.

Of even more significance in this respect was certainly the creation of the European Space Agency, whose Convention entered into force in 1980,[82] to guide the activities of European states in space matters, in particular 'to pursue and to strengthen European cooperation, for exclusively peaceful purposes, in space research and technology and their space applications'.[83] While built on the basic respect for the legal framework existing in space, in particular for the peaceful uses of outer space, it certainly became one of the most influential and most powerful among the new actors, not only in the implementation, but also in the progressive development of new norms governing the cooperation of states as well as non-state actors in space matters.

Having been invested by its Convention with legal personality[84] the Agency was also empowered to 'cooperate with other international organisations and institutions and with Governments, organisations and institutions of non-member States, and conclude agreements with them to this effect'.[85] While it remains debatable whether the wide and fragmented body of agreements and legal obligations regulating the relations between ESA and its member countries, as well as the host of agreements concluded between ESA and many governments and governmental space agencies, can be characterized as 'space law', they must certainly be considered as an important contribution to creating a stable and transparent legal framework for many types of space operations.

The latest effort in this direction comes from the European Union, which, with the entry into force of the Treaty of Lisbon,[86] giving it a

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24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1; and the Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71. See further *infra*, § 8.2.

[82] Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1. See further *infra*, § 4.2.2.

[83] Preamble, 3rd para., ESA Convention, *supra* n. 82.

[84] See Art. XV, ESA Convention, *supra* n. 82.

[85] Art. XIV(1), ESA Convention, *supra* n. 82.

[86] Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter Treaty of Lisbon), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 306/1 (2007).

shared competence in space matters,[87] has become a potential major player in this field. By proposing an international Code of Conduct for Outer Space Activities[88] to address many aspects of security, safety and sustainability in space, the European Union offered to enter the domain of space rule making, albeit starting from the very beginning with a soft-law instrument of a non-binding character. Although the fate of the EU Code of Conduct remains uncertain at the time of writing, this undertaking provides a good impression of the possible role of actors such as the European Union in further developments of space law.

So certainly, in the realm of space law, as some authors have remarked, 'international intergovernmental organizations such as the European Space Agency, the International Telecommunication Union (ITU) and more recently the European Union play an important regulatory, administrative and legal role at the international level'.[89] And their addition that 'the development of international law has also extended to private non-governmental entities and even to individuals' certainly also extends to space law.[90]

Another relatively new page in the development of space law is the national space legislation in the strict sense of the word, where again the United States took a leading and path-breaking role with its National Aeronautics and Space Act of 29 July 1958.[91] The political importance of this legislative innovation was underscored by the fact that the body of the US Senate at this time dealing with space matters, the Senate Special

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[87] See further e.g. Protocol on the Exercise of Shared Competence, Treaty of Lisbon, *supra* n. 86; Arts. 2(2), 4(3), 189, Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter Treaty on the Functioning of the European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/47 (2009).

[88] European Union Draft Code of Conduct for Outer Space Activities, initially endorsed by the Council of the European Union on 3 December 2008, later revised and endorsed by the Council of the European Union on 27 September 2010 and again on 26 September 2013, http://eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_16_sept_2013_en.pdf, last accessed 2 January 2014.

[89] S. Freeland, The Role of 'Soft Law' in Public International Law and its Relevance to the International Legal Regulation of Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 11.

[90] *Ibid.*

[91] National Aeronautics and Space Act, Public Law 85-568, 85th Congress, H.R. 12575, 29 July 1958; as amended through 1983; 72 Stat. 426; *Space Law – Basic Legal Documents*, E.III.1 (original instalment).

Committee on Space and Aeronautics,[92] was chaired by no other than Senator Lyndon B. Johnson.

Today national space legislation is a rapidly expanding branch of a particular type of space law as more and more states in Europe and other parts of the world adopt national rules, which, based on international space law, create a framework for the authorization of governmental but also private space activities.[93]

The importance of national space legislation as a new avenue to promote the principles of space law was also recognized by the General Assembly of the United Nations in Resolution 63/90.[94] As a follow-up a working group of the Legal Sub-Committee of COPUOS in accordance with a multi-year work plan entered into a most productive exchange of information on national legislation relevant to the peaceful exploration and uses of outer space.[95] While national space legislation cannot be considered as a totally new branch of space law, it contributes, as some authors have stated, 'considerably to the transparency of the procedures of authorization. Even if such legislation is not mandated by the Outer Space Treaty, it is an important means of ensuring responsible and transparent implementation of the international obligations of the states concerning authorization of space activities carried out by non-governmental entities.'[96]

An overall review of these new branches and types of space law leads to the conclusion expressed currently by many authors that, as a consequence of the reduced and virtually complete standstill of the codification process in space law making there now appears 'a tendency to produce relevant international instruments containing non-binding principles, norms, standards or other statements of expected behaviour in

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[92] See United States National Aeronautics and Space Administration History Office, *From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners*, Government Printing Office, 1998, 173; also S.J. Dick, Why We Explore (2008), www.nasa.gov/exploration/whyweexplore/Why_We_29.html, last accessed 12 April 2014.

[93] See further *infra*, Chapters 3 and 4.

[94] International cooperation in the peaceful uses of outer space, UNGA Res. 63/90, of 18 December 2008; UN Doc. A/RES/63/90.

[95] See Draft Report of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, Committee on the Peaceful Uses of Outer Space, Legal Subcommittee, Fiftieth Session, UN Doc. A/AC.105/C.2/2011/CRP.4, of 24 March 2011.

[96] I. Marboe & F. Hafner, Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 68.

the form of recommendations, charters, terms of reference, guidelines, codes of conduct'.[97] In the words of this author: 'this phenomenon has been qualified as "soft law", a term that can be defined, according to leading authors, as "all those social rules generated by State[s] or other subjects of international law which are not legally binding but which are nevertheless of special legal relevance"'.[98]

The international community has certainly not remained totally oblivious to these new developments and challenges. Many of these issues were addressed by the last great UN Conference on the Exploration and Peaceful Uses of Outer Space held in Vienna in July of 1999, which recommended several measures such as reviewing the existing treaties and their interpretation, thus clarifying problematic areas with the aim of making them more widely acceptable.[99] It also recommended dealing with a variety of issues raised by the commercialization and privatization of space activities as well as working on proposals to cover new and expanding areas of space activities to meet further regulatory challenges. It also called for the adoption of new methods of regulating complex technical issues.

Many of these issues also remain on the agenda of the UN Committee on the Peaceful Uses of Outer Space and its Legal Sub-Committee, although it is here that the reluctance of many of the current space powers to enter into new and binding legal obligations can be most strongly felt. Over most of the past years the Committee, while considering some important legal matters that could have required new sets of regulations, has been unable to achieve concrete results in these matters.

Last but not least, such issues also were and continue to be regularly addressed by important non-governmental organizations of the space world such as the International Institute of Space Law (IISL),[100] the Space Law Committee of the International Law Association (ILA)[101] or the European Centre for Space Law (ECSL).[102]

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97 M. Ferrazzani, Soft Law in Space Activities – An Updated View, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 100.

98 *Ibid.*, *i.a.* quoting D. Thürer, Soft Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum), Vol. IX (2012), 271.

99 See Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (1999), A/CONF./184/6, 3.

100 See further www.iislweb.org, last accessed 12 April 2014.

101 See further www.ila-hq.org/en/committees/index.cfm/cid/29, last accessed 12 April 2014.

102 See further www.esa.int/SPECIALS/ECSL/, last accessed 12 April 2014.

The increasing pace of commercialization of space activities driven by ever more numerous private actors will have or already has left a permanent impact on international space law, which, at its origins, was intended to regulate relations between states or state actors only. Many issues related to private space activities such as property rights, intellectual property rights, liability of non-governmental entities, insurance, legal status of space tourists and others require adequate regulation, especially as future advances in space technology can be expected. These new issues have already, although to a limited degree, resulted in the introduction of certain elements of private international law into new space regimes such as the UNIDROIT Space Assets Protocol[103] or the Permanent Court of Arbitration (PCA) Rules on Outer Space Disputes.[104] Some authors, in this context, have also argued for the creation of a separate branch of international private law in the form of 'international space private law'.[105]

1.6 THE FUTURE OF SPACE LAW

There is a significant degree of agreement between authors dealing with space law that the progressive development and codification of the law of space has moved through several stages, of which only the first one produced a number of binding legal instruments in the form of the five classical space treaties, in addition to which contiguous legal instruments, such as the Partial Test Ban Treaty of 1963, although only partially addressing outer space, can also be considered as part of this core *corpus juris spatialis*.

In the subsequent stages, the history of space law displays an increasing number of less-binding norms of varying origins, only a small number of which have received the more universal cover of Resolutions of the General Assembly of the United Nations, most of them, however, entering the field from other sources.

As some authors argue, both processes constitute a unitary development in view of the common origin of all these rules resting, despite their diversity and difference of purpose, on the main principles of the law of space as spelled out by the 1963 Resolution of the General Assembly and

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103 See further *infra*, § 16.4.

104 See further *infra*, § 19.3.

105 *Cf.* e.g. M. Yuzbashyan, Potential Uniform International Legal Framework For Regulation of Private Space Activities, in *Proceedings of the International Institute of Space Law 2010* (2011), 39 ff.

the 1967 Outer Space Treaty.[106] There is less dispute, however, about the fact that the main developments of space law today happen in the field of 'soft law', that is in the proliferation of various non-binding rules, many of which show a tendency to develop into customary law.[107] This process is exemplified by many contemporary examples, the best of which is certainly the slow ascendance of rules for space debris mitigation from an essentially non-legal agreement between major space agencies to a status of soft-law regulation blessed by a 2007 Resolution of the General Assembly.[108]

Contrary to these developments some authors still continue to argue for a future of international space law beyond 'soft law'. They see many convincing and concrete reasons for this, mainly in the fields of security and safety of space operations, which need a guarantee of long-term sustainability. They see hard law as much more appropriate and effective in these as well as many other cases in which juridical certainty, predictability and responsibility are needed.[109] All this seems to suggest that the history of space law is far from being over and that it will proceed in further stages dominated not only by states and their international organizations, but also, and to an increasing degree, by non-state actors.

In the final analysis the emergence of new rules and regulations for outer space will still require the legitimacy and universality that only global organizations like the United Nations can provide. When introducing the initial Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space to the General Assembly of the United Nations in December of 1963, Manfred Lachs, one of the most important architects of space law, remarked that

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106 See e.g. J.H. Castro Villalobos, The Legal Categories in Outer Space, in *Proceedings of the International Institute of Space Law 2010* (2011), 265.

107 For a discussion of 'soft law' in works of public international law scholars, see e.g. A. Boyle, Soft Law in International Law-Making, in *International Law* (Ed. M.D. Evans) (2006); O. Schachter, The Twilight Existence of Non-Binding International Agreements, 71 *American Journal of International Law* (1977); H. Hillgenberg, A Fresh Look at Soft Law, 10 *European Journal of International Law* (1999), 499.

108 See F.G. von der Dunk, *Contradictio in terminis* or *Realpolitik*? A Qualified Plea for a Role of 'Soft Law' in the Context of Space Activities, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 54.

109 See e.g. J. Montserrat Filho & A. Fabricio dos Santos, Is There a Future for Space Law Beyond 'Soft Law'?, in *Proceedings of the International Institute of Space Law 2010* (2011), 234.

> it ought to be made clear that principles as enumerated do not constitute a closed chapter. We have to welcome what was achieved and strive for further agreements. The law of outer space is in its formative stage only. We must proceed with prudence and care-take full benefit of agreements reached … make them a living reality and continue with our efforts for further agreements.[110]

No less illuminating are his comments on the first space treaties when he said:

> Looking at the body of law now existing, it could not be claimed that the rules adopted attained all the required objectives … some of them demand further elaboration, while others are not free of imprecision or leave room for improvement. Some others constitute a bare scaffolding for the law of tomorrow, indications or merely inklings of the trend to be followed. This notwithstanding, the balance-sheet is impressive. Principles and rules, instruments of law have come into being which are universal in scope and character. They are clear and unequivocal on many issues.[111]

These remarks and comments will certainly keep their validity as the course of space law continues into the twenty-first century.

[110] M. Lachs, *The Law of Outer Space: An Experience in Contemporary Law-making* (reissue 2010), 128.

[111] *Ibid.*, 130.

2. International space law

Frans von der Dunk

2.1 INTRODUCTION

2.1.1 International Space Law as a Branch of Public International Law

International space law is usually defined as a branch of general (public) international law, a subset of rules, rights and obligations of states within the latter specifically related to outer space and activities in or with respect to that realm.[1] Public international law in turn is usually defined

[1] See M. Lachs, *The Law of Outer Space* (reprint 2010), 11–25; P. Malanczuk, Space Law as a Branch of International Law, 25 *Netherlands International Law Yearbook* (1994), 143–80; N.M. Matte, Space Law, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. 4 (2000), 552–7; G. Zhukov & Y. Kolosov, *International Space Law* (1984), 1–17; G. Gál, *Space Law* (1969), 38–46, 129–39; B. Cheng, *Studies in International Space Law* (1997), esp. 70–87; V. Kopal, Evolution of the Doctrine of Space Law, in *Space Law – Development and Scope* (Ed. N. Jasentuliyana) (1992), 17–32; N. Jasentuliyana, *International Space Law and The United Nations* (1999), 1–32; M.J. Kleiman, J.K. Lamie & M.V. Carminati, *The Laws of Spaceflight* (2012), 57 ff.; T. Neger & E. Walter, Space Law – An Independent Branch of the Legal System, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 234–9; early on C.W. Jenks, International Law and Activities in Space, 5 *International and Comparative Law Quarterly* (1956), 99–114; *cf.* also M.N. Shaw, *International Law* (6th edn., 2008), 541 ff.; P. Malanczuk, *Akehurst's Modern Introduction to International Law* (7th edn., 1997), 201–8.

In line with this, Art. III, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967), already provides for essential application of general international law to outer space, following the *lex specialis derogat legi generali* principle, in particular where and to the extent that space law itself is moot or fundamentally open to conflicting interpretations; *cf.* also Resolution 2222(XXI), of 19 December 1966.

with reference to the Statute of the International Court of Justice,[2] as comprising at a first level treaties and customary international law, and at a secondary level general principles of law, the writings of the most respected legal experts, regulations emanating from international organizations and – arguably – what is called 'soft law'.[3]

The most outstanding feature of public international law is of course that states act both as 'makers' and as 'breakers' of the law, that is to say they are not only the main creators of such rules, rights and obligations, they are usually also the subjects of such rules.[4] This essentially is no different for international space law.[5]

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[2] See Art. 38(1), Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1; further R. Wolfrum, Sources of International Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IX (2012), 299–313; H. Thirlway, The Sources of International Law, in *International Law* (Ed. M.D. Evans) (2003), 117–44; J. Crawford, *Brownlie's Principles of Public International Law* (8th edn., 2012), 20–47; Shaw, *supra* n. 1, 69–128; specifically as applied to space: Malanczuk, Space Law, *supra* n. 1, 158–63; S. Gorove, Sources and Principles of Space Law, in *Space Law – Development and Scope* (Ed. N. Jasentuliyana) (1992), 45–58; E. Galloway, Consensus Decisionmaking by the United Nations Committee on the Peaceful Uses of Outer Space, 7 *Journal of Space Law* (1979), 3–13; V. Kopal, The Role of United Nations Declarations of Principles in the Progressive Development of Space Law, 16 *Journal of Space Law* (1988), 5–20; V.S. Vereshchetin & G.M. Danilenko, Custom as a Source of International Law of Outer Space, 13 *Journal of Space Law* (1985), 22–35; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 31–52, esp. 39–43.

[3] See for a recent thorough discussion of this concept in the context of space law in particular *Soft Law in Outer Space – The Function of Non-binding Norms in International Space Law* (Ed. I. Marboe) (2012); M. Ferrazzani, Soft Law in Space Activities, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 429–47; and broader e.g. D. Thürer, Soft Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IX (2012), 269–87; D. Shelton, International Law and 'Relative Normativity', in *International Law* (Ed. M.D. Evans) (2003), 145–50, 166–70.

[4] See further e.g. Crawford, *supra* n. 2, 115 ff.; Shaw, *supra* n. 1, 195 ff.; A. Cassese, *International Law* (2001), esp. 117 ff.; C. Warbrick, States and Recognition in International Law, in *International Law* (Ed. M.D. Evans) (2003), 205 ff.; C. Walter, Subjects of International Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IX (2012), 634 ff.

[5] See in particular P. Malanczuk, Actors: States, International Organisations, Private Entities, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 23–36. Also e.g. Gál, *supra* n. 1, 37; Zhukov & Kolosov, *supra* n. 1, 64–8 (focusing on the key overarching concept of

On the one hand, states jointly draft and agree to the texts of treaties, and then each in their sovereignty decide to vote for or against them, or ratify or abstain from ratifying them.[6] Likewise, states are the ones who by their behaviour and attendant *opinio juris* give rise to the conclusion that customary international law exists and is binding upon them.[7]

On the other hand, by and large the rights and obligations that were codified or developed in public international law were almost exclusively addressed directly at states, and even to the extent they were (also) addressed to other actors, states were held internationally responsible for their activities, at least vicariously.[8]

Occasionally yet increasingly, especially as of the last half century, intergovernmental organizations, as encompassing groups of states still

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'state responsibility' as reflecting this state-oriented character of space law; see also further, *infra*, § 2.3.1); A. Soucek, International Law, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 294–6.

[6] The one main exception to such a rather legalistic approach to international law concerns the concept of *jus cogens*; see F.G. von der Dunk, *Jus Cogens Sive Lex Ferenda*, in *Air and Space Law: De Lege Ferenda* (Eds. T.L. Masson-Zwaan & P.M.J. Mendes de Leon) (1992), 219–39; C.Q. Christol, The *Jus Cogens* Principles and International Space Law, in *Proceedings of the Twenty-Sixth Colloquium on the Law of Outer Space* (1984), 1–9; more in general J.A. Frowein, Ius Cogens, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VI (2012), 443–6; F.A. Mann, *Further Studies in International Law* (1990), 84–102; Shelton, *supra* n. 3, 150–9; Shaw, *supra* n. 1, 123–7.

[7] See on customary international law in the context of space law e.g. Vereshchetin & Danilenko, *supra* n. 2, 22–35; in general terms Shaw, *supra* n. 1, 72–93; Thirlway, *supra* n. 2, 124–30; Crawford, *supra* n. 2, 23–30, 33–4; Malanczuk, *Akehurst*, *supra* n. 1, 39–46; T. Treves, Customary International Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. II (2012), 937 ff.; including such key concepts as 'acquiescence' (silence by consent) and 'persistent objector' (a state which expressly and consistently objects to a norm of customary international law and thereby can escape being bound by it). On the problems with customary law in general, see B.D. Lepard, *Customary International Law: A New Theory with Practical Applications* (2010).

[8] See on this issue of what used to be called 'vicarious', 'indirect' or 'due care' responsibility e.g. A. Kees, Responsibility of States for Private Actors, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VIII (2012), 959–65; as applied to space Cheng, *supra* n. 1, 606–7; Malanczuk, Space Law, *supra* n. 1, 164; Malanczuk, *Akehurst*, *supra* n. 1, 257 ff.; A. Kerrest de Rozavel, Remarks on the Responsibility and Liability, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 138; S. Bhat & P.I. Bhat, Legal Framework of State Responsibility and Liability for Private Space Activities, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 138.

being of an essentially public nature, have obtained a similar status of co-creators and subjects of general public international law – a legal role developed in the space law context in a special manner.[9] Only in exceptional circumstances, usually in the context of crimes against humanity and crimes of war, can individual persons or entities be held directly accountable in the international legal realm.[10] This latter legal role has consequently not developed to any appreciable extent in the context of international space law.

2.1.2 The Relationship Between International (Space) Law and National (Space) Law

A further consequence of this state-oriented conception of (public) international law is its complex interaction with national laws of the states comprising the international community, which could usually be further subdivided in public and/or administrative law[11] (as essentially dealing with the role, competences, rights and obligations of the state and state organs in a national context) and private law[12] (as essentially

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[9] *Cf.* e.g. D. Akande, International Organizations, in *International Law* (Ed. M.D. Evans) (2003), 272–86; Crawford, *supra* n. 2, 166–99; Shaw, *supra* n. 1, 1295 ff.; Walter, *supra* n. 4, 636; G. Lafferranderie, The European Space Agency (ESA) and International Space Law, in *International Organisations and Space Law* (1999), ESA, SP-442, 19–24. Most far-reaching are the developments in the context of the European Economic Community, then European Community, now European Union, where a separate legal order has developed that is often considered intermediate between public international law and national law; see also further *infra*, § 4.3.

[10] See e.g. comprehensively R. McCorquodale, The Individual and the International Legal System, in *International Law* (Ed. M.D. Evans) (2003), 299–325; also Crawford, *supra* n. 2, 671 ff.; Shaw, *supra* n. 1, 397–443; *cf.* further Malanczuk, *Akehurst*, *supra* n. 1, 353–61.

[11] A standard definition of 'public law' would be 'constitutional law, criminal law, and administrative law taken together'; *Garner's Dictionary of Legal Usage* (3rd edn., 2011), 729; *cf.* also *Nolo's Plain-English Law Dictionary* (2009), 342 (defining 'public' as opposed to 'private'). 'Criminal law' would usually be understood to provide a special branch of public law referring to 'the administration of justice'; *Garner's Dictionary of Legal Usage*, 236; or '[t]he law of crime and its punishment'; *Bouvier Law Dictionary* (2012) Vol. I, 1554. 'Administrative law' is 'the regulation of regulations'; *Bouvier Law Dictionary*, Vol. I, 1546; alternatively '[t]he procedures created by administrative agencies (governmental bodies)'; *Nolo's Plain-English Law Dictionary*, 12.

[12] 'Private law' almost by definition would be the opposite of 'public law'; *cf. Garner's Dictionary of Legal Usage*, 729.

dealing with the relations between citizens, and sometimes foreigners, amongst themselves in that same national context).[13] That interaction, also when it comes to space law specifically, could best be summarized along two lines.

On the one hand national sovereignty of individual states was and remains the point of departure. Not only did states 'make' the law which they could respectively be held to; wherever international legal obligations were absent they could determine the prevalent legal regime at liberty (cases of *jus cogens* excepted[14]). This national sovereignty, which 'geographically' speaking extended to the national territory, the inland waterways and the territorial waters,[15] was explicitly recognized in numerous treaties,[16] and in the juridical realm translated into the exclusive competence to exercise jurisdiction – whether to legislate, to adjudicate or to enforce.[17]

On the other hand, once states have subscribed to certain treaty regimes or could be held to have accepted rules of customary international law, they are to that extent restrained in their sovereign discretion – after all, *pacta sunt servanda*;[18] and '[a] party may not invoke the

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[13] See on the interaction of international and national law in general Crawford, *supra* n. 2, 48 ff.; Shaw, *supra* n. 1, 129–94; E. Denza, The Relationship between International and National Law, in *International Law* (Ed. M.D. Evans) (2003), 415–42.

[14] *Cf. supra*, n. 6.

[15] *Cf.* e.g. Art. 2, United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 & 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39.

[16] See e.g. Art. 2(1), Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1; Art. 1, Convention on International Civil Aviation (hereafter Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300.

[17] See e.g. B.H. Oxman, Jurisdiction of States, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VI (2012), 546–57; V. Lowe, Jurisdiction, in *International Law* (Ed. M.D. Evans) (2003), 329–55; Shaw, *supra* n. 1, 645 ff., esp. 649–51; Crawford, *supra* n. 2, 456 ff.; Malanczuk, *Akehurst*, *supra* n. 1, 109–17; specifically with respect to space: Cheng, *supra* n. 1, 437–41.

[18] See Art. 26, Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969). The Vienna

provisions of its internal law as justification for its failure to perform a treaty'.[19] Moreover, the mirror side to a state's sovereign control over its national territory and its citizens (including legal persons such as companies and associations) is the need to respect *other* states' sovereignty,[20] and the fundamental responsibility as a state that arises in case somehow from within its sphere of control the rights of other states are violated and the concurrent requirement to provide appropriate reparation arises.[21]

2.1.3 The Genesis of International Space Law

Historically, the concept of public international law (or 'law of nations' as it was often called) as summarily sketched above goes largely back to the seventeenth century, when with the 1648 treaties resulting in the Peace of Westphalia[22] the modern concept of the 'state' as distinct from

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Convention on the Law of Treaties is generally perceived to constitute customary international law also for those states that are not party to the Convention, at least in major respects; see A. Aust, Vienna Convention on the Law of Treaties (1969), in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. X (2012), 712–3; Thirlway, *supra* n. 2, 122; Crawford, *supra* n. 2, 377–8; Shaw, *supra* n. 1, 902–7; M. Fitzmaurice, The Practical Working of the Law of Treaties, in *International Law* (Ed. M.D. Evans) (2003), 176.

[19] Art. 27, Vienna Convention on the Law of Treaties, *supra* n. 18; see also Art. 13, Draft Declaration of Rights and Duties of States, Annex, UNGA Resolution 375(IV), of 6 December 1949.

[20] *Cf.* already Art. 2(4), (7), UN Charter, *supra* n. 16; further Shaw, *supra* n. 1, 489–92; Crawford, *supra* n. 2, 447–9, 453–5.

[21] See (esp.) Arts. 1, 2, 4–6, 8, 11, 12, 31, ILC Draft Articles on Responsibility of States for Internationally Wrongful Acts, Part 1; UN Doc A/56/10(2001); also the famous *Chorzów Factory Case*; Case concerning the factory at Chorzów (Merits) (Germany v. Poland), Permanent Court of International Justice, 13 September 1928, P.C.I.J., Ser. A, No. 17, esp. 29; further e.g. Crawford, *supra* n. 2, 539 ff., esp. 569–80; Malanczuk, *Akehurst*, *supra* n. 1, esp. 269–71; Shaw, *supra* n. 1, 800–6.

[22] Actually several treaties were concluded at the same time: the Treaty of Peace between Spain and the United Provinces of the Netherlands (Peace of Münster), Münster, done 30 January 1648, entered into force 14 May 1648; the Treaty of Peace between France and the Holy Roman Empire (Treaty of Münster), Münster, done 24 October 1648, entered into force January 1649; and the Treaty of Peace between the Holy Roman Empire and Sweden (Treaty of Osnabrück), Münster, done 24 October 1648, entered into force January 1649; see B. Fassbender, Westphalia, Peace of (1648), in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. X (2012), 865–9.

property of a sovereign monarch took hold in Western Europe, soon to spread over the whole world.[23]

Once, in 1957, mankind first entered into outer space, albeit not yet in person but rather through the proxy of an artificial earth satellite, Sputnik-1, the clear international character of the realm and any activities taking place therein immediately led to the realization that an effective, fair and transparent legal regime could only be developed principally at the international level as between such states – and the specific body of 'space law' came into being.

Following the geopolitical and technological constellation of the 1950s, a core body of international space law thus developed from the launch of Sputnik-1 onwards.[24] Interestingly and to a certain extent uniquely, the two antagonistic superpowers, in spite of their Cold War rivalry, not only led these developments, but were actually able to arrive at a general understanding that outer space should remain outside of the arms race as much as possible and by contrast should remain free and open for (in particular) scientific exploration, and finally that international law was to play a crucial role in guaranteeing such an outcome.[25]

In addition to other factors discussed elsewhere,[26] this was the consequence of a rather unique and fortunate geopolitical constellation. After all, usually a set of legal rights and obligations appreciated by the one superpower already for that very reason alone would look suspicious to the other superpower. Yet, in the particular context of mankind's first exploits in outer space *both* superpowers apparently perceived the legal constraints under discussion to be restraining the opponent more than themselves.

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[23] For an overview of the role of the Peace of Westphalia in the *Werdegang* of general international law, see R. Grote, Westphalian System, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. X (2012), 870–4; S.C. Neff, A Short History of International Law, in *International Law* (Ed. M.D. Evans) (2003), 37 ff.; Cassese, *supra* n. 4, esp. 19–30; Shaw, *supra* n. 1, 22–31; further Malanczuk, *Akehurst*, *supra* n. 1, 9–12.

[24] See on the early history and *Werdegang* of international space law e.g. Lachs, *supra* n. 1, 27–39; Gál, *supra* n. 1, 23–30; S.E. Doyle, Origins of International Space Law and the International Institute of Space Law of the International Astronautical Federation (2002), 1–93; Lyall & Larsen, *supra* n. 2, 1–22; S. Hobe, Historical Background, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 2–12.

[25] See for an extended analysis of this history Chapter 1.

[26] See *supra*, §§ 1.1, 1.4.

On the one side, the United States, following the political shockwaves that Sputnik-1 and an ensuing string of Soviet 'space firsts' well into the mid-1960s[27] generated, felt so threatened by the perceived 'missile gap' that any treaty providing for limits to military uses of outer space would slow the seeming Soviet progress to long-term dominance of outer space and hence was worthwhile. It would for those reasons be perceived, realistically speaking, as limiting Soviet freedom of action far more than that of the United States.

The Soviet Union from its side, however, must have realized rather early on that the missile gap was more propagandistic hype than a strategic reality.[28] While this obviously did not keep it from milking any new 'defeat' of the opponent to the maximum, it would understandably be apprehensive that one day the United States would draw level with and then overtake it[29] – and would appreciate that by then it had better have an international legal system in place that precluded the latter from achieving precisely such a long-term military dominance in outer space.

This unique constellation of mutual perception of one's own inferiority versus the other's superiority immediately following Sputnik-1 gave rise to a fundamental willingness on both sides to work together and arrive at a legal regime entailing substantial limitations to all, but notably of course military, activities in outer space. Thence followed the establishment of the Committee on the Peaceful Uses of Outer Space (COPUOS)

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[27] Following Sputnik-1, the first orbiting man-made satellite, the Soviet Union *inter alia* was first in launching a living being into outer space (Laika in 1957), putting a man in outer space (Yuri Gagarin in 1961), rendezvousing two spacecraft in orbit (in 1962), sending a woman into outer space (Valentina Tereshkova in 1963), sending a proper crew into orbit (three men in 1964) and achieving the first space walk (Alexei Leonov in 1965).

[28] *Cf.* also M.H. Hersch, *Inventing the American Astronaut* (2012), 36–7, pointing in this regard to the differing US and Soviet philosophies of spaceflight; W.A. McDougall, … *the Heavens, and the Earth* (1985), 237–75; further J.M. Logsdon, *John F. Kennedy and the Race to the Moon* (2010), 6–8, 71 ff., 239.

[29] And indeed, from 1965 the most spectacular – read manned – firsts in outer space were generally American: in 1965, shortly after Leonov's first spacewalk, Gemini-5 for the first time gave the United States the record for the longest flight, and the United States in 1966 performed the first proper docking in space, in 1968 with Apollo-8 travelled around the moon, while Apollo-9's Schweickart in 1969 tested the first lunar device in outer space, and in the same year Apollo-11's Armstrong and Aldrin for the first time actually landed on the moon.

as a UN General Assembly body to codify and develop international space law, first as an ad hoc committee, a year later as a permanent one.[30]

COPUOS, supported by the UN Office for Outer Space Affairs (OOSA) based in Vienna since 1993 and itself encompassing two subcommittees, the Scientific and Technical Sub-Committee and the Legal Sub-Committee, was to constitute the central, for many years often even only relevant platform for developing and codifying legal instruments regulating human activities in outer space. Such activities included those by 'remote control', read guided from earth through radio waves directed at unmanned space objects. COPUOS included by and large all states seriously and substantially interested in spacefaring; its membership increased from 18 to (as of today) 74.[31]

2.2 THE KEY CHARACTERISTICS OF INTERNATIONAL SPACE LAW

2.2.1 The First Three Phases in the Development of Space Law

Often, in the history of COPUOS developing what became commonly known as the *corpus juris spatialis internationalis* three phases could be distinguished in rather straightforward fashion, by focusing on the role of COPUOS as the main platform for agreeing on space law development.[32]

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[30] By means of UNGA Res. 1348(XIII), Question of the peaceful use of outer space, of 13 December 1958; Resolutions adopted on the reports of the First Committee, General Assembly – Thirteenth Session, at 5; resp. UNGA Res. 1472(XIV) A, International co-operation in the peaceful uses of outer space, of 12 December 1959; Resolutions adopted on the reports of the First Committee, General Assembly – Fourteenth Session, at 5. See succinctly E. Galloway, Patterns of Space Law in the 21st Century, in *Air and Space Law in the 21st Century* (Eds. M. Benkö & W. Kröll) (2001), 328–30; further *supra*, § 1.3.

[31] See www.unoosa.org/oosa/en/COPUOS/copuos.html, last accessed 5 January 2014. For an overview of COPUOS' role and history see Jasentuliyana, *supra* n. 1, 23 ff.; Zhukov & Kolosov, *supra* n. 1, 17–29; V. Kopal, Origins of Space Law and the Role of the United Nations, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 224–32; N. Jasentuliyana, The Lawmaking Process in the United Nations, in *Space Law – Development and Scope*, (Ed. N. Jasentuliyana) (1992), 33–44; C.Q. Christol, *The Modern International Law of Outer Space* (1984), 12–20.

[32] Chapter 1 already discusses some main elements in this fundamental change over time of the character of UN-developed space law; see *supra*, §§ 1.1, 1.5. Further e.g. V.S. Vereshchetin, The Law of Outer Space in the General Legal Field (Commonality and Particularities), in *Proceedings of the International*

From a more abstract perspective, by now a fourth phase should be discerned, not necessarily clearly distinguishable in time from the others but providing a more fundamental paradigm change; this fourth phase will therefore be addressed separately further below.[33]

2.2.1.1 The first phase

In the first phase, COPUOS drafted a handful of UN Declarations, Resolutions with considerable political and moral force, but no binding legal character – although they could, partly or comprehensively, come to be considered as providing for rules of customary international law.[34] The most important of those Resolutions were Resolution 1721(XVI)B of 1961,[35] positing the principle of registration with the United Nations of any space object launched into outer space, and Resolution 1962(XVIII) of 1963,[36] hailed as the 'Principles Declaration' as it achieved a blueprint for an all-encompassing legal regime for outer space.

This phase is largely of historical interest now, as the second phase by and large marginalized any discussion on whether those Resolutions

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Institute of Space Law 2009 (2010), 3–14; S. Hobe, The Relevance of Current International Space Treaties in the 21st Century, 27 *Annals of Air and Space Law* (2002), 335–46; S. Hobe, Space Law – An Analysis of its Development and its Future, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 476–89; P. Jankowitsch, The Role of the United Nations in Outer Space Law Development: Past Achievements and New Challenges, 26 *Journal of Space Law* (1998), 101–10; Malanczuk, Space Law, *supra* n. 1, 151–4; *cf.* Jasentuliyana, *supra* n. 1, 22–66; also F.G. von der Dunk, The *U*ndeniably *N*ecessary *C*radle – *O*ut of *P*rinciple and *U*ltimately *O*ut of *S*ense, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 402 ff.

[33] See *infra*, § 2.4.1.

[34] See e.g. Cheng, *supra* n. 1, 125–49; A.D. Terekhov, UN General Assembly Resolutions and Outer Space Law, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 97–107; C.Q. Christol, *Space Law – Past, Present and Future* (1991), 311–28.

[35] UNGA Res. 1721(XVI) B, of 20 December 1961; General Assembly – Sixteenth Session, Resolutions adopted on reports of the First Committee, at 6. See further e.g. Christol, *supra* n. 31, 215–7; Lyall & Larsen, *supra* n. 2, 84–5; B. Schmidt-Tedd & L.I. Tennen, The 1975 Convention on Registration of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 234–8.

[36] Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, UNGA Res. 1962(XVIII), of 13 December 1963; UN Doc. A/AC.105/572/Rev.1, at 37. See further e.g. Cheng, *supra* n. 1, 153–5; Terekhov, *supra* n. 34, 98–9; Kopal, *supra* n. 2, 7–9.

reflected customary international law, the main exception being the resolution on registration, which continues to be relevant in respect of those states that did not ratify the convention later promulgated on the issue.[37]

2.2.1.2 The second phase

The Principles Declaration within a few years was essentially transformed into a binding convention, the Outer Space Treaty of 1967,[38] which thus heralded a second phase. In this phase, under the guidance of the two superpowers the world's leading nations in space were able to arrive at a general understanding of what the limitations should be to conducting outer space activities, and to accept them as binding law in the form of treaties.

Several articles and aspects of the Outer Space Treaty were soon to be seen as requiring elaboration beyond the mere positing of the leading principles and broad legal rules. Thus, the obligations stemming from Articles V and VIII of the Outer Space Treaty concerning foreign astronauts/cosmonauts and foreign spacecraft were soon elaborated by the 1968 Rescue Agreement;[39] the liability concept provided by Article VII of the Outer Space Treaty gave rise to the 1972 Liability Convention;[40] and further to Resolution 1721(XVI)B and Articles V and VIII of

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[37] See further *infra*, § 2.3.4.

[38] Outer Space Treaty, *supra* n. 1. See e.g. K. Traunmüller, The 'Declaration of Legal Principles Governing the Activities of States in the Exploration of Outer Space': The Starting Point for the United Nations' Law of Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 145–60; further on the Outer Space Treaty *infra*, § 2.3.1.

[39] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968); also Resolution 2345(XXII), of 19 December 1967. See further *infra*, § 2.3.2.

[40] Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971); also Resolution 2777(XXVI), of 29 November 1971. See further *infra*, § 2.3.3.

the Outer Space Treaty, registration was addressed in some detail by the 1975 Registration Convention.[41]

All four conventions so far were able to generate widespread acceptance: the score for the Outer Space Treaty currently reads 102 parties and 26 signatories, for the Rescue Agreement 92 and 24 respectively, plus 2 intergovernmental organizations, and for the Liability Convention 89 and 22 respectively, with 3 such intergovernmental organizations.[42] Even for the Registration Convention, with lesser numbers of 60 and 4 respectively, and 2 intergovernmental organizations,[43] this score may be deemed to qualify as quasi-global acceptance in view of the large measure of acceptance (at least in theory[44]) by those states in practice qualifying as registration states.[45]

This 'golden age' of space law treaty making effectively came to an end, however, with the 1979 Moon Agreement,[46] the last treaty to be

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[41] Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975); also Resolution 3235(XXIX), of 12 November 1974. See further *infra*, § 2.3.4.

[42] Status as of 1 January 2013; see www.unoosa.org/oosa/SpaceLaw/treatystatus/index.html, last accessed 5 January 2014. Art. 6, Rescue Agreement, *supra* n. 39, and Art. XXII, Liability Convention, *supra* n. 40, allow for intergovernmental organizations under certain conditions to become de facto parties to those treaties. See further *infra*, §§ 2.3.2.2 and 2.3.3.7 respectively.

[43] Status as of 1 January 2013; see www.unoosa.org/oosa/SpaceLaw/treatystatus/index.html, last accessed 5 January 2014. Art. VII, Registration Convention, *supra* n. 41, allows for intergovernmental organizations under certain conditions to become de facto parties to the convention. See further *infra*, § 2.3.4.3.

[44] As e.g. Y. Lee, Registration of Space Objects: ESA Member States' Practice, 22 *Space Policy* (2006), 42–51, makes clear, actual compliance presents a considerably less favourable picture. *Cf.* also Lyall & Larsen, *supra* n. 2, 89–96; Y. Zhao, Revisiting the 1975 Registration Convention: Time for Revision?, in *United Nations Treaties on Outer Space: Actions at the National Level, Proceedings of the United Nations/Republic of Korea Workshop on Space Law* (2004), ST/SPACE/22, 127–34.

[45] See e.g. F.G. von der Dunk, The Registration Convention: Background and Historical Context, in *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (2004), 450–3; also further *infra*, § 2.3.4.2.

[46] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979); also Resolution 34/68, of 5 December 1979. See further *infra*, § 2.3.5.

drafted in the bosom of COPUOS. Destined to elaborate in particular the Outer Space Treaty with respect to celestial bodies (as opposed to the vacuum void around them), it became embroiled in extended discussions regarding the Moon's claimed status as 'common heritage of mankind' and the consequences thereof for prospective mineral exploitation.[47] The result was a treaty ultimately ratified by a mere 15 states, none of them major spacefaring nations, and with only four more signatory states.[48]

2.2.1.3 The third phase

Partly also because of the expanding range of states becoming interested in spaceflight and becoming members of COPUOS, it was surmised, the period in which more or less global agreement on binding international space law documents was achievable was now over, with the fate meeting the Moon Agreement being considered ultimate proof. In the next, third, phase, COPUOS would largely aim at further developing international space law by means again of essentially non-legally binding UN Resolutions, hoping, as it were, that through practice and experience major parts of it would become customary international law. This is, beyond the substance of those Resolutions to be addressed further below, the main issue in the present context.

It was in this spirit that in 1982 a first major Resolution was drafted on direct broadcasting satellites[49] – which failed to achieve consensus as a consequence of the divide between haves and have-nots regarding the

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[47] See e.g. L. Viikari, *From Manganese Nodules to Lunar Regolith* (2002), esp. 90–124; F. Tronchetti, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies* (2010), esp. 9–130; also F.G. von der Dunk, The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources, 32 *Annals of Air and Space Law* (2007), 91–113; S. Hobe, Adequacy of the Current Legal and Regulatory Framework Relating to the Extraction and Appropriation of Natural Resources in Outer Space, 32 *Annals of Air and Space Law* (2007), 115–30; S. Hobe, P. Stubbe & F. Tronchetti, Historical Background and Context, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 336–7; Lyall & Larsen, *supra* n. 2, 183–97.

[48] Status as of 1 January 2013; see www.unoosa.org/oosa/SpaceLaw/treatystatus/index.html, last accessed 5 January 2014. In recent years the Moon Agreement has received some attention again, but this has not given rise to any appreciable interest on the part of the major spacefaring nations to consider ratifying it, even if after a thorough overhaul of its provisions.

[49] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, UNGA Res. 37/92, of 10 December 1982; UN Doc. A/AC.105/572/Rev.1, at 39.

freedom to broadcast into other states.[50] The next Resolution, on remote sensing,[51] fared considerably better; adopted by consensus it has since generally been considered to comprise rules of customary international law.[52] The third Resolution usually referred to in this context, on the use of nuclear power sources in outer space,[53] enjoyed a similar fate as it was essentially of a technical guidelines nature.[54] In more recent times two more major Resolutions followed: the so-called 'Benefits Declaration'[55] laying out the general principles applicable to international cooperation

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[50] See F. Koppensteiner, The 1982 UN Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 161–81; D.I. Fisher, *Prior Consent to International Direct Satellite Broadcasting* (1990), esp. 45–54; Cheng, *supra* n. 1, 154–5; Lyall & Larsen, *supra* n. 2, 263–8; Christol, *supra* n. 34, 115 ff.; Jasentuliyana, *supra* n. 1, 42; S. Courteix, International Legal Aspects of Television Broadcasting, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 109–10. Also further *infra*, § 8.3.

[51] Principles Relating to Remote Sensing of the Earth from Outer Space, UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986).

[52] See A. Ito, *Legal Aspects of Satellite Remote Sensing* (2011), 45–66; J.I. Gabrynowicz, The UN Principles Relating to Remote Sensing of the Earth from Outer Space and Soft Law, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 183–93; Cheng, *supra* n. 1, 589–97; Lyall & Larsen, *supra* n. 2, 420–9; Jasentuliyana, *supra* n. 1, 43–4, also 314–20 focused on security issues. Also further *infra*, § 9.4.1.2.

[53] Principles Relevant to the Use of Nuclear Power Sources in Outer Space, UNGA Res. 47/68, of 14 December 1992; UN Doc. A/AC.105/572/Rev.1, at 47.

[54] See L. Viikari, *The Environmental Element in Space Law* (2008), 83–5, 173–4; Lyall & Larsen, *supra* n. 2, 289–5; Jasentuliyana, *supra* n. 1, 44–6; D.A. Porras, The United Nations Principles Relevant to the Use of Nuclear Power Sources in Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 205–32. Also further *infra*, § 13.3.1.4.

[55] Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries, UNGA Res. 51/122, of 13 December 1996; UN Doc. A/RES/51/122. See also M. Benkö & K.U. Schrogl, Article I of the Outer Space Treaty Reconsidered After 30 Years, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 67–79; Tronchetti, *supra* n. 47, 61–81; Jasentuliyana, *supra* n. 1, 46–50; G. Hafner, The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 267–87; B.D. Lepard, The Legal Status of the 1996 Declaration on Space Benefits: Are Its Norms Now Part of Customary International Law?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 289–313.

in space, further to Articles I and III of the Outer Space Treaty, and the 2007 Resolution endorsing the Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space,[56] which in turn were derived from the Space Debris Mitigation Guidelines of the Inter-Agency Space Debris Coordination Committee (IADC).[57]

In essence this third phase is still lingering as the main COPUOS-guided developments in space law continue to play at the level of non-binding declarations and resolutions and the fate of the Russo-Chinese proposal for a treaty on de-weaponization of outer space[58] has once more proven the unlikelihood of the majority of the world's spacefaring nations agreeing to a fundamental treaty on outer space matters. To many observers it looks like the major contributions emanating from COPUOS to further development of space law would continue to take such a form: sets of formally non-binding principles and guidelines hopefully sooner (or later) achieving a status of customary international law.

2.2.2 The Nature of the *Corpus Juris Spatialis Internationalis*

2.2.2.1 The main parameters and paradigms of international space law

This brings analysis to the substance of the five treaties forming the heart of international space law, which as such has been dealt with in great detail by literature, and will therefore once again only be summarized here. The present purpose is to sublimate from the substance thereof the overarching parameters and paradigms, the red thread of that *corpus juris spatialis internationalis*, impacting and guiding all substantive issues and developments of space law and hence allowing for an understanding of

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56 Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space (A/62/20); endorsed by General Assembly Resolution 62/217, of 21 December 2007; A/RES/62/217, p. 6, at 26. See further *infra*, § 13.3.2.1.

57 See IADC Space Debris Mitigation Guidelines, IADC-02-01, Revision 1, September 2007. *Cf.* C. Wiedemann, Space Debris Mitigation, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 315–24; on the discussion of the IADC Guidelines vis-à-vis the role of e.g. COPUOS e.g. Viikari, *supra* n. 54, 246–56.

58 Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (hereafter Draft PPWT Treaty); presented 12 February 2008 to the Conference on Disarmament, hwww.cfr.org/space/treaty-prevention-placement-weapons-outer-space-threat-use-force-against-outer-space-objects-ppwt/p26678, last accessed 18 March 2014; see further *infra*, § 6.7.

the true distinctive character of that body of law and the fundamental changes that have appeared over time in its context.

It so happens, moreover, that many of these parameters and paradigms warrant a fresh look and a new perspective, as necessitated in many instances by the paradigm-changing developments space activities and space law have undergone during the last decades. That applies to begin with to the space treaties themselves, to some extent addressed here, but also to other key documents that have often been included in the notion of the *corpus* – the various UN Resolutions mentioned, further treaties having a major impact on space activities and the regime developed in the context of the International Telecommunication Union (ITU). This holds true even as these usually are not comprehensive in scope *ratione materiae* in that they do not basically address all space activities across the board, which also means that in a number of respects these would be more appropriately discussed in some of the more specialized chapters in the book.[59]

2.2.2.2 The focus on scientific and military usage of outer space

Outer space originally and for many years was the domain of activities either of a scientific or of a military/strategic nature, including the element of political prestige in the context of the Cold War. The impact of Sputnik-1 was first and foremost a strategic one, resulting in the prestige-driven race for the moon.[60] Astronauts were usually highly qualified engineers but in addition either the crème de la crème of air force or navy pilots or the crème de la crème of scientists – actually, far more frequently the former rather than the latter. Of the 12 men the United States has put on the moon, exactly one was a scientist by education – and a tremendous bureaucratic battle had to be won to get him a place on the very last Apollo mission to the moon instead of a more traditional pilot-astronaut originally slated for that seat.[61]

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[59] See further *infra*, § 2.4.

[60] See *in extenso* McDougall, *supra* n. 28, esp. 307 ff.; Logsdon, *supra* n. 28, e.g. 18–22.

[61] This concerned geologist Jack Harrison Schmitt, who ultimately replaced Joe Engle as lunar module pilot on the Apollo-17 mission against great resistance (at least initially) from mission commander Gene Cernan and many others at NASA. See e.g. Hersch, *supra* n. 28, 96–8; A. Chaikin, *A Man on the Moon* (2007), 449–51, 503; M. Croft, One More Time, in *Footprints in the Dust* (Ed. C. Burgess) (2010), 317–9; and more generally about the attitude of NASA to scientists as astronauts, Hersch, e.g. 75–102.

With the exception of a niche area where satellites were used for more mundane telecommunication purposes, a niche that slowly started growing from the late 1960s onwards, there was no revenue whatsoever to be found in space and space activities, which in addition proved tremendously costly and risky at the same time. Only states could be interested, for the sake of the public good, in investing enormous sums of money in space and space activities for science or military purposes, and only they could afford them.[62]

So costly and risky, as a matter of fact, were space activities, that apart from the superpowers few states were able (or willing) to bear such costs and risks on their own. Most states either piggybacked on the broad shoulders of the space powers, or pooled their financial and technological resources in unique intergovernmental organizations such as INTELSAT,[63] INMARSAT[64] and the European Space Agency (ESA).[65]

2.2.2.3 The 'state-centricity' of space law: The legal side of scientific and military usage

The traditional 'state-centricity' of the human endeavours in outer space was reflected almost one-on-one in the legal area, most notably in the

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[62] See S. Chaddha, U.S. Commercial Space Sector: Matured and Successful, 36 *Journal of Space Law* (2010), 20 ff.; also (somewhat erratically and biased) S.H. Bromberg, Public Space Travel–2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier, 70 *Journal of Air Law & Commerce* (2005), 640 ff. (both focusing on the United States); K. Kasturirangan, Space Technology for Humanity: A Profile for the Coming 50 Years, 23 *Space Policy* (2007), 159–60 ff. (focusing on India); more generally, F.G. von der Dunk, As Space *Law* comes to Nebraska, *Space* comes down to Earth, 87 *Nebraska Law Review* (2008), 500–2; J.I. Gabrynowicz, Space Law: Its Cold War Origins and Challenges in the Era of Globalization, 37 *Suffolk University Law Review* (2004), 1051–7; D.M. Gray, Space as a Frontier – The Role of Human Motivation, 15 *Space Policy* (1999), 161–3.

[63] INTELSAT, privatized in the early 2000s, was originally established as an intergovernmental consortium for developing and operating an infrastructure for fixed satellite communications on behalf of its member states; see further *infra*, § 2.4.2.1, incl. n. 299.

[64] INMARSAT was also privatized in the early 2000s, but had been established as an intergovernmental organization for maritime, then all mobile satellite communications; see further *infra*, § 2.4.2.1, incl. n. 302.

[65] ESA was established to pool material, including notably financial and scientific resources, of a set of European states for space research and development, broadly interpreted; see further *infra*, § 2.4.2.2, incl. n. 319; also §§ 4.2.2–4.2.4.

Outer Space Treaty – of which the other four conventions essentially comprised elaborations.[66]

Thus, the traditional concept of state responsibility, which under general public international law applied only directly to acts of a state itself violating its international legal obligations towards another state, was widened in the space law context to include *all* space activities as long as qualifying as '*national* activities in outer space'.[67] Article VI of the Outer Space Treaty uses the phrase 'international responsibility' instead of the more common 'state responsibility', but as such responsibility under Article VI is attributed to states, the former actually constitutes an extension of the latter in order to encompass full responsibility of the state also for activities by 'non-governmental entities' and of international organizations.[68]

Along similar lines, states were going to be held squarely liable for damage caused by space objects (to be) launched into outer space – even if built, launched and operated exclusively by private entities.[69] Thereby, Article VII of the Outer Space Treaty and the Liability Convention

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[66] *Cf.* Jasentuliyana, *supra* n. 1, 32–40; Gorove, *supra* n. 2, 46–8; Lyall & Larsen, *supra* n. 2, 65–8.

[67] Art. VI, Outer Space Treaty, *supra* n. 1 (emphasis added). If such activities happened to be conducted by 'non-governmental entities', the states concerned actually had to undertake 'authorization and continuing supervision' of such activities to guarantee conformity with the rules of the Outer Space Treaty. See M. Gerhard, Article VI, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 111–22; F.G. von der Dunk, *Private Enterprise and Public Interest in the European 'Spacescape'* (1998), 17–22; F.G. von der Dunk, The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 3–28; P.G. Dembling & D.M Arons, The Evolution of the Outer Space Treaty, 33 *Journal of Air Law and Commerce* (1967), 436–8; Cheng, *supra* n. 1, 237–9, 608–9.

[68] As different from general public international law, in space law the activities of private entities are fully equated to state activities for the purpose of international/state responsibility; see *supra*, § 2.1.1 and n. 8. See for the background to this compromise between the United States and the Soviet Union e.g. B. Perlman, Grounding U.S. Commercial Space Regulation in the Constitution, 100 *The Georgetown Law Journal* (2012), 954; J. Hermida, *Legal Basis for a National Space Legislation* (2004), 30; also V.S. Vereshchetin & G.V. Silvestrov, Space Commercialization in the Soviet Union: Facts, Policy and Legal Issues, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 32–40; Malanczuk, *supra* n. 5, 31–2.

[69] See Art. VII, Outer Space Treaty, *supra* n. 1 and Arts. I(c), II–V, Liability Convention, *supra* n. 40, where international liability is allocated to the state(s)

constituted an even larger extension of state-centricity as compared to more traditional public international law, where the concept of state liability was only found in a handful of treaties addressing specific circumstances.[70]

Furthermore, not only did the international space law regime as indicated primarily address states (and intergovernmental organizations, still public in character after all, only in subsidiary fashion whilst mentioning 'non-governmental entities' just once[71]); it also did so largely in addressing very much the politico-military and scientific aspects of space activities.

The use of space for peaceful purposes figures very prominently throughout the Outer Space Treaty, and a prominent effort was made to minimize the risk of nuclear war using space,[72] to a priori demilitarize the moon[73] and to establish confidence- and transparency-building measures *avant la lettre*.[74] The express reference to the UN Charter as part of the general body of international law applicable to outer space was also to a large extent for reasons of its generic prohibition of the threat or use of force against the sovereignty and territorial integrity of other states, which was to be extended comprehensively to outer space.[75]

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qualifying as 'launching State(s)' regardless of any private involvement in launch or operation of the space object in question.

70 See further on this *infra*, § 2.3.3.4, notably n. 220.

71 In Art. VI, Outer Space Treaty, *supra* n. 1.

72 *Cf.* Art. IV, 1st para., Outer Space Treaty, *supra* n. 1; also e.g. the general obligations of Art. III and the focus on international cooperation. On Art. IV, see in detail K.U. Schrogl & J. Neumann, Article IV, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 70–85 ff.; Christol, *supra* n. 31, 20–37; also P.S. Dempsey, Overview of the U.S. Space Policy and Law, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 374–85. More in general *supra*, § 1.4 & *infra*, § 6.3.1.

73 *Cf.* Art. IV, 2nd para., Outer Space Treaty, *supra* n. 1; also Arts. 2, 3, Moon Agreement, *supra* n. 46.

74 *Cf.* Art. X, Outer Space Treaty, *supra* n. 1, which aims at allowing states parties to be present at space launches conducted by other states parties, albeit subject not only to reciprocity but also to further agreement. See A. Kapustin, Article X, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 183–8. Also the Registration Convention, *supra* n. 41, as a whole from this perspective could be viewed as a confidence- and transparency-building measure.

75 See Art. III, Outer Space Treaty, *supra* n. 1, Art. 2(4), UN Charter, *supra* n. 16 respectively. *Cf.* O.M. Ribbelink, Article III, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 67–9; P. Jankowitsch, Legal Aspects of Military Space Activities, in *Space Law* –

Likewise, the freedom for exploration and use – probably the most fundamental substantive principle applicable to outer space, enshrined in Article I of the Outer Space Treaty – certainly was in major part inspired by a desire to protect the interests in *scientific* exploration.[76] Later discussions on whether 'use' effectively did or should include 'exploitation', in particular exploitation of mineral resources,[77] constitute further proof of this.

Or from another angle, the definition of 'damage' as the basis for liability claims under the Liability Convention was only concerned with physical damage, not harm such as interference with operations and loss of revenues, which, commercially speaking, could be at least as important.[78]

Development and Scope (Ed. N. Jasentuliyana) (1992), 145–8; Lyall & Larsen, *supra* n. 2, 501–25 ff.; Lachs, *supra* n. 1, 98.

[76] See also Preamble, 3th & 4th paras., Outer Space Treaty, *supra* n. 1. Further S. Hobe, Article I, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 34–6.

[77] Hobe, *supra* n. 47, 116–20, makes a clear case for 'use' being inclusive of 'exploitation'. At the same time, the Moon Agreement sows confusion on this point by singling out exploitation as being ruled by the 'common heritage of mankind' principle, whereas use and exploration remain part of the *res* or *terra communis*; *cf.* Arts. 11(1) (5) resp. 4(1); also von der Dunk, *supra* n. 47, 101–3. Further S.E. Doyle, Issues of Sovereignty and Private Property, in *Air and Space Law in the 21st Century* (Eds. M. Benkö & W. Kröll) (2001), 315; P.G. Dembling, Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies, in *Manual on Space Law* (Eds. N. Jasentuliyana & R.S.K. Lee) Vol. I (1979), 11; Cheng, *supra* n. 1, 374 ff.; S.R. Freeland, Space Tourism and the International Law of Outer Space, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 26; Christol, *supra* n. 31, 42, 375 ff.; Tronchetti, *supra* n. 47, 22; Hobe, *supra* n. 76, 35. Also *infra*, §§ 14.4.2.1, 14.4.2.2.

[78] 'Damage' was defined by Art. I(a), Liability Convention, *supra* n. 40, as 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations', whereas Arts. II and III principally addressed such damage 'caused by [a] space object'. See further L.J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 111–3; Christol, *supra* n. 31, 91–105; Cheng, *supra* n. 1, 323–4; C.Q. Christol, International Liability for Damage Caused by Space Objects, 74 *American Journal of International Law* (1980), 355–68; B.A. Hurwitz, *State Liability for Outer Space Activities in Accordance with the 1972 Convention on International Liability for Damage caused by Space Objects* (1992), 12–20.

But also outside of that core body of international space law, many important treaties and treaty-like arrangements on space activities that saw the light of day were drafted with a similar focus on military issues – such as the Nuclear Test Ban Treaties[79] and the ABM Treaty[80] – or on scientific issues – the International Space Station (ISS) was developed primarily as a low-orbiting laboratory for applied science,[81] and the ESA Convention established the aforementioned European Space Agency to make European cooperation in research and development for space activities more effective and cost-efficient.[82]

2.3 THE CORE SUBSTANCE OF INTERNATIONAL SPACE LAW: THE UN SPACE TREATIES

2.3.1 The Outer Space Treaty

The Outer Space Treaty[83] represents the most fundamental and all-encompassing of the space treaties, and hence the foundation for all of space law. As indicated, however, no effort will be attempted to address all of its substance and legal ramifications – to the extent these indeed

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[79] This concerned the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Partial Test Ban Treaty), Moscow, done 5 August 1963, entered into force 10 October 1963; 480 UNTS 43; TIAS No. 5433; 14 UST 1313; UKTS 1964 No. 3; ATS 1963 No. 26; respectively the Comprehensive Test Ban Treaty, New York, done 24 September 1996, not yet entered into force; Cm. 3665; 35 ILM 1439 (1996); S. Treaty Doc. No. 105-28 (1997). *Cf.* also Cheng, *supra* n. 1, 526–7; Lyall & Larsen, *supra* n. 2, 510–4; Dembling & Arons, *supra* n. 67, 423–4.

[80] Agreement Between the United States of America and the Union of Socialist Soviet Republics on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty), Moscow, done 26 May 1972, entered into force 3 October 1972, no longer in effect 13 June 2002; 944 UNTS 13; TIAS No. 7503; 23 UST 3435. See also e.g. Jankowitsch, *supra* n. 75, 150–3.

[81] See further *infra*, § 2.4.3.1.

[82] See further *infra*, § 2.4.2.2.

[83] See on the Outer Space Treaty, *supra* n. 1, in general from amongst a wealth of literature, *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009); Dembling & Arons, *supra* n. 67, 419–56; J.F. McMahon, Legal Aspects of Outer Space: Recent Developments, *British Yearbook of International Law* (1965), 417–30; Christol, *supra* n. 31, 20–58; Cheng, *supra* n. 1, 215–64; Lyall & Larsen, *supra* n. 2, 53–80; Dembling, *supra* n. 77, 1–51; also Lachs, *supra* n. 1, esp. 11–64; Zhukov & Kolosov, *supra* n. 1, 33–88.

concern key elements of the *corpus juris spatialis*, they will be addressed in relevant chapters elsewhere.[84] Rather, the overarching principles and clauses of the Outer Space Treaty as shaping and directing the remainder of space law will be assessed here – partly since those continue to provide major bones of contention amongst the space lawyers.

Two of those key concepts, of international responsibility and liability of states, have already been touched upon briefly in the context of the state-oriented character of space law,[85] but their legally speaking most important aspects still remain to be addressed.

The other major issue, in many respects the mirror side to the state-centricity of responsibility and liability, concerns outer space as a 'physical' realm, its definition and legal status, and the resulting delineation of the scope of application of space law – where other concepts for such delineation have also been asserted. This issue pervades the Outer Space Treaty and much of what came after it, and determines the fundamental parameters for all legal regulation of activities in outer space. In addition, it gave rise to more specific and long-standing debates on a legal (lower) boundary of outer space and the existence of a 'right of innocent passage' to outer space.

2.3.1.1 International responsibility and international liability

With respect to responsibility and liability, the main aspect to be noted beyond the absolute state-centricity prevailing in the Outer Space Treaty and the Liability Convention is the large potential for confusion resulting from the concurrent use of those two concepts of accountability in the same convention in an outer space context.[86] Noting that at least in the

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[84] E.g., Art. IV on military uses of outer space (see *infra*, § 6.3.1), Art. V on astronauts as elaborated by the Rescue Agreement, *supra* n. 39 (see *infra*, § 2.3.2, also §§ 11.4.3.2, 12.5.1), and environmental concerns following from Art. IX (see *infra*, § 13.3.1.1). More generally, it also applies to issues such as international cooperation and the role of intergovernmental organizations (see Chapter 5), exploitation of celestial resources (see Chapter 14) and the application of the Treaty as a whole to various major civil uses of space (see *infra*, e.g. §§ 7.4.1, 8.3.1, 9.4.1.1, 10.3.1).

[85] See *supra*, § 2.2.2.3.

[86] For an extended analysis of this issue, *cf.* e.g. F.G. von der Dunk, Liability versus Responsibility in Space Law: Misconception or Misconstruction?, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 363–71. Also Bhat & Bhat, *supra* n. 8, 131–49; Smith & Kerrest de Rozavel, *supra* n. 78, 123–5; Cheng, *supra* n. 1, 603–20, 632–8; M. Pedrazzi, Outer Space, Liability for Damage, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VII (2012), 1109 ff.; Christol, *supra* n. 34, 236–48; S.

Russian, Spanish and French text versions of the Outer Space Treaty – which are equally authentic[87] – only one generic phrase is used for both 'responsibility' and 'liability', there are at least four major interrelated problems of partial overlaps arising here.

Firstly, whilst international responsibility generally focuses on conformity with international law (in this case, the Outer Space Treaty and by extension, as that treaty is considered the basis of the comprehensive legal framework for outer space activities, essentially all of space law[88]) and liability, at least in a space law context, to compensating for damage caused, the two overlap where internationally wrongful acts may entail the causation of damage.[89]

However, whilst the liability aspect properly speaking has been further elaborated by the Liability Convention to be briefly discussed further below,[90] there is no principled reason why the more general concept of state responsibility could not be used also for obtaining compensation for

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Gorove, Liability in Space Law: An Overview, 8 *Annals of Air and Space Law* (1984), 373 ff.; Jasentuliyana, *International Space Law*, *supra*, n. 1, 200–3; V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001), 31–44; more insightfully still N. Horbach, The Confusion about State Responsibility and Liability, 4 *Leiden Journal of International Law* (1991), 47 ff.

87 See Art. XVII, Outer Space Treaty, *supra* n. 1.

88 *Cf.* also Art. III, Outer Space Treaty, *supra* n. 1, referring to general international law in principle being applicable to outer space as well. See further e.g. Cheng, *supra* n. 1, 618; Lachs, *supra* n. 1, 113–4; Gál, *supra* n. 1, 129–39; Bhat & Bhat, *supra* n. 8, 139.

89 *Cf.* also the discussions within the ILC leading to separate sets of Draft Articles on the Responsibility of States for Internationally Wrongful Acts, adopted in August 2001; Report of the ILC on the Work of its Fifty-third Session, UN Doc A/56/10(2001), 26 ff. – which may call for compensation for damage in certain cases of reparation for injuries as a consequence of an internationally wrongful act; see Arts. 34, 36 – and Draft Articles on International Liability for Injurious Consequences arising out of Acts not Prohibited by International Law, which ended up sub-divided into draft articles on the prevention of transboundary damage from hazardous activities (see UN GA Resolution 62/68, of 8 January 2008; UN Doc A/RES/62/68(2008)), and draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities (see UN GA Resolution 61/36, of 18 December 2006; UN Doc A/RES/61/36(2006)). Further the *Chorzów Factory Case*, *supra* n. 21, at 29; see Mann, *supra* n. 6, 124 ff.; R.M.M. Wallace, *International Law* (3rd edn., 1997), 173–80; Cassese, *supra* n. 4, 182–212; *cf.* also e.g. Christol, *supra* n. 34, 212; Bhat & Bhat, *supra* n. 8, 135 ff.

90 See *infra*, § 2.3.3.

damage in cases where the liability concept may not offer a particular relief.[91]

Thus, at least in theory, a state that is the victim of damage caused by an unlawful act (or of damage the causation of which constitutes an unlawful act in itself) might choose to seek reparation for such injuries not from a state technically liable under Article VII of the Outer Space Treaty and the Liability Convention, but from a state technically responsible under Article VI of the Outer Space Treaty.

It is here where the second problem arises, that responsibility and liability in the context of space law in spite of their similarity and overlap are attributed quite differently. Whilst a state is responsible for 'national activities in outer space' under Article VI of the Outer Space Treaty, it is liable by reason of its being the 'launching State' of the space object causing the damage under Article VII of the Outer Space Treaty and the Liability Convention. In particular in the context of private space activities, a different set of states might thus be held responsible from that to be held liable.[92]

Take, for example, a telecommunications satellite being launched, then sold in orbit to a private operator of a third state not at all involved in the launch and hence not qualifying as a 'launching State' of the satellite. If the satellite would then cause damage compensable under the Liability Convention, the original launching state(s) would remain liable even if no longer able to exercise any jurisdiction and control over the operator actually accountable for the damage – once a launching state, always a liable one. Yet, states and their nationals suffering the damage may also

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[91] Whilst many authors seem to assume that compensation for damage as a consequence of space activities (notably of course through the concept of the 'space object' causing such damage; see Arts. I(c), II–V, Liability Convention, *supra* n. 40) is exclusively regulated by Art. VII, Outer Space Treaty, *supra* n. 1, and the Liability Convention (*cf.* Lachs, *supra* n. 1, 113 ff.; Jasentuliyana, *supra* n. 1, 35–6; Christol, *supra* n. 31, 91, 104 ff.; Cheng, *supra* n. 1, e.g. 305–6; Lyall & Larsen, *supra* n. 2, 66–7; Zhukov & Kolosov, *supra* n. 1, 64–8), nowhere is it explicitly provided that the Liability Convention would serve as the sole remedy, neither is it even explicitly argued.

Interestingly, e.g. Art. XI, Liability Convention, does already refer to one specific alternative dispute settlement route: that of national judicial procedures. Similarly, '[t]he provisions of this Convention shall not affect other international agreements in force insofar as relations between the States Parties to such agreements are concerned' (Art. XXIII(1)), and '[n]o provision of this Convention shall prevent States from concluding international agreements reaffirming, supplementing or extending its provisions' (Art. XXIII(2)).

[92] See on the 'launching State' further *infra*, § 2.3.3.1.

or instead hold the third state responsible on account of this being a national activity of that state – and next request compensation from that third state for the damage caused in the context of the satellite's operations.

Obviously, such complexities – most authors not seeming to be aware of the potential availability of an Article VI-responsibility option for obtaining reparation for injuries – are not conducive to a transparent, effective and comprehensive framework for handling damage caused by outer space activities. Until either a generally acknowledged and authoritative document is drafted formally excluding the use of Article VI for obtaining reparation for damages or an equally authoritative judgment of an international court or tribunal would so rule in a given dispute, this problem remains.

Thirdly, the relevance of this issue is enlarged by the limited scope of compensable damage under the Liability Convention – presumably excluding such other major categories as damage by electronic interference and indirect, consequential and loss-of-revenue types of damage.[93] Since state responsibility under Article VI of the Outer Space Treaty does not suffer from such limitations to possible compensable damage, states may well be tempted to put forward claims on that basis, rather than the more obvious but more circumscribed one of the Liability Convention.

Fourthly, the problem is aggravated still further by the uncertainty, in particular, as to what 'national activities' refers to in the context of Article VI. Generally, three schools of thought may be distinguished. The first simply equates 'national activities' to 'activities of nationals'.[94] The second argues that 'national activities in outer space' of a state essentially should equate with cases where that state also qualifies as a state liable

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93 See further on this *infra*, § 2.3.3.1.

94 This argument is predominantly based on Art. IX, Outer Space Treaty, *supra* n. 1, where a certain responsibility of a state for activities of its national is expressly provided for. *Cf.* e.g. (with some reservations) K.H. Böckstiegel, The Terms 'Appropriate State' and 'Launching State' in the Space Treaties – Indicators of State Responsibility and Liability for State and Private Activities, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 13–4; Gorove, *supra* n. 86, 377; Kerrest de Rozavel, *supra* n. 8, 139; P. Nesgos, International and Domestic Law Applicable to Commercial Launch Vehicle Transportation, in *Proceedings of the Twenty-Seventh Colloquium on the Law of Outer Space* (1985), 100; Lyall & Larsen, *supra* n. 2, 66; Christol, *supra* n. 34, 247. This interpretation does not, however, solve the issue of why Art. VI did not then phrase its yardstick for attribution identically to that of Art. IX. Cheng, *supra* n. 1, 659, even refers to 'a slip of the pen' in describing Art. IX's usage of the term 'nationals' only.

for damage (in accordance with Article VII of the Outer Space Treaty) and a state registering the satellite (in accordance with Article VIII of the Outer Space Treaty), in an effort to take away the inconsistency in attribution.[95]

The third school takes a more fundamental approach of logic, essentially equating national activities for which a state can be held responsible with those over which it is entitled to exercise some form of generally accepted jurisdiction. In other words: responsibility under Article VI of the Outer Space Treaty encompasses both activities conducted from the territory of the state concerned (not just launching activities, but also, for example, satellite communication, satellite remote sensing and satellite navigation activities) and activities conducted by its nationals, and as relevant also activities conducted involving space objects registered by that state.[96]

A final point of note in the context of responsibility in particular concerns the role of public international organizations. While they are to some extent recognized as legitimate actors in space, 'activities … carried on in outer space … by an international organization' as to 'responsibility for compliance with this Treaty' gives rise to such responsibility 'both by the international organization and by the States

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[95] *Cf.* e.g. V. Kayser, An Achievement of Domestic Law: U.S. Regulation of Private Commercial Launch Services, 17 *Annals of Air and Space Law* (1991), 341–3; H.A. Wassenbergh, Public Law Aspects of Private Space Activities and Space Transportation in the Future, in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (1996), 246.

This interpretation does not solve the issues of why Arts. VI and VII respectively, Outer Space Treaty, *supra* n. 1, use quite different concepts and terminology, or why Art. VIII actually refers to 'jurisdiction' and not to 'nationality'. Also and more fundamentally it overlooks the fact that 'activities in outer space' comprise more than only the launching activities which Art. VII, Outer Space Treaty, and the Liability Convention, *supra* n. 40, focus on.

[96] See e.g. Cheng, *supra* n. 1, 658–63, also addressing the practical problems arising from such interpretations; V.S. Vereshchetin, Space Activities of 'Non-Governmental Entities': Issues of International and Domestic Legislation, in *Proceedings of the Twenty-Sixth Colloquium on the Law of Outer Space* (1984), 263; Lachs, *supra* n. 1, 114; Gerhard, *supra* n. 63, 112–4; von der Dunk, *Private Enterprise*, *supra* n. 67, 18–9; implicitly (by referring to a 1963 resolution of the Institute of International Law) Zhukov & Kolosov, *supra* n. 1, 66–7.

Parties to the Treaty participating in such organization'.[97] Also Article XIII of the Outer Space Treaty[98] makes clear that, as a consequence largely of the erstwhile Soviet refusal to recognize intergovernmental organizations as legal entities enjoying their own separate international legal personality, they are essentially to be seen as platforms for sovereign states cooperating, rather than autonomous actors in the space arena.

2.3.1.2 Outer space as a 'global commons' and the freedom of exploration and use

The concepts of international/state responsibility and state liability, as mentioned, effectively constitute the counterpart to the fundamental character of outer space as constituting a 'global commons', a '*res communis*' or '*territorium extra commercium*'.[99] In a sense, the broadness of the responsibility- and liability-concepts should provide some guarantees that the tragedy of the global commons – where by definition all feel

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[97] Art. VI, Outer Space Treaty, *supra* n. 1. See also A. Kerrest de Rozavel, International Organisations as Active Subjects of International Law of Outer Space, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 259.

[98] Art. XIII, Outer Space Treaty, *supra* n. 1, refers in this context to 'cases where [activities] are carried on within the framework of international intergovernmental organizations', and '[a]ny practical questions arising in connection with activities carried on by international intergovernmental organizations in the exploration and use of outer space, including the Moon and other celestial bodies, shall be resolved by the States Parties to the Treaty either with the appropriate international organization *or with one or more States members of that international organization*, which are Parties to this Treaty' (emphasis added). See further e.g. U.M. Bohlmann & G. Suess, Article XIII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 215–22; Dembling & Arons, *supra* n. 67, 437–8.

[99] On these concepts as applied to outer space see further Cheng, *supra* n. 1, 434–44; F.G. von der Dunk, The Dark Side of the Moon – The Status of the Moon: Public Concepts and Private Enterprise, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 119–24; S.R. Freeland & R. Jakhu, Article II, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 48–55; Viikari, *supra* n. 47, 17–21; Hobe, *supra* n. 47, 120 ff.; Gál, *supra* n. 1, 122–9, 139 ff.; Lachs, *supra* n. 1, 44–5; Tronchetti, *supra* n. 47, 26–33, 41–5; V. Pop, *Who Owns the Moon?* (2009), 73–97; in general Crawford, *supra* n. 2, 203 ff.; Shaw, *supra* n. 1, 487 ff.; also Malanczuk, *Akehurst*, *supra* n. 1, 147 ff.

entitled, but no one feels truly responsible – could be avoided in the context of outer space.[100]

The most fundamental clause determining the overall legal status of outer space is Article II of the Outer Space Treaty, which determines that '[o]uter space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means'. It thereby establishes outer space as a realm beyond national territorial jurisdiction, essentially akin to the high seas.[101] One consequence thereof is that no state may extend the scope of its territorial jurisdiction, for example regarding how an individual may obtain title to land, to outer space or any celestial body, as well as to minerals and archaeological treasures to be found there and vice versa what rights the government would have to nationalize real estate for the purpose of a highway or a railway.[102]

This obviously does not mean states cannot exercise *any* jurisdiction in outer space. Non-manned space activities are usually controlled from some earthly territory where national sovereign territorial jurisdiction would normally apply to anyone undertaking those activities, and in respect of manned space activities states remain also entitled to exercise jurisdiction over their nationals (personal jurisdiction), as well as over space objects registered with them and personnel on board such objects.[103]

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100 *Cf.* also V. Pop, Planetary Resources in the Era of Commercialisation, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 60–5.

101 See Arts. 86–120, United Nations Convention on the Law of the Sea, *supra* n. 15. *Cf.* on Art. II, Outer Space Treaty, *supra* n. 1, Freeland & Jakhu, *supra* n. 99, 44–63; Christol, *supra* n. 31, 46–8; Dembling & Arons, *supra* n. 67, 429–32; Tronchetti, *supra* n. 47, 26–33.

102 *Cf.* the Statements of the Board of Directors of the International Institute of Space Law (IISL) of 2004 and 2009, at www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf and www.iislweb.org/docs/Statement%20BoD.pdf, last accessed 12 April 2014; also on the lunar (un)real estate-hoax e.g. P.M. Sterns & L.I. Tennen, Privateering and Profiteering on the Moon and Other Celestial Bodies: Debunking the Myth of Property Rights in Space, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 56–67; F.G. von der Dunk *et al.*, Surreal Estate: Addressing the Issue of 'Immovable Property Rights on the Moon', 20 *Space Policy* (2004), 149–56; Tronchetti, *supra* n. 47, 197–211; Lyall & Larsen, *supra* n. 2, 183–5; and for a comprehensive background analysis Pop, *supra* n. 99, 1–156.

103 As per Art. III, Outer Space Treaty, *supra* n. 1, and the Registration Convention, *supra* n. 41. See further *infra*, § 2.3.4.1.

The nature of outer space as being beyond the individual territorial jurisdiction of states is further confirmed by the fundamental freedom of activities there:

> The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.
>
> Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.
>
> There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation.[104]

Whilst at the time of drafting of the Outer Space Treaty the possibility of (commercial) exploitation other than of the 'void' of space for activities such as communications using satellites was not substantially taken into account, it has meanwhile been generally agreed that 'use' in this context also includes such 'exploitation'.[105] Next to the concepts of responsibility and liability as discussed before, the references to international law, international cooperation and the interests of all countries in the above clauses[106] serve as a check (or at least the possibility of creating such checks) on unfettered unilateral usage of outer space to the detriment of all others.

At the same time, this – and in particular the use of the phrase 'province of all mankind'[107] – should not be mistaken as meaning that outer space as a whole should be considered a 'common heritage of

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[104] Art. I, Outer Space Treaty, *supra* n. 1. See further Dembling & Arons, *supra* n. 67, 429–32; Hobe, *supra* n. 76, 25–43; Tronchetti, *supra* n. 47, 20–3; Christol, *supra* n. 31, 38–46.

[105] See also *supra*, § 2.2.2.3, text at n. 76.

[106] See Arts. I, III, Outer Space Treaty, *supra* n. 1.

[107] See on this novel key concept of the Outer Space Treaty e.g. Christol, *supra* n. 31, 44–6; Lachs, *supra* n. 1, 43 ff.; Hobe, *supra* n. 76, 38–9; Zhukov & Kolosov, *supra* n. 1, 41 ff.; von der Dunk, *Private Enterprise*, *supra* n. 67, 68–9; N.M. Matte, Legal Principles Relating to the Moon, in *Manual on Space Law* (Eds. N. Jasentuliyana & R.S.K. Lee) Vol. I (1979), 259.

mankind' in the sense that this concept has been developed in the context of the law of the sea[108] and the Moon Agreement.[109]

The main distinction between a 'global commons'/'province of all mankind'/'*res communis*' approach and that of the 'common heritage of mankind' concerns the fundamental freedom in the former context for individual states to act unless specific international obligations have been agreed upon such as, for example, found in the Outer Space Treaty and the Liability Convention.

As for the common heritage of mankind, by contrast that basic freedom has been replaced for exploitation in particular with a presumption that an international regime is required before any such exploitation could take place, and such exploitation can then take place *only* within the limits of that international regime.[110] In addition, following the actual elaboration of the 'common heritage of mankind' concept in the law-of-the-sea context, the assumption would be that any elaboration for the moon and other celestial bodies – where the concept has at least been posited – would fundamentally entail the transfer of technology to, and sharing of exploited resources with, all states, regardless of their actual involvement in the exploitation activities.[111]

Of course the non-applicability of the 'common heritage of mankind' concept to outer space as a whole does not mean the freedom of activity there would be unfettered. Rather, any limits to such freedom would have

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[108] *Cf.* esp. Arts. 136 ff., United Nations Convention on the Law of the Sea, *supra* n. 15. See further Shaw, *supra* n. 1, 533–4, 628–35; Crawford, *supra* n. 2, 326–30; Malanczuk, *Akehurst*, *supra* n. 1, 207–8, 233–4.

[109] *Cf.* Art. XI, Moon Agreement, *supra* n. 46, and discussion *infra*, § 2.3.5.2; further Tronchetti, *supra* n. 47, 38–61, 85–130; Hobe, *supra* n. 47, 124 ff.; von der Dunk, *supra* n. 47, 101–3; *Report of the Sixty-Ninth Conference*, ILA (2000), 576, 586 ff.; Resolution 1/2002, Space Law, Seventieth ILA Conference, and *Report of the Seventieth Conference*, ILA (2002), accessible via www.ila-hq.org/en/committees/index.cfm/cid/29, last accessed 12 April 2014; Pop, *supra* n. 99, 121–34 (labelling the concept 'reaping without sowing'); Lyall & Larsen, *supra* n. 2, 193–7; Cheng, *supra* n. 1, 365–74; Shaw, *supra* n. 1, 548–9; Malanczuk, *supra* n. 1, 208; Matte, *supra* n. 107, 265–70.

[110] *Cf.* for a balanced discussion Lyall & Larsen, *supra* n. 2, 190 ff., esp. 195–6; further e.g. Jasentuliyana, *supra* n. 1, 139–44; Hobe, *supra* n. 47, 124–5. See also *infra*, §§ 14.4.2.2, 14.4.3.

[111] See further e.g. Tronchetti, *supra* n. 47, 99–108; Lyall & Larsen, *supra* n. 2, 195–6; for the elaboration of the 'common heritage of mankind' principle in the law of the sea on these two core elements Arts. 144, and 140(2) respectively, United Nations Convention on the Law of the Sea, *supra* n. 15; further Viikari, *supra* n. 47, 52–8; Shaw, *supra* n. 1, 629–31; Malanczuk, *Akehurst*, *supra* n. 1, 193–5; Crawford, *supra* n. 2, 327–9.

to be imposed by general international consensus, read international treaties with more or less global application – of which the Outer Space Treaty itself provided the most immediate example – and customary international law, rather than by one state or group of states alone (for example by blocking any consensus on an international regime).

Specifically, the Outer Space Treaty provided for further limitations to any potentially unfettered freedom to act in outer space in the context of its 'global commons' character by requiring all space activities to be conducted in accordance with general international law,[112] by imposing certain limitations on military uses,[113] by imposing certain coordination and consultation requirements in case of potentially harmful space activities,[114] and by allowing access 'to representatives of other States Parties to the Treaty on a basis of reciprocity' to '[a]ll stations, installations, equipment and space vehicles on the Moon and other celestial bodies'.[115] Some other important provisions, notably those of Articles V and VIII of the Outer Space Treaty, finally, will be discussed in some detail below.

As a further consequence of so determining outer space to be a 'global commons', the Outer Space Treaty would obtain an elevated legal status as a treaty not simply constituting an international binding agreement between a set of states, but establishing the broad legal framework for an entire specific area.[116] Without amounting to *jus cogens* such a status would override the normally applicable *res inter alios acta* principle and the equally principled legal equality of states under international law.

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[112] See Art. III, Outer Space Treaty, *supra* n. 1.

[113] As per Art. IV, Outer Space Treaty, *supra* n. 1; see further *supra*, § 2.2.2.2, and *infra*, § 6.3.1.

[114] *Cf.* Art. IX, Outer Space Treaty, *supra* n. 1; see further *infra*, § 13.31.1. Further S. Marchisio, Article IX, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 169–82; Dembling & Arons, *supra* n. 67, 440–2; Zhukov & Kolosov, *supra* n. 1, 69–73; Jasentuliyana, *supra* n. 1, 205–8.

[115] Art. XII, Outer Space Treaty, *supra* n. 1. See further L.J. Smith, Article XII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 207–14; Dembling & Arons, *supra* n. 67, 447–51; Cheng, *supra* n. 1, 248–50, pointing at the essentially military/security-related background to this clause.

[116] The so-called '*traité-lois*' as opposed to '*traité-contrats*'; *cf.* e.g. Crawford, *supra* n. 2, 31–2; (carefully) Wallace, *supra* n. 89; Thirlway, *supra*, n. 2, 122–3; M. Fitzmaurice, Treaties, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IX (2012), 1062.

Following such an argumentation – which has also worked noticeably in the context of the continent of Antarctica[117] – the general principles and legal regime posited by the Outer Space Treaty can also be upheld against those currently not parties to it. Or, at the very least, the burden of proof as regards why certain of those principles and rules would not be binding upon them rests with such non-parties.

Currently, most of those non-parties are small(er) states which have so far shown no, little or only derivative interest in space activities. Should they be allowed, once seriously becoming interested in outer space, to legally ignore the Outer Space Treaty's regime, developed by the major space powers of the 1960s (the United States, the Soviet Union and their respective allies on both sides of the Cold War-fence) and accepted by the newer space powers (China, India, Indonesia, Brazil, Nigeria and many others from other parts of the geopolitical world)? Noting, moreover, that allowing a non-party to the Outer Space Treaty to fundamentally ignore it ultimately could cause the whole international space law regime to come crashing down? Noting, finally, that the Outer Space Treaty's regime has generally been endorsed with customary legal status, causing non-protesting parties to have acquiesced in this regime, which prominently acknowledges, even protects, mankind's overarching interests including those of developing countries by its very first Article?

2.3.1.3 The boundary question

A further fundamental consequence of the determination that outer space is a global commons, where freedom to operate is the baseline rule and restrictions to that freedom can only arise under *jus cogens*, international treaties or customary international law, is the need, at least in principle,

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[117] The Antarctic Treaty (Washington, done 1 December 1959, entered into force 23 June 1961; 402 UNTS 71; TIAS 4780; 12 UST 794; UKTS 1961 No. 97; Cmnd. 913; ATS 1961 No. 12) fundamentally recognizes that states need to substantially invest in the area in order to be entitled to become a 'Consultative Party' and thereby have a formal voice in further developing the legal regime applicable to Antarctica; *cf.* Arts. IX, X, XII, esp. XIII, Antarctic Treaty. This effective claim to collectively determine the legal status of Antarctica by the states parties has generally become accepted also by other aspiring states who, rather than trying to ignore the regime once having become interested in the continent, have tried – and usually succeeded – in becoming parties themselves, joining the club. See further e.g. S. Vöneky & S. Addison-Agyei, Antarctica, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. I (2012), 420 ff., esp. 433–4.

to agree on a boundary vis-à-vis the underlying realm of air space[118] – where, after all, the individual sovereignty of states over their own airspace reigns supreme (airspace over the high seas and Antarctica excepted).[119]

The one, historical occasion where this issue came to the fore most prominently – and continued to remain on the agenda of the COPUOS Legal Sub-Committee for many years as part of the so-called 'delimitation/definition' question – concerned the geostationary orbit, the most popular orbit for many space applications, in particular satellite communications.[120] This orbit however also happened to be above the equator, which in view of its 'geostationary' character meant that equatorial states were faced with (the prospect of) satellites being more or less permanently stationed above their territory – even if at an altitude of about 35,786 km.

Consequently, those states in 1976 claimed that those parts of the geostationary orbit that were above their respective territories were subject to their respective sovereignty.[121] Though no one contested that, at this altitude and being used by satellites, the geostationary orbit would logically be considered part of outer space, the lack of any agreed boundary between outer space and airspace made it easier to claim

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118 See further in detail M. Benkö & E. Plescher, *Space Law – Reconsidering the Definition/Delimitation Question and the Passage of Spacecraft through Foreign Airspace* (2013), 3–48; Cheng, *supra* n. 1, 425–56, 645–8; Gál, *supra* n. 1, 59 ff.; G. Oduntan, The Never Ending Dispute: Legal Theories on the Spatial Demarcation Boundary Plane between Airspace and Outer Space, 1(2) *Hertfordshire Law Journal* (2013), 64 ff.; Christol, *supra* n. 31, 435 ff.; Galloway, *supra* n. 30, 333–5; Lachs, *supra* n. 1, 53–6; Zhukov & Kolosov, *supra* n. 1, 153–66; Lyall & Larsen, *supra* n. 2; Hobe, *supra* n. 76, 31.

119 *Cf.* Art. 1, Chicago Convention, *supra* n. 16.

120 See further *infra*, § 8.2.1.

121 This concerned the famous Bogotá Declaration of 3 December 1976, in Conclusion 2. The result was *i.a.* a claim by the equatorial countries that any 'device to be placed permanently on the segment of a geostationary orbit of an equatorial state shall require previous and expressed authorization on the part of the concerned state' (Conclusion 3, sub (d)), as if such a device equated with an aircraft traversing sovereign national airspace. See also e.g. M.L. Smith, *International Regulation of Satellite Communication* (1990), 201–18; S. Gorove, *Developments in Space Law – Issues and Policies* (1991), 41–6; Freeland & Jakhu, *supra* n. 99, 55; Oduntan, *supra* n. 118, 75–8; S.R. Freeland, The Impact of Space Tourism on the International Law, in *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space* (2006), 187, at n. 17; Benkö & Plescher, *supra* n. 118, 41.

sovereignty over it by way of exception with a view to its special physical character.

Indeed tellingly, the long-standing item on the COPUOS Legal Sub-Committee's agenda often linked the legal status of the geostationary orbit to the question of defining outer space; for example the fortieth session of the Legal Sub-Committee in 2001 discussed the agenda item as 'Matters relating to (a) The definition and delimitation of outer space; (b) The character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union'.[122]

In the end, it was especially the geopolitical fact of life that the equatorial states comprised a small minority amongst all states interested in the geostationary orbit, which ensured these claims were never successful; the reference to 'equitable use' was as far as any effort to arrive at a special privileged status for the equatorial states would get.[123] Apparently, only Colombia (which has an article in its Constitution claiming that 'the segment of the geostationary orbit, the electromagnetic spectrum and the zone in which it operates are also part of Colombia'), while acknowledging that 'the international community advocates the establishment of the principle of the non-appropriation of outer space, where, it asserts, the stationary orbit is located', still maintains 'that Colombia has not renounced sovereignty over the segment of the geostationary orbit that corresponds to it'.[124]

Until recently, apart from this ill-fated proposition with respect to the geostationary orbit, the issue of a geographical boundary between the respective applicability of air law and space law could be considered a more or less theoretical one. This also allowed room for applying either a 'wait-and-see' attitude or a 'functionalist approach'. Following the former, it was not necessary (or at the very least too early) to establish a

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[122] Historical summary on the consideration of the question on the definition and delimitation of outer space, UN Doc A/AC.105/769, of 18 January 2002, § 23, at 6. See also e.g. Benkö & Plescher, *supra* n. 118, 3, 31 ff.

[123] Oduntan, *supra* n. 118, 76, speaks of 'the most formidable brick wall of technically constructive and legally framed refutations by the industrial powers including the communist states', then adding most non-equatorial developing countries to the opposition as well.

[124] Art. 101(4), Political Constitution of Colombia; see UN Doc A/AC.105/865/Add. 13, of 6 March 2013, at 2, 3. Note also that Colombia still implies that these claims are 'in accordance with international law'; Art. 101(4).

proper boundary, an attitude especially espoused by the US authorities.[125] Following the latter, the respective application of air law and space law was to be determined by reference to the types of activities and/or the technology used for those – without yet addressing the possible hybridity of activities (assuming a simple dichotomy of air transportation versus space activities[126]) or technological designs (assuming a simple dichotomy of aircraft versus spacecraft[127]). In either case, many experts concluded that a 'spatially' defined boundary between the application of air and space law respectively was not appropriate or helpful.

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[125] *Cf.* the statement of the US delegate to the COPUOS Legal Sub-Committee, Unedited Transcript of its 644th Mtg., 4 April 2011, COPUOS/ LEGAL/T.644, at 2, as quoted by V. Nase, Delimitation and the Suborbital Passenger: Time to End Prevarication, 77 *Journal of Air Law & Commerce* (2012), 754; see also 754–6. Further e.g. D.N. Reinhardt, The Vertical Limit of State Sovereignty, 72 *Journal of Air Law & Commerce* (2007), 84–8, 113; Oduntan, *supra* n. 118, 66–9; V.J. Vissepó, Legal Aspects of Reusable Launch Vehicles, 31 *Journal of Space Law* (2005), 175–6.

[126] The underlying assumption was that 'air transportation' was about transporting passengers and cargo, usually on a commercial/private basis, from one point on earth to another, whereas 'space activities' concerned the launch into outer space of certain useful payloads, or occasionally humans called astronauts or cosmonauts – two rather separate notions, apparently, even more separate through their usage of aircraft and spacecraft respectively; *cf. infra*, n. 127. *Cf.* also Oduntan, *supra* n. 118, 69–72; Nase, *supra* n. 125, 752–3. That separation, however, is now seriously at issue, with commercial suborbital spaceflight ('space tourism') aiming to (also) transport passengers from A to B on earth as well as to launch small satellites or other payloads into the lower regions of outer space; *cf.* further *infra*, esp. § 12.2.2.

[127] The underlying assumption was that 'aircraft' as defined by the Chicago Convention, *supra* n. 16 ('any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface'; e.g. Annex 7 to the Chicago Convention, Aircraft nationality and registration marks, 5th edition, July 2003, Definitions; Annex 8, Airworthiness of aircraft, 10th edition, April 2005, Definitions), and 'space objects' as part-defined under further space treaties (see esp. *infra*, § 2.3.3.2) could be clearly separated, already at the basic level of horizontal take-off and landing versus vertical take-off and landing. That separation, however, is also fundamentally compromised with the various technologies proposed for private suborbital vehicles, which range from vertical take-off and landing through two-stage-to-space to horizontal take-off and landing; see e.g. F.G. von der Dunk, The Integrated Approach – Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventurism, 92 *Acta Astronautica* (2013), 200–3; Reinhardt, *supra* n. 125, 68, 119–20.

Aircraft operations and certainly commercial aviation transportation, the main target for air law as based upon that notion of sovereignty, only rarely took place above altitudes of 12 or 13 km, whereas the lowest orbiting satellites flew at much higher altitudes (after a short passage through airspace, usually the airspace of the state of launch or over the high seas).[128] The US Space Shuttle, until recently the only manned space vehicle using an almost horizontal flight path upon return, also crossed airspace only above the high seas and/or the United States itself.[129] The Soviet Buran shuttle, flying only once in an unmanned test flight, did cross the upper regions of Turkish airspace upon its return, but without Turkey being aware at the time, the issue of whether permission should have been requested for such a passage was not raised (other than by some authors[130]).[131]

The advent of private commercial sub-orbital flight, however, also known somewhat imprecisely as 'space tourism',[132] is now bringing the boundary issue back to the table, inevitably calling for a spatialist demarcation of the respective fields of application of air and space law, in other words: for a 'geographical' boundary between airspace and outer space.[133]

After all, the prospective operators sell these flights as *space*flights with reference to the altitude of 100 km above the earth – at the same time some vehicles to be used look much more like aircraft than rockets, and are from an operational perspective best seen as having developed out of experimental aircraft. By the same token, the boundary issue provides excellent insight into some of the key characteristics of outer space and space activities from a legal perspective, and how definitions

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[128] *Cf.* Benkö & Plescher, *supra* n. 118, 8, stating it to be 'unlikely … that an aircraft will ever fly above 60 km'. See further e.g. Lyall & Larsen, *supra* n. 2, esp. 167–9; Lachs, *supra* n. 1, 56–8; Zhukov & Kolosov, *supra* n. 1, 153–4; Gál, *supra* n. 1, esp. 79–82.

[129] See in detail Benkö & Plescher, *supra* n. 118, 17–25.

[130] See thus, on this issue of such 'innocent passage' through foreign airspace on the way to and from outer space, further *infra*, § 2.3.1.4; also e.g. Gál, *supra* n. 1, 102–4; Christol, *supra* n. 34, 329–40; Cheng, *supra* n. 1, 648–9; Lyall & Larsen, *supra* n. 2, 171–2; Reinhardt, *supra* n. 125, 103. On the origins of the concept in the law of the sea, see e.g. Shaw, *supra* n. 1, 570–7; Crawford, *supra* n. 2, 317–9; Malanczuk, *Akehurst*, *supra* n. 1, 176–7; Wallace, *supra* n. 89, 143–6.

[131] See in detail Benkö & Plescher, *supra* n. 118, 19–27, 34–5.

[132] See further on this *infra*, § 12.2.1.

[133] See e.g. Nase, *supra* n. 125, 749–67; broader Reinhardt, *supra* n. 125, 66 ff., esp. 76–7, also 88–100, 120–2 (extensively quoting Cheng).

and concepts in space law are (and should be) intricately connected to scientific, technical and operational definitions and concepts – but only if the latter are clear cut, comprehensive and generally agreed upon.

Much confusion, however, has arisen on this issue, and to the extent experts (and others) have undertaken efforts to arrive at a geographical boundary, many theories have been used for arriving at a particular figure – and consequently, many figures have been quoted: 'In fact between 1957 and 1960 alone the proposals made ranged from 20 km to 1,500,000 [km].'[134] The two approaches making most sense with a glance to the previous functionalist theories, as not unduly subsuming spacecraft under an air law regime or vice versa subsuming aircraft under a space law regime, were the ones based on the highest altitude where aircraft could benefit from the upward lift of the available air and the lowest altitude where spacecraft could feasibly orbit the earth respectively. Even those approaches, however, as will be seen, were not without their problems – should actual or potential maximum or minimum altitudes be used? – and they were, in addition, often erroneously and confusingly treated as synonymous.

The particular figure of 100 km (equating to some 62 miles[135]) ultimately emanated from the discussions on the theorem of the eminent scientist Theodore von Kármán, whose calculations pointed out that below a certain altitude 'the Earth's atmosphere becomes too thin for aeronautical purposes (because any vehicle at this altitude would have to travel faster than orbital velocity in order to derive sufficient aerodynamic lift from the atmosphere to support itself)'.[136] In other words, the von Kármán line as such bases itself on the maximum altitude of feasible aviation.

Several authors then referred to 83/84 km as the von Kármán line – notably including the first major advocate of that 'primary jurisdictional

[134] Oduntan, *supra* n. 118, 81, and for a good overview of some of those proposals more generally 72–81; Benkö & Plescher, *supra* n. 118, 31–40; also Reinhardt, *supra* n. 125, 66–7, 112–9; himself proposing a 12 nm/22 km/72,912 ft boundary in 2007, at 127.

[135] It should be further pointed out that when 'miles' are used in this context, usually – so also in this book – *statute* miles are referred to, a statute mile being defined as 5,280 ft = 1.609 km; confusion often arises, however, where frequently also *nautical* miles are used, which equate with 6,076 ft = 1.852 km; see https://en.wikipedia.org/wiki/Mile, last accessed 6 January 2014.

[136] As per http://en.wikipedia.org/wiki/Kármán_line, last accessed 6 January 2014; see also www.fai.org/icare-records/100km-altitude-boundary-for-astronautics, last accessed 6 January 2014. See further e.g. Benkö & Plescher, *supra* n. 118, 7–9.

line' amongst the space lawyers.[137] However, to start with, arguments generally were far from consistent.[138] A further complication arose from the various types of miles used in various publications.[139] Finally, Haley himself was not claiming the 275,000 feet altitude to be written in stone, either:

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[137] This concerned the then President of the International Astronautical Federation (IAF), usually referring to 275,000 ft (amounting to 83.82 km): see A.G. Haley, Space Age Presents Immediate Legal Problems, in *Proceedings of the First Colloquium on the Law of Outer Space* (1959), 9; A.G. Haley, Space Exploration – the Problems of Today, Tomorrow and in the Future, in *Proceedings of the Second Colloquium on the Law of Outer Space* (1960), 50; A.G. Haley, Survey of Legal Opinion on Extraterrestrial Jurisdiction, in *Proceedings of the Third Colloquium on the Law of Outer Space* (1961), 40.

More recently the same altitude could be found in S. Hobe, Legal Aspects of Space Tourism, in 86 *Nebraska Law Review* (2007), 442; M. Gerhard, Space Tourism – The Authorisation of Suborbital Space Transportation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 280; *cf.* also Reinhardt, *supra* n. 125, 113–4.

[138] *Cf.* as for Haley himself: Space Exploration, *supra* n. 137, 49, refers to 'the occurrence of free molecular oxygen in the atmosphere up to *90 km (295,000 ft)*. It is only above *this* level (*called the von Kármán Line*)' (emphasis added); and Survey, *supra* n. 137, 41, states: 'Representatives of the USA and the USSR in connection with arriving at agreements within the Federation Astronautique Internationale as to records in both air flight and space flight have agreed upon the definition of space flight as being flight above *62 miles (100 km)* altitude. *At this point* aircraft flight must end and space flight begin. *This agreement coincides* with the Kármán line theory' (emphasis added).

[139] *Cf. supra*, n. 135. E.g. M.S. McDougal, H.D. Lasswell & I.A. Vlasic, *Law and Public Order in Space* (1963), 334, refer to a US Air Force Major accepting 'the Karman line of 53 miles', which in view of Haley's/Von Kármán's focus on 275,000 ft might have suggested *statute* miles (53 statute miles would equate to 85.28 km), were it not that this statement was then lumped together (in fn. 450) with that of a Colonel from the US Air War College in 1958, explicitly referring to '50 *nautical* miles' (emphasis added), which assumes also the Major was referring to nautical miles. This is moreover strengthened by the very next sentence in McDougal, Lasswell & Vlasic, that '[i]n support of this altitude it is also emphasized that agreement has been reached within the Federation Astronautique Internationale to the effect that for the purposes of keeping records the flight exceeding 62 miles (100 km) altitude will be considered as "space flight"'. G.H. Reynolds & R.P. Merges, Outer Space – Problems of Law and Policy (1989), 11, even consciously or unconsciously step over the distinction in effectively using *both* at the same time: 'Above an altitude of approximately 53–62 miles (the so-called von Karman line) aerodynamic lift is largely non-existent.' Note that 53 *nautical* miles would equate to 98.15 km; 62 *statute* miles to 99.75 km – both awfully close to 100 km. Even more imprecisely, J.B.

> This is a critical jurisdictional line, marking the theoretical limit of air flight, which I term the Kármán Line. It must be noted with care that the exact location of this line of primary jurisdiction is not presented as an apodictic solution of the problem. The Kármán primary jurisdictional line may eventually remain, or, after due consideration of such developments as improved techniques of cooling and the discovery of more heat resistant materials, this line may be changed significantly. But, while these changes will be in the exact location of the Kármán Line, the existence of the line is certain and wherever the line is finally drawn will be the place where 'airspace' terminates.[140]

As the 100 km boundary has been asserted *inter alia* by the Fédération Aéronautique Internationale (FAI) as being agreed by both the United States and the Soviet Union, as well as by von Kármán himself after considerable discussion with other scientists and, possibly, indeed driven by (the prospects of) developments such as suggested, this would be the logical altitude of reference.[141] In other words, to start with from an aviation-perspective a boundary at 100 km altitude would make considerable sense.

From a space perspective, meanwhile, the logical approach would be to determine the minimum altitude of feasible orbits, arriving at a line dividing 'non-orbital velocity' from 'orbital velocity'[142] – and this begged the question of how such a line would then square with the maximum altitude of feasible aviation. From this perspective it was realized that only very rarely did satellites seem to 'dip' below an imaginary 100 km

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Marciacq *et al.*, Accommodating Sub-Orbital Flights into the EASA Regulatory System, in *Safety Regulations and Standards* (Eds. J.N. Pelton, R.S. Jakhu & T. Sgobba) (2010), 193, state: 'Calculations of that line [the von Kármán line] differ, and that is why some see it as 54 miles (c. 83 km) and others at 60 miles (almost 100 km)'.

[140] Haley, Space Exploration, *supra* n. 137, 50.

[141] As per http://en.wikipedia.org/wiki/Kármán_line, last accessed 6 January 2014, and www.fai.org/icare-records/100km-altitude-boundary-for-astronautics, last accessed 6 January 2014; see also *supra*, text at n. 136. *Cf.* also extended discussion and analysis of early alternative proposals in McDougal, Lasswell & Vlasic, *supra* n. 139, 323–49.

[142] *Cf.* also Oduntan, *supra* n. 118, 71; Reinhardt, *supra* n. 125, 116. This furthermore ties in with the issues concerning the definition of 'sub-orbital'; see extensively F.G. von der Dunk, Beyond *What*? Beyond *Earth Orbit*?…! The Applicability of the Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight, 43 *California Western International Law Journal* (2013), 285–9; also e.g. Nase, *supra* n. 125, 748–9.

altitude line.[143] Thus, to the extent that (prior to the advent of space tourism) the boundary question had been discussed in a legal and/or COPUOS context, by and large those discussions had converged on a 'lowest perigee rule', 'perigee' referring to the point closest to earth in (usually) elliptical earth orbits.[144]

Not that this 'lowest perigee rule' was *not* fraught with difficulties in itself. Some presumed it to refer to the lowest altitude at which an orbit around the earth would be *sustainable*: '[t]he lowest perigee at which space objects are still able to continue effectively their orbiting around the Earth for a longer period of time meets these requirements and remains a valid basis for defining outer space despite a rapid progress in space technology'.[145] This would, however, merely shift the issue as to what 'sustainable' would actually refer to rather than provide a self-understood criterion. In other words: the few cases of satellites briefly dipping below a 100 km boundary to be agreed would have to be treated as exceptions to the rule, rather than push such a rule to its problematic limits.

To some extent skirting the above scientifically-, technically- and/or operationally-based discussions, many states were in any event looking for a singular altitude where sovereign air space was giving way to the global commons of outer space. Thus, indeed '[t]he determination of a demarcation line is primarily of legal significance. Scientific considerations are merely necessary to arrive at a suitable legal demarcation which would have a concrete and sensible basis, and around which the consensus of states can be built'.[146] Consequently:

> The argument that the job should be left to competent scientists to deal with in the future is not cogent enough and therefore, is unacceptable. Scientists

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[143] See for a general overview e.g. Oduntan, *supra* n. 118, 79–80. E.g. Cheng, *supra* n. 1, 450, refers to one satellite (UK Skynet-II(A)) in 1974 having had a perigee of 96 km (and, at 451, to the next lowest one with a perigee at 104 km); whereas in the UN register of space objects reference can be found to a 1990 COSPAR satellite with a perigee of 78 km, see ST/SG/SER.E/258, of 7 January 1993, at 5. Oduntan, 79, in quoting other authors makes reference to altitudes as low as 50 miles, and himself arrives at a preliminary suggestion of 55 miles as the upper boundary of airspace properly speaking (at 82). *Cf.* further Benkö & Plescher, *supra* n. 118, 8 ff., 31 ff.

[144] *Cf.* http://en.wikipedia.org/wiki/Apsis, last accessed 6 January 2014.

[145] V. Kopal, Issues Involved in Defining Outer Space, Space Object and Space Debris, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 38.

[146] Oduntan, *supra* n. 118, 65.

> will, like lawyers, remain undecided on this. In any case any consensus reached now on the basis of science alone is at the mercy of the inevitable, next scientific or technological development. Besides it is more realistic to hold the view that the problem of the lack of demarcation is basically legal and political in terms of the problems and conflicts it would lead to.[147]

Tying in with the natural instinct of states to look for clear, geographically defined boundaries to determine where their respective sovereign territorial jurisdiction gives way to lack of such jurisdiction[148] – witness for example the extended process in the law of the sea to determine in quite precise terms the extent of territorial waters, contiguous zones, exclusive economic zones and continental shelves[149] – considerable state practice and *opinio juris* has developed assuming, firstly, a boundary would indeed be necessary, and, secondly, that a 100 km altitude following the debate on the von Kármán line would make most sense from this perspective.[150]

Various Soviet/Russian proposals for establishing a boundary presented to COPUOS over the years,[151] answers by Pakistan,[152] Germany[153] and

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147 Oduntan, *supra* n. 118, 81–2. *Cf.* also Benkö & Plescher, *supra* n. 118, 4, quoting UN Doc. A/AC.105.39, of 6 September 1967, at 7, stating: 'No scientific and technical criteria could be found which would permit a precise and lasting definition of outer space and which would be acceptable to all States.'

148 See e.g. Cassese, *supra* n. 4, 55 ff.; Reinhardt, *supra* n. 125, 69 ff.; Oduntan, *supra* n. 118, 64–8, incl. authors quoted.

149 *Cf.* e.g. Reinhardt, *supra* n. 125, 77–81, 124–6; Oduntan, *supra* n. 118, 83; Wallace, *supra* n. 89, 134–72; also Arts. 3, 33(2), 56–57, 76 United Nations Convention on the Law of the Sea, *supra* n. 15.

150 See for an extended version of the argument, Benkö & Plescher, *supra* n. 118, 32–5; von der Dunk, *supra* n. 142, 328–34; further also e.g. Freeland, *supra* n. 77, 20–4; Neger & Walter, *supra* n. 1, 239–41; Hobe, *supra* n. 137, 441–2; M. Chatzipanagiotis, *The Legal Status of Space Tourists in the Framework of Commercial Suborbital Flights* (2011), 6–17; Gerhard, *supra* n. 137, 280–2; Cheng, *supra* n. 1, 450 ff.; *cf.* also Reinhardt, *supra* n. 125, 123; Nase, *supra* n. 125, 764; Lyall & Larsen, *supra* n. 2, 167–9; earlier Christol, *supra* n. 31, 502–11.

151 *Cf.* e.g. V. Kopal, The Question of Defining Outer Space, 8 *Journal of Space Law* (1980), 148; Cheng, *supra* n. 1, 452–5; Lyall & Larsen, *supra* n. 2, 172; Reinhardt, *supra* n. 125, 115–6; further Zhukov & Kolosov, *supra* n. 1, 160–71.

152 See A/AC.105/635, of 15 January 1996, p. 6; A/AC.105/C.2/L.204, of 18 February 1997, at § 18.

153 See A/AC.105/635, of 15 January 1996, pp. 4–5. It should be added, however, that Germany for the time being remained non-committal as to whether

Russia itself[154] to a Russian-inspired COPUOS questionnaire, a 2002 amendment to the national Australian space law,[155] the 2012 Kazakh national space law,[156] the Isle of Man's Treasury Regulations' definition of 'space object',[157] the 2008 Russo-Chinese proposal for a treaty on the prohibition of space weapons[158] and an EU document defining 'space-qualified technology'[159] indeed all made explicit reference to that altitude.

Furthermore, several national space laws, including US[160] and South African[161] ones, refer to the atmosphere, and the altitude below which a satellite could feasibly orbit as airspace respectively. If one ignores the few exceptions referred to, this would point, as argued, to an altitude at least close to 100 km. In addition, the FAA – the US government agency tasked with regulating *inter alia* private sub-orbital flights! – awards astronaut wings to anyone who has flown at altitudes over 100 km.[162]

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a boundary would be fully and legally recognized; cf. A/AC.105/865, of 27 January 2006, p. 2.

[154] See A/AC.105/C.2/L.204, of 18 February 1997, at § 63; A/AC.105/635/Add.1, of 15 March 1996, p. 6.

[155] See Sec. 8, *sub* 16th, 21st, 33rd & 35th bullet, An act about space activities, and for related purposes, No. 123 of 1998, assented to 21 December 1998; as amended by amending legislation up to No. 100 of 2002, www.austlii.edu.au/au/legis/cth/num_act/saaa2002247/, last accessed 6 January 2014.

[156] See Art. 1(6), Law of the Republic of Kazakhstan on Space Activities, of 6 January 2012, 2012 No. 528-IV; www.oosa.unvienna.org/pdf/spacelaw/national/kazakhstan/528-IV_2012-01-06E.pdf, last accessed 12 April 2014.

[157] As mentioned by Freeland, *supra* n. 121, 187, n. 18.

[158] See Art. I(a), Draft PPWT Treaty, *supra* n. 58.

[159] See Annex I, List referred to in Article 3 of this Regulation, Council Regulation setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, No. 428/2009/EC, of 5 May 2009; OJ L 134/1 (2009), at 134/28. Note that the European Union comprises such major space powers as France, Germany, the United Kingdom, Italy and Spain.

[160] *Cf.* Sec. 103(1)(A), National Aeronautics and Space Act, Public Law 85-568, 85th Congress, H.R. 12575, 29 July 1958; as amended through 1983; 72 Stat. 426; *Space Law – Basic Legal Documents*, E.III.1.

[161] *Cf.* Sec. 1, *sub* 15th bullet, South African Space Affairs Act, 6 September 1993, assented to on 23 June 1993, No. 84 of 1993; Statutes of the Republic of South Africa – Trade and Industry, Issue No. 27, 21–44; *National Space Legislation of the World*, Vol. I (2001), at 413. Also Nase, *supra* n. 125, 762, already taking it for granted that this refers to a 100 km boundary.

[162] See R.D. Launius & D.R. Jenkins, Is It Finally Time for Space Tourism?, 4 *Astropolitics* (2006), 279 at n. 63; Nase, *supra* n. 125, 762. The US Air Force, US Navy and NASA, by contrast, have routinely handed astronaut wings to those

Also, at least one US state, Virginia, at one time was contemplating the inclusion of the same altitude into its state-level legislation.[163]

Finally, on a more private level (as indicated) the FAI,[164] the global world aviation sporting events organization following von Kármán's lead, and a recent study of the International Academy of Astronautics (IAA), one of the most authoritative bodies of individual experts on matters of outer space, both make reference to a 100 km altitude as the point of re-entry into a national airspace.[165] Whilst in themselves such pronouncements (just like the insistence of private spaceflight operators that travelling further away from the earth than 100 km makes one a space traveller) cannot create customary international law, soon they may force states to take a stance on this issue one way or another.

As a consequence, it seems likely a more formal agreement on a boundary between airspace and outer space, presumably at an altitude of some 100 km, would be required – if it is not going to be developed as a

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having achieved altitudes of 50 miles and over, which in view of the standard usage of *nautical* miles in those branches of the US military forces must be taken to refer to 92.6 km; *cf. United States Naval Aviation 1910–1995*, Appendix 20, Evolution of Naval Wings (Breast Insignia), 662; Launius & Jenkins, *ibid.*; Reinhardt, *supra* n. 125, 88.

[163] House Bill No. 3184, Amendment in the Nature of a Substitute, proposed by the House Committee for Courts of Justice on 2 February 2007, defines 'spaceflight activities' by means of a one-on-one reference to sub-orbital flights, and then – effectively under an inverted 'geographic' approach! – defines 'suborbital' to mean 'a distance at or above 62.5 miles from the Earth's mean sea level'; Art. 24, Spaceflight Liability and Immunity Act, § 8.01-227.8, 'Definitions'. The legal effect of Virginia's approach, however, may be offset by another state, New Mexico, defining space as 'any location beyond altitudes of sixty thousand feet above the earth's mean sea level' in the Gross Receipts and Compensating Tax Act, N.M. Stat. § 7-9-54; following a private e-mail dated 6 March 2007 from L. Montgomery, Senior Attorney, Office of the Chief Counsel of the FAA (on file with the author). 60,000 ft translates into some 18 km only. Note that both US states are in the frontline when it comes to developing private commercial spaceflight (*cf.* further *infra*, § 12.3.4.4), hence apparently have a clear appetite for clearly delineating their jurisdiction also in a vertical sense. Reinhardt, *supra* n. 125, 118–9, further refers to a failed 2002 proposal at the federal level to arrive at a 37 miles/60 km lower boundary of outer space.

[164] See Launius & Jenkins, *supra* n. 162, 279 at n. 63; Nase, *supra* n. 125, 763; Lyall & Larsen, *supra* n. 2, 168.

[165] See *IAA Cosmic Study on Space Traffic Management*, International Academy of Astronautics (2006), 39.

rule of customary international law, where the above could be seen as at least an unequivocal tendency towards agreement on such a rule.[166]

Even if not a foregone conclusion, such a practical/legal modification of the originally scientific/technical/operational concept of a 'lowest perigee rule' would indeed be requisite. Otherwise, from a space perspective any boundary would have to be established at or below the altitude where *any* satellite would arrive at its perigee, which would mean at 78 km or less to cover every actual possible satellite orbit as proven so far – with the 'reverse' result that some experimental aircraft would now be able to reach into what would then be outer space, creating havoc with the current legal definitions or conceptions of 'outer space', 'airspace', 'aircraft' and 'spacecraft' and the ensuing applicability of many of the attendant legal obligations.[167] Under such an approach, such aircraft would, for example, be able to overfly foreign sovereign territory at an altitude of, for instance, 80 km, arousing all sorts of political and military sensitivities, as aircraft are by definition much more manoeuvrable than satellites.

2.3.1.4 The issue of a 'right of innocent passage' through foreign airspace

Establishing agreement on a 100 km lower boundary of outer space (or indeed establishing a boundary at any similar altitude), as demarcating it from the underlying, largely sovereign airspaces of the world, would solve many current jurisdictional issues and confusions – but it would certainly not solve all such problems. For example, with certain experimental aircraft able to fly higher and higher, their flight paths may in the future start crossing those of certain satellites dipping below that altitude – as the 'lowest perigee rule' for determining the lower boundary of outer space would now simply have been replaced by a more or less fixed 100 km altitude. More importantly for the present discussion, no agreement

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[166] *Cf.* M. Lachs, Freedoms of the Air – The Way to Outer Space, in *Air and Space Law: De Lege Ferenda* (Eds. T.L. Masson-Zwaan & P.M.J. Mendes de Leon) (1992), 245 ('The time may be approaching when a decision to define the frontier between the two dimensions will have to be taken'); also e.g. H.P. van Fenema, Suborbital Flights and ICAO, 30 *Air and Space Law* (2005), 398; S.R. Freeland, Fly Me to the Moon: How Will International Law Cope with Commercial Space Tourism, 11 *Melbourne Journal of International Law* (2010), 101–2.

[167] Note that those aircraft would, for those portions of flight, operate in a global commons subject only to the rules of international space law, being considerably less developed and precise than those of – international as well as national – air law.

on demarcation would *ipso facto* solve the conundrum of 'innocent passage' through foreign airspace.[168]

Thus, a 100 km boundary would indeed raise the issue of a 'right of innocent passage' for satellites with respect to the short parts of those (elliptical) orbits which would dip into the upper areas of what now would be airspace. After all, such satellites in relevant orbits operationally speaking simply *cannot* stay out of the 75–100 km area; prohibiting them from briefly dipping into that realm means prohibiting their orbits altogether. On the other hand, for satellites this will remain a rather exceptional scenario, limited, moreover, to the upper parts of any perceived air space where no routine commercial aviation takes place, only experimental or close-to-experimental aviation – but how different would that be once private manned sub-orbital spaceflights were undertaken?[169]

It seems the United States – ironically the very state where private commercial spaceflight, likely to force the issue of agreeing to a boundary at whatever altitude, is about to take off in the near future – increasingly turns out to be the only state adamant that it is, *inter alia* for reasons of the above conundrum, at the very least too early (and possibly undesirable altogether) to draw such a legal line between airspace and outer space. Conundrum or not, however, one may discern a strong tendency towards customary legal acceptance of a 100 km boundary in most other parts of the world as a matter of practice and perhaps even already as a rule of customary international law.

If such a boundary were indeed accepted without states protesting vehemently against certain satellites briefly 'dipping' into the 75–100 km altitude realm above their respective territories, a right of innocent passage – for satellites only, as manned spaceflight would be an

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[168] *Cf.* on the issue of a 'right of innocent passage' through foreign airspace *supra*, n. 130; further e.g. Benkö & Plescher, *supra* n. 118, 17–29, 47–8; Reinhardt, *supra* n. 125, 71–5, 100 ff., 116–8; B. Schmidt-Tedd & S. Mick, Article VIII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 160–1 (who contest the existence of such a right, but largely based on the assumption that every vehicle traversing national airspace would be an aircraft in the sense of the Chicago Convention, *supra* n. 16; see further on this *infra*, § 12.3.2.2); Oduntan, *supra* n. 118, 68–9; T.L. Masson-Zwaan, The Aerospace Plane: An Object at the Cross-Roads Between Air and Space Law, in *Air and Space Law: De Lege Ferenda* (Eds. T.L. Masson-Zwaan & P.M.J. Mendes de Leon) (1992), 253, 257–8; Lachs, *supra* n. 1, 56–8.

[169] See further *infra*, esp. §§ 12.2, 12.3, 12.5.2. *Cf.* also Benkö & Plescher, *supra* n. 118, e.g. 10–3.

altogether different issue in view of its manoeuvrability among other things – would come into being by acquiescence. If states by contrast *were* to protest to such use of their upper airspace, prohibiting those satellites from flying in the first place as a legal solution would fly straight in the face of the fundamental freedom of use and exploration of outer space as per Article I of the Outer Space Treaty.[170]

Obviously, for private manned sub-orbital spaceflight a different analysis would apply. For the foreseeable future, the sub-orbital hops would not present too much of an issue: they would need to operate in operational compatibility with air law, in particular in order to clear surrounding air spaces as needed by aircraft – but this is a matter of *national* air law, not international air law (just as clearing the airspaces for Vostok and Apollo launches was an exclusively Soviet and American affair respectively). However, once other – notably smaller – countries got involved in sub-orbital flights and/or started transporting passengers between different parts of the world, this might well have to be reconsidered.[171]

It may be noted also that in the law of the sea – one of the three legal realms usually referred to when new rules of space law are being discussed[172] – specific rules have been devised for so-called 'land-locked' states to allow them to benefit from the freedoms of the high seas, which go even further than the right of innocent passage in that field of international law. The latter only presumes the use of some other state's territorial waters subject to a range of conditions, the former the actual use of harbours and ports of another state and workable terrestrial connections therewith:

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170 So e.g. Lachs, *supra* n. 166, 244–5.

171 For example, this would have to be dealt with in the context of space traffic management regimes (see *infra*, § 7.4) and/or the international trade regime relevant to air transport services (*cf. infra*, § 15.5.4).

172 The main focus of such comparisons is either the law of the *high* seas, as these constitute a global commons just like outer space, or specific sub-sets of rules, such as regarding jurisdiction on board ships, exploitation of non-living resources or certification of crew and craft. The other two regimes referred to would be that of Antarctica, as this is (with the exception of a few states still clinging to their territorial claims – *cf.* also Art. IV, Antarctic Treaty, *supra* n. 117) also considered a global commons and Antarctica presents the environment on earth closest to outer space in many respects; and that of air law, essentially for historical and technical/operational reasons. See for a critical appraisal of the latter e.g. F.G. von der Dunk, A New 'Star' in the Firmament, 6 *The Korean Journal of Air and Space Law* (2011), 409–13.

> Land-locked States shall have the right of access to and from the sea for the purpose of exercising the rights provided for in this Convention including those relating to the freedom of the high seas and the common heritage of mankind. To this end, land-locked States shall enjoy freedom of transit through the territory of transit States by all means of transport.[173]

Using this right of land-locked states to access to international waters as an analogous precedent,[174] it should be argued that protest by states whose upper airspace (following a 100 km boundary) would be briefly traversed by satellites diving towards and then again rising up from their perigee could only be legitimate to the extent such passages would not be 'innocent'. Again, the law of the sea may be helpful in providing guidance as to what 'innocent passage' should be taken to mean more specifically. Firstly:

> 1. Passage means navigation through the territorial sea for the purpose of:
>   (a) traversing that sea without entering internal waters or calling at a roadstead or port facility outside internal waters; or
>   (b) proceeding to or from internal waters or a call at such roadstead or port facility.
> 2. Passage shall be continuous and expeditious. However, passage includes stopping and anchoring, but only in so far as the same are incidental to ordinary navigation or are rendered necessary by *force majeure* or distress or for the purpose of rendering assistance to persons, ships or aircraft in danger or distress.[175]

Translated into the outer space context: passage can only possibly be subject to a right of innocent passage if it is on the way to or from outer space in a continuous and expeditious manner, without somehow actually landing on or departing from the territory of the state whose airspace is at issue, unless a case of *force majeure*, distress or rescue is at hand. Secondly, as to the element of 'innocence':

> 1. Passage is innocent so long as it is not prejudicial to the peace, good order or security of the coastal State. Such passage shall take place in conformity with this Convention and with other rules of international law.

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[173] Art. 125(1), United Nations Convention on the Law of the Sea, *supra* n. 15; see more broadly Arts. 124–32.
[174] See also Neger & Walter, *supra* n. 1, 252–3 on this analogy.
[175] Art. 18, United Nations Convention on the Law of the Sea, *supra* n. 15.

2. Passage of a foreign ship shall be considered to be prejudicial to the peace, good order or security of the coastal State if in the territorial sea it engages in any of the following activities:
   (a) any threat or use of force against the sovereignty, territorial integrity or political independence of the coastal State, or in any other manner in violation of the principles of international law embodied in the Charter of the United Nations;
   (b) any exercise or practice with weapons of any kind;
   (c) any act aimed at collecting information to the prejudice of the defence or security of the coastal State;
   (d) any act of propaganda aimed at affecting the defence or security of the coastal State;
   (e) the launching, landing or taking on board of any aircraft;
   (f) the launching, landing or taking on board of any military device;
   (g) the loading or unloading of any commodity, currency or person contrary to the customs, fiscal, immigration or sanitary laws and regulations of the coastal State;
   (h) any act of wilful and serious pollution contrary to this Convention;
   (i) any fishing activities;
   (j) the carrying out of research or survey activities;
   (k) any act aimed at interfering with any systems of communication or any other facilities or installations of the coastal State;
   (l) any other activity not having a direct bearing on passage.[176]

It should not be that difficult to translate such requirements for 'innocence' as appropriate to the context of space law and space objects either; those *sub* 2(a), (b), (h), and (k) would already be prohibited in more or less straightforward fashion by existing outer space law,[177] whereas the others are either irrelevant (such as the one *sub* 2(i)) or effectively subsumed in paragraph 2(k) by reference to 'any … activity not having a direct bearing on passage'.

Referring to one of the other legal regimes often serving as guidance for space law – that of air law – one may next point to a key formulation on how crimes on board aircraft are handled:

> A Contracting State which is not the State of registration may not interfere with an aircraft in flight in order to exercise its criminal jurisdiction over an offence committed on board except in the following cases:

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[176] Art. 19, United Nations Convention on the Law of the Sea, *supra* n. 15.

[177] *Cf.* e.g. Art. III, Outer Space Treaty, *supra* n. 1, and its inclusion of general international law, prohibiting acts of aggression from outer space as well as other acts intended to inflict substantial harm on other states without underlying justification. See further Benkö & Plescher, *supra* n. 118, 32–4.

(a) the offence has effect on the territory of such State;
(b) the offence has been committed by or against a national or permanent resident of such State;
(c) the offence is against the security of such State;
(d) the offence consists of a breach of any rules or regulations relating to the flight or manoeuvre of aircraft in force in such State;
(e) the exercise of jurisdiction is necessary to ensure the observance of any obligation of such State under a multilateral international agreement.[178]

In other words, a state in whose sovereign national airspace an aircraft registered by another state is flying when a crime is committed on board is *not* supposed to apply its sovereign right to exercise territorial jurisdiction over such a crime *unless* the crime has a distinct nexus with that state, as specified by one of the five alternative scenarios listed.

Transposing these general concepts to space law: as long as a satellite, flying for short parts of its orbit above a state other than the state(s) under whose international responsibility the satellite operates but below a 100 km altitude, operates in conformity with applicable international (space) law and does not undertake specific activities directly impacting the sovereign terrestrial realm of the underlying state (let alone cross foreign airspace at an altitude endangering normal aviation), it should be considered to have such a 'right of innocent passage'.

Note that the United Nations Convention on the Law of the Sea does not even require, for a 'right of innocent passage' to apply, an obligation of the state making use of that right to inform, much less to do so in advance, the state whose territorial waters are at issue of its intention to make use of such a right.

Ships, however, move with velocities which are dimensions smaller than space objects, so it would be appropriate in this respect to deviate from the law of the sea, and insist on some mechanism of information provision in order to guarantee that the state whose upper airspace is traversed will not be completely unaware of such transit. The least that could be required is compliance with the Registration Convention's requirements to provide relevant information, including, in particular, under 'additional information concerning a space object carried on its

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[178] Art. 4, Convention on Offences and Certain Other Acts Committed on Board Aircraft (Tokyo Convention), Tokyo, done 14 September 1963, entered into force 4 December 1969; 704 UNTS 219; TIAS 6768; UKTS 1969 No. 126; Cmnd. 2261; ATS 1970 No. 14; 2 ILM 1042 (1963); ICAO Doc. 8364.

registry'[179] to the extent feasible such information as allows relevant states to determine their respective airspace may be at issue. In the current electronic environment, including OOSA's register of space objects being available online, it should not be too difficult in addition to ensure automatic forwarding of such information to relevant states.

The only current caveat would then apply to direct broadcasting satellites, where a majority of the world's states have indicated their strong legal support for a rule of prior consent as per the UN Principles on satellite direct broadcasting[180] – and would consequently be entitled to demand any transmission of broadcasts into their territory to be suspended during that transition through the upper part of their airspace. This, however, seems to be a purely theoretical matter, as satellites orbiting so low would hardly be useful for broadcasting purposes, and are so far used exclusively for two-way communications, remote sensing and scientific research activities.

Logically, the first real test to such a 'right of innocent passage' would consequently come only once it no longer concerned unmanned and hardly manoeuvrable satellites, but rather manned and pilot-flown sub-orbital vehicles which would traverse such upper parts of the airspaces of other states than those internationally responsible for those flights.[181] A more extended analysis and regime would then likely be necessary, which may or may not involve 'innocent passage' properly speaking.

2.3.2 The Rescue Agreement

As indicated earlier, Articles V and VIII of the Outer Space Treaty, dealing respectively with the status of astronauts and the basic requirement to return space objects to the state of launch, gave rise to the 1968 Rescue Agreement,[182] which was developed rapidly after the Outer Space Treaty itself, and entered into force less than 12 months after the latter.

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[179] Art. IV(2), Registration Convention, *supra* n. 41.

[180] UNGA Res. 37/92, *supra* n. 49; also *infra*, § 8.3.1.

[181] See further e.g. *infra*, esp. § 12.2. *Cf.* also e.g. Benkö & Plescher, *supra* n. 118, 28–9, 42–6.

[182] See on the Rescue Agreement, *supra* n. 39, in general I. Marboe, J. Neumann & K.U. Schrogl, The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 1–82; J.M. de Faramiñan Gilbert & M.C. Muñoz

The treaty was essentially part of a package deal, preserving some key interests of the major spacefaring nations, where the Liability Convention and Registration Convention soon to be concluded were in turn to preserve some key interests notably of all other states.[183] Along the lines of the underlying two articles of the Outer Space Treaty, the essential substantive clauses of the Rescue Agreement focused on two main issues.

2.3.2.1 Personnel of a spacecraft

Firstly, the Rescue Agreement addresses the 'personnel of a spacecraft', who are to be rescued, rendered assistance and returned safely and promptly by another state than the launching state if found to be in distress.[184] The precise extent of the duties of such a third state in this respect depends on whether the personnel concerned were found on its territory or in areas outside of its jurisdiction, notably the high seas – but also outer space itself.

Generally, those duties to come to the rescue were considered to follow from the terms of Article V of the Outer Space Treaty, which provided for astronauts to be regarded as 'envoys of mankind in outer space'. This was not a term denoting formal diplomatic status, but indicated that astronauts were, as 'representatives' of mankind in the dangerous outer

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Rodríguez, The Return of Objects Launched into Outer Space: Some Legal Questions, in *The Astronauts and Rescue Agreement – Lessons Learned* (Eds. G. Lafferranderie & S. Marchisio) (2011), 35–54; Cheng, *supra* n. 1, 265–86; P.G. Dembling & D.M. Arons, The Treaty on Rescue and Return of Astronauts and Space Objects, 9 *William and Mary Law Review* (1968), 630–3; F.G. von der Dunk, A Sleeping Beauty Awakens: The 1968 Rescue Agreement after Forty Years, 34 *Journal of Space Law* (2008), 411–34; Lachs, *supra* n. 1, 75–88; Christol, *supra* n. 31, 152–212; R.S.K. Lee, Assistance to and Return of Astronauts and Space Objects, in *Manual on Space Law* (Eds. N. Jasentuliyana & R.S.K. Lee) Vol. I (1979), 53–81.

[183] Such interests notably pertained to being assured that any damage caused to them by the space activities of others would be generously compensated under a no-fault liability regime. See further e.g. Marboe, Neumann & Schrogl, *supra* n. 182, 9–10; Smith & Kerrest de Rozavel, *supra* n. 78, 95; Schmidt-Tedd & Tennen, *supra* n. 35, 236–7; Lyall & Larsen, *supra* n. 2, 81–3.

[184] Arts. 2–4, Rescue Agreement, *supra* n. 39. Further e.g. Marboe, Neumann & Schrogl, *supra* n. 182, 48–62; Christol, *supra* n. 31, 171–6; Lee, *supra* n. 182, 65–9.

space environment, entitled to a certain level of support in situations of distress above and beyond normal humanitarian considerations.[185]

One issue in respect of the provisions of the Rescue Agreement concerns the precise meaning of the term 'personnel', where Article V of the Outer Space Treaty referred to 'astronauts' (in the Russian version 'cosmonauts'). As the Rescue Agreement itself in its full title as well as its Preamble also referred to 'astronauts', the two terms were generally considered to be synonymous, with 'personnel' perhaps pointing a bit more precisely to their standard role of employees in the service of a space agency tasked with specific operational duties.[186]

This issue of the precise definition of 'astronauts' and 'personnel of a spacecraft', whether as synonymous or as slightly different notions, has in recent years become more relevant. Both in the context of the ISS and in the context of the national US Commercial Space Launch Act reference was made to a new concept of 'spaceflight participant',[187] which suggested an increasing perception that not *all* humans venturing into outer space – and notably not 'space tourists' – should be entitled to the epithet 'envoys of mankind' and the ensuing support noted above.[188]

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[185] See Lyall & Larsen, *supra* n. 2, 129–34; F.G. von der Dunk & G.M. Goh, Article V, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 98; Cheng, *supra* n. 1, 259, 460; *cf.* further Jasentuliyana, *supra* n. 1, 187–8; M.J. Sundahl, The Duty to Rescue Space Tourists and Return Private Spacecraft, 35 *Journal of Space Law* (2009), 167–71; *cf.* also Dembling & Arons, *supra* n. 67, 436.

[186] *Cf.* e.g. Lachs, *supra* n. 1, 76–7, 83; Jasentuliyana, *supra* n. 1, 190–1.

[187] See Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers, ISS Multilateral Crew Operations Panel, November 2001, Revision A, of 28 November 2001, p. 4; at http://esamultimedia.esa.int/docs/isscrewcriteria.pdf, last accessed 12 April 2014; and Sec. 50902, *sub* 17, 51 U.S.C. 509 respectively. Further *infra*, §§ 11.4.3.2 and 12.3.4.3 respectively.

[188] See further *infra*, §§ 11.4.3.2, 12.5.1. *Cf.* also an insightful analysis in Sundahl, *supra* n. 185, 174–89; further Lyall & Larsen, *supra* n. 2, 129–34; Freeland, *supra* n. 77, 24–6; Freeland, *supra* n. 166, 103–4; A. Farand, Space Tourism: Legal Considerations Pertaining to Suborbital Flights, in *The Astronauts and Rescue Agreement – Lessons Learned* (Eds. G. Lafferranderie & S. Marchisio) (2011), 55–69; S. Hobe, Space Tourism as a Challenge to the Astronaut Concept, *The Astronauts and Rescue Agreement – Lessons Learned* (Eds. G. Lafferranderie & S. Marchisio) (2011), 71–82; Hobe, *supra* n. 137, 454–8; also, however rather equivocally, Chatzipanagiotis, *supra* n. 150, 29–38.

2.3.2.2 Space objects (and their launching authorities)

Secondly, the Rescue Agreement addresses space objects[189] found outside the territory of the state responsible for launching, which are also to be recovered and returned, at the expense of the 'launching authority'.[190] Whilst so far no cases exist of the Rescue Agreement having been invoked with respect to astronauts, a number of instances of invocation for the purposes of returning space objects or component parts thereof have been documented.[191]

The aforementioned 'launching authority', key recipient of rights and bearer of obligations under the Agreement (also with regard to 'its' astronauts), is defined as 'the State responsible for launching, or, where an international intergovernmental organization is responsible for launching, that organization', subject to certain conditions which include a formal declaration by such an organization.[192]

This represented a novelty not only in space law, but in public international law at large: an intergovernmental organization could qualify as a party to at least the substantive obligations of a treaty on a more or less equal footing with sovereign states.[193] At present, ESA and EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites) have actually issued the requisite Declarations and thereby accepted all the rights and obligations of a 'launching authority' under the Rescue Agreement.[194]

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[189] See for a discussion on the definition of 'space objects' *infra*, § 2.3.3.2.

[190] See Art. 5, Rescue Agreement, *supra* n. 39. Further Marboe, Neumann & Schrogl, *supra* n. 182, 63–70; Christol, *supra* n. 31, 176–81; Lee, *supra* n. 182, 69–73.

[191] See for the most interesting cases K. Hodgkins, Procedures for Return of Space Objects under the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, in *Proceedings United Nations/International Institute of Air and Space Law Workshop on Capacity Building in Space Law*, 2003, 61–6; also Lyall & Larsen, *supra* n. 2, 100–2, esp. fn. references; von der Dunk, *supra* n. 182, 425–31.

[192] Art. 6, Rescue Agreement, *supra* n. 39. See further Marboe, Neumann & Schrogl, *supra* n. 182, 71–4; Kerrest de Rozavel, *supra* n. 97, 260; Christol, *supra* n. 31, 200–2; Dembling & Arons, *supra* n. 182, 658–9; Cheng, *supra* n. 1, 279–80; also B. Cheng, Space Objects and their Various Connecting Factors, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 205–8.

[193] Procedural rights such as to amendment or withdrawal (Arts. 8 and. 9 respectively, Rescue Agreement, *supra* n. 39) remained reserved to sovereign states parties.

[194] See Status of International Agreements relating to activities in outer space as at 1 January 2013, A/AC.105/C.2/2013/CRP.5, of 28 March 2013, p. 10.

2.3.3 The Liability Convention

Whilst Article VII of the Outer Space Treaty had introduced the essential principle of states being held liable for damage caused by space objects launched or procured by them or from their territory or facility, it was the Liability Convention[195] which formally labelled such states 'launching States'[196] and elaborated the liability regime actually applied to such damage.[197] The Liability Convention took almost five years to be finalized from the entry into force of the Outer Space Treaty. Essentially, that regime as per the Convention entailed eight key elements; whereas its application in actual practice would also have to be taken into consideration in assessing its importance.

2.3.3.1 The definition of the 'launching State'

Differently from the lack of definition of 'national activities in outer space' of a particular state and the consequent uncertainties as to attribution of international responsibility for private activities under Article VI of the Outer Space Treaty,[198] the attribution of international liability under the Liability Convention (in elaboration of Article VII of the Outer Space Treaty) would seem rather straightforward. Article I(c) of the Liability Convention simply provides: 'The term "launching State" means: (i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched'.

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[195] See on the Liability Convention, *supra* n. 40, in general e.g. L.J. Smith, A. Kerrest de Rozavel & F. Tronchetti, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 83–226; Christol, *supra* n. 31, 59–128; Cheng, *supra* n. 1, 286–356; Christol, *supra* n. 78, 346–71; Hurwitz, *supra* n. 78, 9–109; Lyall & Larsen, *supra* n. 2, 105–14; Bhat & Bhat, *supra* n. 8, 141–4; in a broader context also R. Bender, *Space Transport Liability – National and International Aspects* (1995), esp. 279–335.

[196] See Art. I(c), Liability Convention (*supra*, n. 40), see *infra*, § 2.3.3.1. Further Smith & Kerrest de Rozavel, *supra* n. 78, 107–9; Cheng, *supra* n. 1, 309–10; Christol, *supra* n. 31, 107–8; Kayser, *supra* n. 86, 35–6; Hurwitz, *supra* n. 78, 21–3.

[197] See for the discussion of the relationship of such liability to that of international responsibility as per Art. VI, Outer Space Treaty, *supra* n. 1, *supra*, § 2.3.1.1.

[198] See *supra*, § 2.3.1.1.

Of the four alternative criteria thus used to determine the liable state, the most unequivocal and undisputed criterion under the Liability Convention is clearly that of use of the state's territory for the launch at issue as the definition of 'territory' under international law is rather unequivocal. Even launches from national airspace have generally been assumed to form part of launches from a state's 'territory' for the purpose of the Liability Convention.[199]

With respect to the other three criteria, however, how would they apply to cases where it was not a state organ but a private company which would 'launch' or 'procure' the launch, or the launch would take place from a private facility as opposed to a state-owned one? Should the reference to, for example, '[a] State which launches'[200] be read broadly, following the equation under Article VI of the Outer Space Treaty of activities conducted by non-governmental entities to governmental activities including 'non-state entities which launch' as long as somehow most closely related to the state concerned? Most states indeed understood this to mean they might still be held liable under those headings also for private launches, but only some extended this to private procurement or launches from private facilities, hence calling for authorization before allowing them to take place; in that manner, implicitly or explicitly they largely ignored the latter in their national legislative efforts.[201]

Or should it be read narrowly, meaning that if there is, for instance, no state which 'procures' the launch at issue (but a private satellite operator), at least under this criterion there *is* no launching state, hence no liable state? Indeed, other states have apparently understood it this way, in the context of their national space laws and licensing regimes not requiring a private entity, for example procuring a launch elsewhere, to obtain a licence including appropriate liability derogation arrangements.[202]

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199 See e.g. Cheng, *supra* n. 1, 330; Hobe, *supra* n. 24, 7.

200 Art. I(c) (i), Liability Convention, *supra* n. 40.

201 See in general e.g. I. Marboe & F. Hafner, Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 51–7; von der Dunk, *Private Enterprise*, *supra* n. 67, 107–64; also *infra*, § 3.3.

202 The only clear exceptions here are the UK Outer Space Act, 18 July 1986, 1986 Chapter 38; *National Space Legislation of the World*, Vol. I (2001), at 293; *Space Law – Basic Legal Documents*, E.I; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 12, *cf.* Sec. 1(a); and the French Law on Space Operations (*Loi relative aux opérations spatiales*); *Loi n° 2008–518 du 3 juin 2008*; unofficial English version 34 *Journal of Space Law* (2008), 453, *cf.* Art. 2(3).

Furthermore, in particular the phrase 'procuring' gave rise to widely varying interpretations, from the application by states of their relevant authorization requirements (and thereby allowing the private space activities to go ahead) to financing the launches concerned. Also here, consequently, states differed considerably in their actual approach as evident in their respective national space legislation.[203]

Finally, complicating matters further still, *two* principles of international accountability ('responsibility' and 'liability', the one attributing private enterprise by means of the concept of 'national activities', the other through the concept of the 'launching state') presented by the international space treaties continue to cause additional confusion. It is the international *responsibility* of Article VI of the Outer Space Treaty which calls for authorization and continuing supervision, of which national space laws form the most comprehensive and transparent representation. Yet it would be the international *liability* following Article VII of the Outer Space Treaty and the Liability Convention which would most directly be of concern to states, since they would have to foot the bill also of any relevant damage privately caused, and thus provide a principal stimulus for the establishment of national space laws regulating *inter alia* reimbursement of the state in case of such international claims.[204]

2.3.3.2 The definitions of 'damage' and 'compensation'

Secondly, the damage that was to be considered compensable under the Convention's regime was delineated as 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations'.[205] Thus, for example damage to the environment of the high seas or consequential and indirect damage was not included.[206]

On the other hand, the Liability Convention also provided for what in essence amounts to unlimited liability, in the following terms:

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[203] See also *infra*, § 7.2.2. With respect to the UK Outer Space Act at one time there actually was a discussion as to whether banks financing a satellite launch, hence in a broad sense 'procuring' it (see also s. 13(2), UK Outer Space Act), would actually be required to obtain a licence under the Act as well; see von der Dunk, *Private Enterprise*, *supra* n. 67, 134.

[204] See further *infra*, § 2.3.3.2.; also § 3.2.3.

[205] Art. I(a), Liability Convention, *supra* n. 40.

[206] See *supra*, literature mentioned in n. 78; *cf.* further also e.g. Smith & Kerrest de Rozavel, *supra* n. 78, 113, 175; Kayser, *supra* n. 86, 47–50.

> The compensation which the launching State shall be liable to pay for damage under this Convention shall be determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.[207]

This phrasing suggests that, at least if equity and justice so required, compensation also of indirect and consecutive damage could be entertained, leading some others to suggest that it would actually depend upon what the case at hand was and who was adjudicating it as to whether such damage would also be compensated.

The scope of application of the Convention further follows from the above definition of the concept of damage: both Article II and Article III of the Liability Convention speak of 'damage caused by a space object', which is commonly agreed to include all damages resulting from physical collision of that space object with the damaged items.

Beyond that, some authors contend that it also includes damage caused by a space object without direct physical collision, such as by way of electronic or laser interference,[208] that indirect or consequential damage is also an inherent element of the liability compensable under the Convention; and exceptionally it has even been argued that damage caused by wrongful signals emitted from a satellite would fall within the Convention's definition.[209] Since such efforts to apply the Liability Convention to a broader range of damages are nevertheless generally

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[207] Art. XII, Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 172–5; Cheng, *supra* n. 1, 332–42; Christol, *supra* n. 31, 92–3, ff.; Hurwitz, *supra* n. 78, 50, 53–4.

[208] *Cf.* e.g. discussion in Smith & Kerrest de Rozavel, *supra* n. 78, 111, 114–5, esp. 126–9, 174–5; Hurwitz, *supra* n. 78, 12–20; authors quoted in Christol, *supra* n. 31, e.g. 96–7.

[209] This concerned the damage caused by an aircraft crashing due to faulty satellite navigation guidance (*cf.* B.D.K. Henaku, *The Law on Global Air Navigation by Satellite: An Analysis of Legal Aspects of the ICAO CNS/ATM System* (1998), 221) and the damage caused by a remote sensing satellite operator not forwarding information which might have helped to mitigate the (consequences of) the 2004 Indian Ocean tsunami respectively (see Ito, *supra* n. 52, 191–4, discussing several claims brought against NOAA; also e.g. www.theage.com.au/news/asia-tsunami/european-victims-file-first-lawsuit/2005/03/06/1110044254434.html, last accessed 6 January 2014; www.news24.com/SciTech/News/Tsunami-lawsuit-unfounded-20050308, last accessed 6 January 2014).

frowned upon, this remains one of the more salient liability-related issues of today's space environment, calling for global agreement one way or another.

2.3.3.3 The definitions of 'space object' and 'launch'

The above pattern of non-clarified concepts is aggravated by two more unresolved definitional issues. As the space object whose operations trigger the Liability Convention if causing damage is usually defined with reference to its being launched into outer space (or at least an effort being made to do so),[210] and the liable entities are also determined through their involvement in the launch as 'launching States', these two concepts of 'space object' and 'launch' constitute the second major problematic element of the Liability Convention. The Convention only determines that a 'space object' 'includes [its] component parts',[211] and that 'launching' explicitly 'includes attempted launching'.[212]

While the underlying assumption may have been that a launch constituted a kind of (at least initially) vertical departure from a land-based launch facility aiming at entering outer space using rocket engines, any such assumption has by now been 'corrupted' by air launches conducted, for example, by Pegasus. In such cases, the proper spacecraft was released from underneath an aeroplane in mid-air where the very first

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[210] On Art. I(d), Liability Convention, *supra* n. 40, and the definition of 'space object' see in particular Lachs, *supra* n. 1, 65–7; Smith & Kerrest de Rozavel, *supra* n. 78, 114–5; Chatzipanagiotis, *supra* n. 150, 20–1; Hurwitz, *supra* n. 78, 23–6; Cheng, *supra* n. 1, 324–6, 493–507; Zhukov & Kolosov, *supra* n. 1, 85 ff.; Hobe, *supra* n. 137, 443–4; Kayser, *supra* n. 86, 44–5; S. Gorove, Issues Pertaining to the Legal Definition 'Space Object', 2 *Telecommunications and Space Journal* (1995), 136–45; V. Kopal, The 1975 Convention on Registration of Objects Launched into Outer Space in View of the Growth of Commercial Space Activities, in *Air and Space Law in the 21st Century* (Eds. M. Benkö & W. Kröll) (2001), 377; also Christol, *supra* n. 78, 348–50 (discussing the space shuttle in this context); Gál, *supra* n. 1, 207 ff. (focusing on the issue with a view to the Outer Space Treaty). This is also reflected in a number of national space laws; e.g. Sec. 1(c), Dutch Space Law (Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects, 24 January 2007; 80 *Staatsblad* (2007), at 1; *Nationales Weltraumrecht/National Space Law* (2008), at 201), defines a 'space object' as 'any object launched or destined to be launched into outer space'.

[211] Art. I(d), Liability Convention, *supra* n. 40. *Cf.* further Vissepó, *supra* n. 125, 198.

[212] Art. I(b), Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 113–14; Hurwitz, *supra* n. 78, 20–1; on what constitutes a launch also Gál, *supra* n. 1, 207–9.

part of the trajectory essentially is a horizontal one – which activities were nevertheless legally defined as 'launches' at least for the purpose of space law. Currently, this issue is becoming even more relevant in the context of sub-orbital flights, some of which take off horizontally, others vertically, yet others from underneath carrier aircraft wings in mid-air.[213]

As of now, the only widespread agreement – at least amongst authors – would be that a space object concerns any man-made object which is at least attempted to be physically brought into outer space. This also has an interesting consequence in the context of the long-standing discussion on 'spatialism' versus 'functionalism' as the most appropriate approach to applying space law.[214] Where 'spatialists' advocate that the choice of the applicable law as regards activities above the earth's surface (air law or space law) should depend in a straightforward fashion on where any object finds itself, 'functionalists' by contrast advocate that space law should be applied to looking at the functions of a particular operation, that is essentially as soon as a 'space object' such as a satellite were involved – presumably negating the need to establish a clear-cut boundary between airspace and outer space.

When, however, a space object is to be defined with reference to an intention to bring it into outer space, the latter would *still* need to be defined, if only to distinguish an object *not* intended to reach outer space (also if still flying very high) from an object intended to do so, even if just for an upper arc of its sub-orbital trajectory. In other words, any craft or balloon intended to be flown up to a 90 km altitude would and should not (under the presumption of a 100 km boundary) qualify as a space object, whereas any spacecraft or satellite intended to be flown up to 110 km under the same premise would and should so qualify.

2.3.3.4 Absolute versus fault liability

Fourthly, the Liability Convention makes a fundamental distinction between absolute liability of a state, applicable in cases where 'damage

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213 See further *infra*, § 12.1; also §§ 7.2.1.1, 7.2.3, on air launches.

214 See e.g. *in extenso* Kopal, *supra* n. 151, 154 ff.; also Neger & Walter, *supra* n. 1, 237–41; earlier already B. Cheng, The Legal Regime of Airspace and Outer Space; The Boundary Problem, Functionalism versus Spatialism: The Major Premises, 5 *Annals of Air and Space Law* (1980), 323–61; C.Q. Christol, Legal Aspects of Aerospace Planes, in *The Highways of Air and Outer Space Over Asia* (Eds. C.J. Cheng & P.M.J. Mendes de Leon) (1992), 77–90; F.G. von der Dunk, Space for Space Law? Spatialism and Functionalism Revisited, in *Perspectives of Air Law, Space Law and International Business Law for the Next Century* (Ed. K.H. Böckstiegel) (1996), 63–71.

[is] caused by its space object on the surface of the Earth or to aircraft in flight',[215] and fault liability, applicable '[i]n the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property on board such a space object' (and this of course then applies vice versa as well).[216] 'Fault' as such, however, has not been defined any further, which may give rise to considerable discussions, as happened for example in the case of the 2009 collision between the Cosmos-2251 and Iridium-33 satellites.[217]
The same principles of absolute and fault liability are applied, firstly, in case of damage caused by jointly launched space objects, where joint and several liability applies, and secondly, in cases of jointly caused damage where debris resulting from a primary collision causes harm to a third space object or on earth.[218] Exoneration from absolute liability is possible to the extent of 'gross negligence or … an act or omission done

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[215] Art. II, Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 116–30; Cheng, *supra* n. 1, 326–8; Hurwitz, *supra* n. 78, 27–32; Kayser, *supra* n. 86, 50–1; Lyall & Larsen, *supra* n. 2, 108–9; Zhukov & Kolosov, *supra* n. 1, 104.

[216] Art. III, Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 131–6; Cheng, *supra* n. 1, 326–8; Hurwitz, *supra* n. 78, 32–6; Kayser, *supra* n. 86, 51; Lyall & Larsen, *supra* n. 2, 109.

[217] See F.G. von der Dunk, Too-Close Encounters of the Third-Party Kind: Will the Liability Convention Stand the Test of the Cosmos 2251-Iridium 33 Collision?, in *Proceedings of the International Institute of Space Law 2009* (2010), 199–209; M. Mejia-Kaiser, Collision Course: 2009 Iridium-Cosmos Crash, in *Proceedings of the International Institute of Space Law 2009* (2010), 274–84; A.K. Dhan & K. Mohan, 'Hit and Run' in the Sky: International Liability for Damage Caused by Collision Between Space Objects in the Light of Recent Iridium-Cosmos Incident, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 151–66; R.S. Jakhu, Iridium-Cosmos Collision and its Implications for Space Operations, in *Yearbook on Space Policy 2008/2009* (Eds. K.U. Schrogl *et al.*) (2010), 254–75; in general also Lachs, *supra* n. 1, 115–7; Smith & Kerrest de Rozavel, *supra* n. 78, 133–4, (esp.) 225; Hurwitz, *supra* n. 78, 33–4; Lyall & Larsen, *supra* n. 2, 108–9.

[218] *Cf.* Arts. V and IV respectively, Liability Convention, *supra* n. 40; also providing for default principles of sharing joint and several liability as between the various launching states so liable. See further Smith & Kerrest de Rozavel, *supra* n. 78, 137–47; Cheng, *supra* n. 1, 328–31; Hurwitz, *supra* n. 78, 37–9; Zhukov & Kolosov, *supra* n. 1, 103–4; Lyall & Larsen, *supra* n. 2, 109–10. For a discussion of possible reform of the fault liability in this particular context, see H. Hertzfeld, Fault Liability for 3rd Party Damage in Space: Is Article IV(1) (B) of the Liability Convention Useful Today?, in *Proceedings of the International Institute of Space Law 2010* (2011), 215–23.

with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents'.[219]

These clauses conform to the general approach that absolute liability in the international community is an exception, requiring a specific international treaty for states to be acceptable, and only applied to high-risk or even ultra-hazardous activities.[220]

2.3.3.5 International versus national liability

Fifthly, the Liability Convention specifically addresses 'international liability', that is liability as between one or more states on the one hand and one or more states on the other. Thus, it does not deal with damage caused to nationals of the launching state of the space object at issue – that is something exclusively for national law to deal with – or foreign nationals who were essentially participating in or invited to the launch.[221]

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[219] Art. VI(1), Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 148–50; Hurwitz, *supra* n. 78, 40–3; Lyall & Larsen, *supra* n. 2, 110.

[220] The other major examples at the international level of absolute liability for states concern oil pollution and nuclear damage as per the International Convention on Civil Liability for Oil Pollution Damage, Brussels, done 29 November 1969, entered into force 19 June 1975; 973 UNTS 3; UKTS 1975 No. 106; Cmnd. 4403; ATS 1984 No. 3; 9 ILM 45 (1970); 64 AJIL 481 (1970); the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Brussels, done 18 December 1971, entered into force 16 October 1978; 1110 UNTS 57; UKTS 1978 No. 95; Cmnd. 5061; ATS 1995 No. 2; 11 ILM 284 (1972); the International Maritime Organization Protocol of 1992 to amend the International Convention on Civil Liability for Oil Pollution Damage of 29 November 1969, London, done 27 November 1992, entered into force 30 May 1996; 1956 UNTS 255; UKTS 1996 No. 86; Cm. 2658; ATS 1996 No. 2; the International Maritime Organization Protocol of 1992 to amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage of 18 December 1971, London, done 27 November 1992, entered into force 30 May 1996; UKTS 1996 No. 87; Cm 2657; ATS 1996 No. 3; the Convention on Third Party Liability in the Field of Nuclear Energy, Paris, done 29 July 1960, entered into force 1 April 1968; 956 UNTS 251; UKTS 1968 No. 69; Cmnd. 1211; 55 AJIL 1082 (1961); the Convention Supplementary to the Paris Convention of 29 July 1960 on Third Party Liability in the Field of Nuclear Energy, Brussels, done 31 January 1963, entered into force 4 December 1974; UKTS 1975 No. 44; Cmnd. 5948; 2 ILM 685 (1963); and the Vienna Convention on Civil Liability for Nuclear Damage, Vienna, done 21 May 1963, entered into force 12 November 1977; 1063 UNTS 265; Cmnd. 2333; 2 ILM 727 (1963).

[221] See Art. VII, Liability Convention, *supra* n. 40; further Smith & Kerrest de Rozavel, *supra* n. 78, 154–61; Cheng, *supra* n. 1, 308–9; Hurwitz, *supra*

The latter clause ties in with the overall aim of the Convention to protect interests of uninformed third parties, not those knowingly part of the activities concerned. Also, the reading of Article III clearly means to exclude claims between launching states of the *same* space object.[222] Furthermore, the Convention does not exclude individuals from pursuing other means for obtaining compensation for any damage suffered, for example by suing in the courts of a launching state.[223] If such individuals choose to try and have their state invoke the Liability Convention on the other hand, they are not required to first exhaust local remedies, something which is otherwise the default route for claims relating to private rights, obligations or damage under public international law.[224]

2.3.3.6 The right to claim

This also brings analysis to the sixth main element, the determination of the states entitled to assert claims under the Liability Convention. Here, the state suffering damage or whose nationals suffer damage has the primary right of claiming, a state on whose territory damage has occurred a subsidiary right, and a state whose permanent residents suffer the damage an again subsidiary right in this respect.[225]

These clauses represent, within the 'given' of state-centricity of the liability regime and a *jus standi* under the Convention for states only, the effort to maximize access by victims to the compensatory mechanism of

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n. 78, 44–8; Lyall & Larsen, *supra* n. 2, 111; Kayser, *supra* n. 86, 52–3; Bender, *supra* n. 195, 307–9.

[222] Art. III, Liability Convention, *supra* n. 40, reads in full: 'In the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property on board such a space object by a space object of *another* launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible' (emphasis added). So also Hurwitz, *supra* n. 78, 33. *Cf.* further Arts. IV, V, Liability Convention, which provide some clues on how joint and several liability in the case of plural launching states is to be addressed, but does not at all discuss claims between launching states of the same space object; also Cheng, *supra* n. 1, 305–20, 344.

[223] See Art. XI(2), Liability Convention, *supra* n. 40; further Smith & Kerrest de Rozavel, *supra* n. 78, 167–8; Hurwitz, *supra* n. 78, 52–3; Lyall & Larsen, *supra* n. 2, 111.

[224] *Cf.* Art. XI(1), Liability Convention, *supra* n. 40; further Lachs, *supra* n. 1, 118; Smith & Kerrest de Rozavel, *supra* n. 78, 166–8; Cheng, *supra* n. 1, 345–6; Hurwitz, *supra* n. 78, 52; Lyall & Larsen, *supra* n. 2, 111.

[225] See Art. VIII, Liability Convention, *supra* n. 40; also Smith & Kerrest de Rozavel, *supra* n. 78, 154–8; Cheng, *supra* n. 1, 306–8; Christol, *supra* n. 31, 113–4; Hurwitz, *supra* n. 78, 49–50; Lyall & Larsen, *supra* n. 2, 110–1.

the Convention – private victims would have at least three options for convincing a relevant state to take up their claim. An interesting side issue concerns application of these clauses to *juridical* persons, where 'permanent residence' as a term of art strictly speaking does not apply, but could yet be interpreted *mutatis mutandis* as referring to the place of the headquarters and/or main place of business for companies.

2.3.3.7 Procedural aspects: Diplomatic negotiations and the Claims Commission

The seventh main element of the Convention concerns the procedural aspects of handling disputes on claims. The first stage is comprised of diplomatic negotiations, which only if not successful within a year, may give rise to a second stage where the dispute settlement system specifically provided for by the Convention is triggered.[226] In the first stage express time limits apply as regards the allowable elapsed time between damage and assertion of claim.[227]

The dispute settlement system offered by the Convention amounts to the setting up of a Claims Commission following quite detailed provisions outlining constitution of the Commission, default and back-up procedures for composing the Commission and other procedural matters.[228] Essentially, this system is very much similar to standard international arbitration procedures, except for the absence of binding force of a decision unless both parties in advance agree otherwise.[229] This presented one of the

[226] See Arts. IX and XIV respectively, Liability Convention, *supra* n. 40. See further Smith & Kerrest de Rozavel, *supra* n. 78, 159–61; 178–80; Hurwitz, *supra* n. 78, 50–5; Cheng, *supra* n. 1, 344–5; Lyall & Larsen, *supra* n. 2, 110–2.

[227] See Art. X, Liability Convention, *supra* n. 40, notably taking into account that the moment of reasonable identification of damage and liable state(s) may differ considerably from the moment of actual occurrence of the damage. *Cf.* Smith & Kerrest de Rozavel, *supra* n. 78, 162–5; Hurwitz, *supra* n. 78, 51–2; Cheng, *supra* n. 1, 345; Lyall & Larsen, *supra* n. 2, 111; G.M. Goh, *Dispute Settlement in International Space Law* (2007), 36–7.

[228] See Arts. XV–XX, Liability Convention, *supra* n. 40. Further in detail Smith & Kerrest de Rozavel, *supra* n. 78, 181–93; F. Tronchetti, L.J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 194–9; Hurwitz, *supra* n. 78, 55–62; Cheng, *supra* n. 1, 346–54; Goh, *supra* n. 227, 33–9; Kayser, *supra* n. 86, 55–8; Lyall & Larsen, *supra* n. 2, 112–3.

[229] See Art. XIX(2), Liability Convention, *supra* n. 40, which of course phrases this the other way around, but the essence is nevertheless that an unwilling party can dodge any legally binding decision at its own discretion. *Cf.*

reasons for the Permanent Court of Arbitration to initiate the development of a specific optional arbitration regime for outer space activities.[230]

2.3.3.8 Partisanship of international intergovernmental organizations

The last element of major importance in the Convention concerns the possibility, even more explicit than in the Rescue Agreement, for international intergovernmental organizations to become *de facto* parties to the Convention, following an explicit declaration and presuming a majority of members of the organization are party to both the Convention itself and the Outer Space Treaty.[231] So far, ESA, EUTELSAT (under its old intergovernmental status, yet maintained under its new 'constitution'[232]) and EUMETSAT have deposited such a Declaration.[233]

Such 'partisanship' remains essentially secondary however. Firstly, it does not pertain to procedural rights in terms, for example, of amendments or withdrawal.[234] Secondly, were the organization to be held liable as a 'launching State' for the purposes of the Convention, after six months claimant states would automatically be entitled to address individual member states if no satisfactory solution had been found.[235] Thirdly, vice versa, an international organization is not entitled to bring a claim itself under the Convention where it suffered damage; it depends on one or more of its member states to do so.[236]

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also e.g. Goh, *supra* n. 227, 32–3, 35; Hurwitz, *supra* n. 78, 59–61; Tronchetti, Smith & Kerrest de Rozavel, *supra* n. 228, 194–7; Cheng, *supra* n. 1, 351–4; Lyall & Larsen, *supra* n. 2, 113. See further on dispute settlement *infra*, § 19.1.3.

[230] This concerns the Rules on Outer Space Disputes; see further *infra*, § 19.3.

[231] See Art. XXII(1), Liability Convention, *supra* n. 40; further *in extenso* on Art. XXII Cheng, *supra* n. 1, 310–20; also Hurwitz, *supra* n. 78, 70–4; Kerrest de Rozavel, *supra* n. 97, 260–1; Tronchetti, Smith & Kerrest de Rozavel, *supra* n. 228, 202–6; Lyall & Larsen, *supra* n. 2, 112.

[232] See on the privatization of this particular public international satellite operator *infra*, § 5.2.6.

[233] See Status of International Agreements relating to activities in outer space as at 1 January 2013, A/AC.105/C.2/2013/CRP.5, of 28 March 2013, p. 10.

[234] *Cf.* Art. XXII in conjunction with Arts. XXV & XXVII, Liability Convention, *supra* n. 40. See further e.g. Tronchetti, Smith & Kerrest de Rozavel, *supra* n. 228, 213–4, 218–20; Hurwitz, *supra* n. 78, 76–7.

[235] *Cf.* Art. XXII(3), Liability Convention, *supra* n. 40. See in particular Cheng, *supra* n. 1, 317–20; Tronchetti, Smith & Kerrest de Rozavel, *supra* n. 228, 205–6.

[236] See Art. XXII(4), Liability Convention, *supra* n. 40. *Cf.* e.g. Cheng, *supra* n. 1, 318–9; Goh, *supra* n. 227, 36.

2.3.3.9 Application of the Liability Convention

Fortunately, so far no cases have arisen whereby space objects have caused substantial death and destruction on the ground calling for settlement of liability under the Liability Convention's terms, whilst the (by now) numerous minor and several major in-space collisions for various reasons have not given rise to formal invocation of the Convention either.[237] It is essentially a matter of semantics, therefore, whether the Liability Convention has been applied in practice at least once or not – with reference to a famous incident in 1978.

In that year the Soviet nuclear-powered satellite Cosmos-954 re-entered the atmosphere over Canada, spreading small pieces of radioactive debris over a large part of essentially uninhabited areas of the latter country. The discussions between the two states on the liability of the Soviet Union, and in particular on the extent of the compensation due, resulted in a bilateral settlement whereby the Soviet Union ex gratia and without formally acknowledging liability paid some 3 million Canadian dollars in final settlement of the claim.[238]

On the one hand one can state that, since the Liability Convention was not referred to in the document of final settlement, and neither had a Claims Commission been set up as the judicial settlement system offered by the Convention, this claim was settled *outside* of, and *without* any invocation or implication of the Convention.

On the other hand, by contrast, one can point out that not only did the Canadian claim explicitly refer to the Liability Convention, but that in addition Articles IX and XIV of the Liability Convention refer to diplomatic negotiations, which need to be unsuccessful for a year before the dispute settlement system offered by Articles XIV through XX can actually be activated – therefore concluding that the Liability Convention to that extent *was* applied.[239] At the very least, it seems that the

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[237] *Cf.* e.g. Lyall & Larsen, *supra* n. 2, 116–20; Cheng, *supra* n. 1, 286–8; Smith & Kerrest de Rozavel, *supra* n. 78, 222–3.

[238] *Cf.* Protocol Between the Government of Canada and the Government of the Union of Soviet Socialist Republics, done 2 April 1981, entered into force 2 April 1981; 20 ILM 689 (1981); *Space Law – Basic Legal Documents*, A.IX.2.2.2. See in more detail Hurwitz, *supra* n. 78, 113–40; also B.A. Hurwitz, Reflections on the Cosmos 954 Incident, *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 350–3; Viikari, *supra* n. 54, 40, 45–8; Lyall & Larsen, *supra* n. 2, 117–8; Christol, *supra* n. 31, 178–80; Christol, *supra* n. 34, 205–7; K.H. Böckstiegel, Case Law on Space Activities, in *Space Law – Development and Scope* (Ed. N. Jasentuliyana) (1992), 206.

[239] For the Statement of Claim by Canada, see *Space Law – Basic Legal Documents*, A.IX.2.2.

Convention served as a stick behind the door for Canada to entice the Soviet Union to take the claim seriously, as otherwise the dispute settlement procedure might have been invoked, which would have been rather embarrassing for the world's first space power.

2.3.4 The Registration Convention

Almost nine years after entry into force of the Outer Space Treaty, the Registration Convention[240] came to pass as the third element of the aforementioned package deal, further to the provisions of the earlier treaty, which had posited the concept of registration and linked it to jurisdiction and control, but not further specified the details of either:

> A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.[241]

In addition, the Outer Space Treaty made reference to obligations to return stranded astronauts to the 'State of registry of their space vehicle'.[242] In elaborating these provisions of Articles VIII and V respectively of the Outer Space Treaty, the Registration Convention realized two sets of substantive obligations.

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[240] See on the Registration Convention, *supra* n. 41, in general e.g. B. Schmidt-Tedd *et al.*, The 1975 Convention on Registration of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 227–324; Christol, *supra* n. 31, 213–45; Lyall & Larsen, *supra* n. 2, 84–96; A.A. Cocca, Registration of Space Objects, in *Manual on Space Law* (Eds. N. Jasentuliyana & R.S.K. Lee) Vol. I (1979), 173–93; Kopal, *supra* n. 210, 372–85; Y. Lee, *supra* n. 44, 42–4.

[241] Art. VIII, Outer Space Treaty, *supra* n. 1. See Jasentuliyana, *supra* n. 1, 204–5 (pointing out that 'jurisdiction, control and ownership over space objects are permanent'); Art. VIII, Outer Space Treaty; Schmidt-Tedd & Mick, *supra* n. 167, 146–68; Dembling & Arons, *supra* n. 67, 439–40; Cheng, *supra* n. 1, 231–3; Lachs, *supra* n. 1, 66–9.

[242] Art. V, Outer Space Treaty, *supra* n. 1; *cf.* also von der Dunk & Goh, *supra* n. 185, 94–102.

2.3.4.1 The national register

On the one hand, the Convention requires states to establish a national register in which to register any space objects for which they qualified as the launching state.[243] The 'launching State' is defined in identical terms as in the Liability Convention.[244] The state of registry then has to inform the UN Secretary-General of the establishment of such a national register, of which otherwise the contents and conditions are at the discretion of the state concerned.[245]

In cases where two or more states qualify as a launching state, those states 'shall jointly determine which one of them shall register the object', and this 'without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof'.[246] In other words: a state of registry is always also liable under the Liability Convention, whereas the opposite is not necessarily true.

A point which has recently raised questions in view of impending commercial sub-orbital hops, not making it into orbit but at least briefly entering what is commonly perceived to be 'outer space', is the focus on space objects 'launched into Earth orbit or beyond' – as (presumably) different from, for example, 'launched into outer space'.[247] Also, the aim to use sub-orbital vehicles for dozens, perhaps hundreds, of individual flights raises issues following the focus of the registration system on registration of space objects as opposed to individual spaceflights. Any single sub-orbital vehicle may now amass many hours in space (that is, above 100 km) even if any single flight accounts for only a few minutes.

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243 *Cf.* Art. II(1), Registration Convention, *supra* n. 41. On Art. II as such see further Schmidt-Tedd *et al.*, *supra* n. 240, 249–97; Cocca, *supra* n. 240, 180–1; Lyall & Larsen, *supra* n. 2, 86–7; Cheng, *supra* n. 1, 484–5, 626–30.

244 See Art. I(a), Registration Convention, *supra* n. 41; further B. Schmidt-Tedd, The 1975 Convention on Registration of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 244–7; Cocca, *supra* n. 240, 180.

245 See Art. II(1) and (3) respectively, Registration Convention, *supra* n. 41. In practice, it makes a lot of sense for such states to, as a minimum, include in the contents the parameters which the Convention prescribes for the international register; see Art. IV(1); further *infra*, § 2.3.4.2.

246 Art. II(2), Registration Convention, *supra* n. 41. See further Christol, *supra* n. 31, 228; Lyall & Larsen, *supra* n. 2, 86–7; Schmidt-Tedd *et al.*, *supra* n. 240, 255–9.

247 See on this *in extenso* esp. von der Dunk, *supra* n. 142, 271–80; further e.g. Hobe, *supra* n. 137, 446–8; Gerhard, *supra* n. 137, 282–3; Soucek, *supra* n. 5, 349; Schmidt-Tedd & Mick, *supra* n. 167, 151; Kopal, *supra* n. 210, 377.

Moreover, once such flights metamorphose into sub-orbital transportation, for example from New York to Tokyo, that parameters would change fundamentally as well.[248]

Confusion further arose as a consequence of the phrasing used. 'Sub-orbital' is a technical/operational criterion of not achieving a full orbit around the earth,[249] but has often been perceived, as a consequence of 'sub' meaning 'below', as a 'geographical', 'spatial' one, as synonymous with 'not reaching outer space'.[250] Whilst 'Earth orbit' also refers to a technical/operational criterion (of completing at least one orbit around the earth), the reference to 'beyond' in Article II of the Registration Convention can only mean it actually is to be seen as a 'geographical', 'spatial' criterion. 'Beyond Earth orbit' makes sense only if it refers to an area beyond wherever 'Earth orbit' itself refers to. Hence 'into Earth orbit and beyond' would best be equated after all with 'outer space' as an area, noting also the above discussion on the 'lowest perigee rule' and the convergence of opinion on a 100 km-altitude boundary.[251]

What little practice has taken place so far in the context of flights not achieving a full orbit around the earth has concerned 'one-off' sounding rockets, 'one-off' deep space probes and 'one-off' missiles for military purposes. This gives rise to the assumption that whilst *such* sub-orbital flights perhaps indeed would *not* need to be registered under the

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248 See further *infra*, e.g. § 12.3.2.1.

249 It should be noted that using the term 'non-orbital' instead of 'sub-orbital', when that is what is actually meant, would have allowed for much more clarity on this point. Freeland, *supra* n. 77, 20, for such example defines 'sub-orbital spaceflight' as 'spaceflights in which orbital velocities are not achieved'; yet e.g. deep space flights which can go millions of miles out do not complete an orbit around the earth yet have escape velocities hugely exceeding those necessary for achieving orbit.

250 *Cf.* e.g. Sec. 1, *sub* 10th bullet, South African Space Affairs Act, *supra* n. 161; which defines 'launching' in a manner setting off 'a sub-orbital trajectory' against 'into outer space'; see http://en.wikipedia.org/wiki/Sub-orbital_spaceflight, last accessed 6 January 2014. Conversely, it has also been equated with *reaching* outer space (alternatively or expressly phrased as achieving an altitude of 100 km) but without achieving a full orbit around the earth; *cf.* the US case, applying the Commercial Space Launch Act to private sub-orbital flight because it constitutes *space*flight, *cf.* Sections 50902(4) & (13), 50904(a), 50905, 50906, 51 U.S.C. 509; see further von der Dunk, *supra* n. 142, esp. 287–9, further 303–15; also e.g. Kleiman, Lamie & Carminati, *supra* n. 1, 83–6; Hobe, *supra* n. 137, 444–6.

251 *Cf. supra*, § 2.3.1.3. See for a more detailed argumentation already von der Dunk, *supra* n. 142, 322–5; also Nase, *supra* n. 125, 762–4; Chatzipanagiotis, *supra* n. 150, 21; *cf.* further Reinhardt, *supra* n. 125, 115–6.

Convention's system, there is nothing inherent in that system excluding registration of such space objects, as long as they reach a certain altitude labelled 'Earth orbit or beyond'. With sub-orbital vehicles presumably soon hopping in and out of the lower realms of outer space on an increasingly frequent basis and next perhaps for increasing stretches of time, it might well be appropriate to actually apply the Registration Convention to such flights.[252]

2.3.4.2 The international register

On the other hand, the Registration Convention provides for the establishment of an international register under the auspices of the UN Secretary-General.[253] The register also happens to encompass information provided to the United Nations under the – formally non-binding – UN Resolution calling upon states to register and provide information on registered space objects, Resolution 1721(XVI)B.[254]

The Convention then, firstly, provides for a minimum set of data to be provided on each space object launched, as follows: '(a) Name of launching State or States; (b) An appropriate designator of the space object or its registration number; (c) Date and territory or location of launch; (d) Basic orbital parameters, including: (i) Nodal period; (ii) Inclination; (iii) Apogee; (iv) Perigee; [and] (e) General function of the space object'.[255] Whilst in itself a binding obligation, the qualification 'as soon as practicable' has unfortunately opened the door to a considerable, presumably even increasing, measure of non-registration.[256]

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[252] So esp. von der Dunk, *supra* n. 142, 334–40.

[253] See Art. III, Registration Convention, *supra* n. 41. The UN Secretary-General has delegated these responsibilities to the Vienna-based Office for Outer Space Affairs (OOSA), where it is electronically accessible at www.unoosa.org/oosa/en/SORegister/index.html, last accessed 12 April 2014; see e.g. Lyall & Larsen, *supra* n. 2, 89. Further Schmidt-Tedd, *supra* n. 244, 298–9; Christol, *supra* n. 31, 232 ff.; Cocca, *supra* n. 240, 181.

[254] See *supra*, § 2.2.1.1, incl. n. 35.

[255] Art. IV(1), Registration Convention, *supra* n. 41. See esp. Christol, *supra* n. 31, 232; also more generally on Art. IV: B. Schmidt-Tedd, N. Malysheva & O. Stelmakh, The 1975 Convention on Registration of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 300–4; Lyall & Larsen, *supra* n. 2, 87–8; Cocca, *supra* n. 240, 181–4.

[256] See Christol, *supra* n. 31, 235–9; Y. Lee, *supra* n. 44, 43–4, 50; Schmidt-Tedd *et al.*, *supra* n. 240, 261–2; Kopal, *supra* n. 210, 380–1; also Lyall & Larsen, *supra* n. 2, 93–6.

Secondly, the suggestion is made for states to, 'from time to time', provide 'additional information concerning a space object carried' on the national register.[257] Similarly, '[e]ach State of registry shall notify the Secretary-General of the United Nations, to the greatest extent feasible and as soon as practicable, of space objects concerning which it has previously transmitted information, and which have been but no longer are in Earth orbit'.[258]

The 'failure' to register of many states on many occasions, as well as the various legal loopholes in the registration obligation, gives rise to the conclusion that the current system is far from comprehensive and transparent, for example in comparison to the international system of registration of aircraft – and hence has led to some attempts to ameliorate the application of the Registration Convention.[259] Once again, the issue may be forced by the impending arrival of private commercial spaceflights, in particular by the extent these would turn out to be governed by this regime of space law.[260]

2.3.4.3 Remaining key provisions

Some back-up duties are provided, notably concerning support for identification of space objects of potentially hazardous or deleterious character by using existing tracking and monitoring facilities, noting that the majority of states do not have the technological and/or financial capabilities to undertake such tracking and monitoring themselves.[261] This clause also, beyond the identical definition of 'launching State' of the Registration Convention and the Liability Convention respectively, reflects the general intention of the two conventions to maximize identification of launching states for liability purposes.

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[257] Art. IV(2), Registration Convention, *supra* n. 41. With a view to state practice, this may in particular refer to information on private owners and operators of the space objects involved, changes in orbital parameters or geo-stationary slot occupied or even change of actual jurisdiction over the satellite, in spite of the *de jure* absence of a possibility of re-registration; see e.g. Lyall & Larsen, *supra* n. 2, 92–3. *Cf.* further Christol, *supra* n. 31, 235–6; more in general on Art. IV(2) e.g. Schmidt-Tedd, Malysheva & Stelmakh, *supra* n. 255, 302–3.

[258] Art. IV(3), Registration Convention, *supra* n. 41.

[259] See further *infra*, § 2.3.6.

[260] See further *infra*, Chapter 12.

[261] See Art. VI, Registration Convention, *supra* n. 41; further Schmidt-Tedd, Malysheva & Stelmakh, *supra* n. 255, 307–9; Lyall & Larsen, *supra* n. 2, 89–90; Cocca, *supra* n. 240, 186.

Finally, the Registration Convention has a clause almost identical to that of the Liability Convention in allowing intergovernmental organizations to become *de jure* bearers of rights and duties under the Convention, read become *de facto* parties to it.[262] Again, ESA and EUMETSAT have so far done so.[263]

2.3.5 The Moon Agreement

The Moon Agreement[264] was supposed to elaborate the Outer Space Treaty's regime in particular with respect to the celestial bodies such as the moon at a time when resource utilization and exploitation seemed imminent. Any high-level analysis of the Agreement, further to its aforementioned unfortunate pivotal role in space law-making in the international arena due to its very limited number of states parties, has to be undertaken in two distinct parts.[265]

2.3.5.1 The non-controversial parts – elaborating the Outer Space Treaty

The non-controversial part of the Moon Agreement, in size representing the larger part, essentially reiterates the general rules and principles enshrined in the Outer Space Treaty for the specific context of the moon and other celestial bodies whilst refining them for the specific purposes.

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[262] See Art. VII, Registration Convention, *supra* n. 41; further Lyall & Larsen, *supra* n. 2, 90–1; U. Bohlmann, The 1975 Convention on Registration of Objects Launched into Outer Space, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 310–4; Cocca, *supra* n. 240, 187.

[263] See Status of International Agreements relating to activities in outer space as at 1 January 2013, A/AC.105/C.2/2013/CRP.5, of 28 March 2013, p. 10.

[264] See on the Moon Agreement, *supra* n. 46, in general e.g. S. Hobe *et al.*, The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 325–426; Cheng, *supra* n. 1, 357–80; Christol, *supra* n. 31, 246–363; Tronchetti, *supra* n. 47, 38–61; Jasentuliyana, *supra* n. 1, 224–49; H. Bashor, Interpretation of the Moon Treaty: Recourse to Working Papers and Related International Documents, 32 *Annals of Air and Space Law* (2007), 149–200; C.Q. Christol, The 1979 Moon Agreement: Where is it Today?, 27 *Journal of Space Law* (1999), 1–33; Lyall & Larsen, *supra* n. 2, 181–97; *cf.* also Matte, *supra* n. 107, 253–82; Doyle, *supra* n. 77, 316–24.

[265] As the main contribution of the Moon Agreement, *supra* n. 46, to international space law concerns the 'common heritage of mankind' concept, the substance thereof will – beyond a brief overview below – be discussed *infra*, see esp. § 14.4.2.2.

Thus, the Moon Agreement reiterated the Outer Space Treaty's references to the 'global commons' character of celestial bodies as part of the global commons of outer space and its characterization as 'province of all mankind', here specified as applying to the exploration and use.[266] Article 1, however, does allow for the option to develop specific rules for celestial bodies in the solar system other than the moon, and *ipso facto* excludes 'extraterrestrial materials which reach the surface of the Earth by natural means', the latter being relevant in the case of asteroids and other Near-Earth Objects (NEOs).[267]

Also, the Moon Agreement essentially repeats the Outer Space Treaty's references to the general application of international law including the UN Charter, the use of celestial bodies for exclusively peaceful purposes (made slightly more explicit), the need for international cooperation and exchange of information, the (slightly elaborated) obligations to assist astronauts, jurisdiction and control over personnel and space objects, international responsibility and international liability (to be yet further elaborated by a future agreement), and open access to areas of the moon as well as installations and stations thereon (again made slightly more explicit).[268] Finally, also the Moon Agreement allows for intergovernmental organizations to become *de facto* parties to its regime.[269]

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[266] See Arts. 4, 6, 8, 9, Moon Agreement, *supra* n. 46, incl. specifics such as the establishment of manned stations; also the Preamble, explicitly referring to the Outer Space Treaty, *supra* n. 1. *Cf.* also Art. 11(2), (3), Moon Agreement; referenced in the context of, yet juxtaposed to, the 'common heritage of mankind' principle, this essentially refers to the 'global commons' character of outer space. See further e.g. S. Hobe & F. Tronchetti, The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 364–6; S.R. Freeland, The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 372–84.

[267] Art. 1(1), and (3) respectively, Moon Agreement, *supra* n. 46. The latter clause raises the issue of a dividing line between a celestial body such as the moon, presumably being a body of rock of a certain minimum size, and NEOs which below that size would qualify as 'extraterrestrial material' rather than as a celestial body. See e.g. Lyall & Larsen, *supra* n. 2, 175–7; Hobe & Tronchetti, *supra* n. 266, 352–4; Matte, *supra* n. 107, 258.

[268] See Arts. 2, 3, 10, 12, 15 respectively, Moon Agreement, *supra* n. 46. Further e.g. Hobe *et al.*, *supra* n. 264, 355–63, 385–7, 400–2, 407–10; Cheng, *supra* n. 1, 367–71.

[269] See Art. 16, Moon Agreement, *supra* n. 46. So far no international organization has done so; *cf.* Status of International Agreements relating to

2.3.5.2 The controversial part – the 'common heritage of mankind'

The controversial part of the Moon Agreement solely concerns the issue of potential (commercial) exploitation of lunar and celestial bodies' resources, reflected by the concept of the 'common heritage of mankind'.[270] The Moon Agreement failed to achieve any significant measure of ratification precisely because of the general unease of most major spacefaring states regarding a system requiring those investing enormous sums for exploitation somehow to share technologies used for and proceeds from such activities with every state so interested without further ado, which was presumed to apply by the reference to this concept.[271]

The concept is applied to the moon and other celestial bodies by virtue of Article 11(1), but not as such elaborated much by the Moon Agreement itself, other than by way of a heightened focus on environmental concerns.[272] The remainder of Article 11 itself only *suggested* such an elaboration, but the Agreement also calls for review conferences, presumably to shape such elaboration,[273] whereas more specifically 'States Parties to this Agreement hereby undertake to establish an international regime, including

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activities in outer space as at 1 January 2013, A/AC.105/C.2/2013/CRP.5, of 28 March 2013, p. 10. *Cf.* further e.g. Freeland, *supra* n. 266, 411–3.

[270] Note already the dichotomy established by the Moon Agreement, *supra* n. 46, stating that '[t]he *exploration and use* of the Moon shall be the *province of all mankind*' (Art. 4(1) (emphasis added)) whilst '[t]he Moon and its natural resources are the *common heritage of mankind*, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article' (Art. 11(1) (emphasis added)) and the latter paragraph details that the international regime to be established should 'govern the *exploitation* of the natural resources of the Moon' (Art. 11(5) (emphasis added)). See for an extended analysis of the issue of exploitation of celestial resources *infra*, Chapter 14.

[271] *Cf.* Viikari, *supra* n. 47, esp. 68–72; 73–8, on the 1994 New York Agreement (Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, New York, done 28 July 1994, entered into force 28 July 1996; 1836 UNTS 3; 33 ILM 1309 (1994); UKTS 1999 No. 82; Cm. 2705; ATS 1994 No. 32), which salvaged the Convention by fundamentally diluting those aspects unacceptable to many developed states; further e.g. Malanczuk, *Akehurst*, *supra* n. 1, 173–5; Lyall & Larsen, *supra* n. 2, 196.

[272] See Art. 7, Moon Agreement, *supra* n. 46; further e.g. Freeland, *supra* n. 266, 372–7.

[273] *Cf.* Art. 18, Moon Agreement, *supra* n. 46; however, such a review conference has never taken place. See further Freeland, *supra* n. 266, 415–6; Cheng, *supra* n. 1, 373–4; also Christol, *supra* n. 34, 403–26, on the background.

appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible'.[274]

These suggestions are phrased as 'the main purposes of the international regime to be established', which then

> shall include:
>
> (a) The orderly and safe development of the natural resources of the Moon;
> (b) The rational management of those resources;
> (c) The expansion of opportunities in the use of those resources;
> (d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration.[275]

Whilst the first three elements could be considered non-controversial, the fourth one turned out to be prohibitive with respect to widespread signature and ratification in particular by the major spacefaring states – mainly because in the context of the law of the sea the very same principle had indeed given rise to a rather detailed system calling for mandatory benefit-sharing and mandatory transfer of technology also with non-contributing states.[276]

Further confusion, however, is created by the clause of the Moon Agreement stipulating that '[n]either the surface nor the subsurface of the Moon, nor any part thereof or natural resources *in place*, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural

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[274] Art. 11(5), Moon Agreement, *supra* n. 46, making furthermore specific reference to Art. 18. *Cf.* R.S. Jakhu *et al.*, The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 396–7; Cheng, *supra* n. 1, 365–7; *in extenso* Christol, *supra* n. 31, 342–63, and at 364–434 even discussing in great detail what such a future regime should look like.

[275] Art. 11(7), Moon Agreement, *supra* n. 46; further e.g. Jakhu *et al.*, *supra* n. 274, 397–9.

[276] See Arts. 133–191, United Nations Convention on the Law of the Sea, *supra* n. 15; *cf.* e.g. Jasentuliyana, *supra* n. 1, 39; Christol, *supra* n. 34, 341–8. Further von der Dunk, *supra* n. 47, 98–105; also Tronchetti, *supra* n. 47, 56–61, esp. 116–23; Viikari, *supra* n. 47, 52 ff.; S. Hobe, *supra* n. 47, esp. 125; Christol, *supra* n. 31, e.g. 315–24; Cheng, *supra* n. 1, 374–80; further *infra*, § 14.5.

person'.[277] *A contrario*, at least resources once extracted should be deemed to be subject to (private or other) appropriation.[278]

The result of these various complicated, sometimes contradictory provisions as well as the broad lack of success of the Moon Agreement (as compared to the United Nations Convention on the Law of the Sea, which currently has 165 states parties, since the 1994 New York Agreement including a number of developed states as well[279]) is a large measure of uncertainty about the legal status of the moon and activities envisaged there – which currently range from actual mining to Google-prize-driven robotic activities. The temptation for individual states to act unilaterally in the legal context, for example to license certain such activities or to try and protect historical sites such as those of the manned moon landings, is commensurately sizable, even as a lack of common global understanding on the legal status of the moon, certain areas thereof and minerals once extracted may give also *bona fide* entrepreneurs second thoughts about investing.

2.3.6 The Work in COPUOS Beyond the Five Space Treaties

As discussed, the Moon Agreement heralded the end of an era of space law-making where it was possible to arrive at treaties of more or less global acceptance and application. The growing number and, more importantly, diversity of member states of COPUOS, reflective of a similar expansion of nations interested and active in space activities as such, may have been largely responsible for this turn of events, in combination also with the phasing out of the bipolar world of the Cold War with the demise of the Soviet Union in 1991.

This did not mean that COPUOS lost its relevance as a breeding ground for space law developments – rather, that henceforth these developments took on the character of working with the existing legal regime to discuss and, where possible, refine that regime on an ongoing basis.

This occurred largely by way of authoritative further UN resolutions. The Resolutions mentioned earlier on direct broadcasting by satellite, satellite remote sensing, the use of nuclear power sources, the Benefits Declaration and the Resolution on space debris mitigation provide the

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277 Art. 11(3), Moon Agreement, *supra* n. 46 (emphasis added).

278 See e.g. Cheng, *supra* n. 1, 369; Kleiman, Lamie & Carminati, *supra* n. 1, 226–7; more carefully Lyall & Larsen, *supra* n. 2, 185.

279 See www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm, last accessed 6 January 2014.

most visible examples thereof.[280] In particular the Resolutions meeting with consensus, such as the one on remote sensing, offer a clear prospect for their contents to become binding by way of customary international law, for others that can only be hoped for.

Most interesting from this perspective is the 2007 Resolution endorsing the Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space.[281] What started out as a space agency-level voluntary commitment between most of the major governmental satellite operators was elevated to a higher political level by their recognition through the UN Resolution, even as it remained legally non-binding at that stage.[282] As of today, increasingly major spacefaring states are using those same, internationally-speaking still voluntary guidelines as key elements of licensing schemes in a domestic context, thereby transforming them to binding ('hard') law at a national level.[283] Soon, it will become difficult as a consequence at least for those

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[280] See *supra*, § 2.2.1.3. The substance of those regimes is dealt with in greater detail *infra* in various chapters throughout the book: respectively in Chapter 8 on satellite communications, in Chapter 9 on satellite remote sensing, in Chapter 13 on environmental aspects, in Chapter 5 on international cooperation at least in the context of intergovernmental organizations and again in Chapter 13 on environmental aspects.

[281] See also *supra*, nn. 56, 57. See for a lucid overview also Viikari, *supra* n. 54, 93–102.

[282] See specifically on the 2007 Resolution W. Balogh, The Role of Binding and Non-Binding Norms in the Implementation of Small Satellite Programmes, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 325–42; more generally the extended discussions on the issue of 'soft law' in the context of outer space and space law in S. Aoki, The Function of 'Soft Law' in the Development of International Space Law, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 57–85; M. Ferrazzani, Soft Law in Space Activities – An Updated View, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 99–117.

[283] *Cf.* also Viikari, *supra* n. 54, 106–11 (esp. on licensing by the US FCC); R. Tremayne-Smith, Environmental Protection and Space Debris Issues in the Context of Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 179–88 (esp. on licensing in the UK case); S. Mosteshar, Regulation of Space Activities in the United Kingdom, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 361 (also on the UK case); P. Achilleas, Regulation of Space Activities in France, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 111 (on the case of France); more generally Lyall & Larsen, *supra* n. 2, 301–11; Kleiman, Lamie & Carminati, *supra* n. 1, 218–21. Also *infra*, § 3.2.1.

states to deny state practice and *opinio juris* having given rise to a customary legal obligation to that extent.[284]

Other interesting recent resolutions drafted pertain to clarifying the concept of the 'launching State' in order *inter alia* to promote the further enunciation of national space laws and licensing regimes dealing with private space activities,[285] to establish the UN SPIDER programme,[286] and to generally improve effectiveness of the Registration Convention by voluntarily providing more information for the purpose of the international register with OOSA than is legally required under that Convention.[287]

Finally, COPUOS and its two subcommittees, notably from the present perspective the Legal Sub-Committee, continue to provide an ongoing platform for discussion and exchange of opinion as well as information – for example concerning the growing needs for, and establishment of, national regulation and legislation of private space activities.[288] And even if the aforementioned Russo-Chinese Draft PPWT Treaty stands little chance of being broadly adopted, the discussions on the key issue of maintaining outer space as much as possible as a realm remaining outside of military conflict provide many less tangible results in terms of mutual understanding and appreciation. Many of those results may not be binding legally speaking, but nevertheless serve as important guides for states and other actors on the appropriate manner of conducting activities in outer space within the boundaries set by the outer space treaties.

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[284] *Cf. infra*, § 13.3.2.1, 2, also § 5.9.2.

[285] This concerns Resolution A/RES/59/115, of 10 December 2004, Application of the concept of the 'launching State'. *Cf.* K.U. Schrogl, The Launching State and the Registration Practice Resolutions as 'Kick Off' for a New Phase in Space (Soft) Law Development, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 195–203.

[286] This concerns Resolution A/RES/61/110, of 14 December 2006, United Nations Platform for Space-based Information for Disaster Management and Emergency Response. *Cf.* e.g. Lyall & Larsen, *supra* n. 2, 436.

[287] This concerns Resolution A/RES/62/101, of 17 December 2007, Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects. *Cf.* also Schrogl, *supra* n. 285, 195–203.

[288] See e.g. the work done on this issue by a working group of the COPUOS Legal Sub-Committee, I. Marboe, National Space Legislation – The Work of the Legal Subcommittee of UNCOPUOS 2008–2011, in *Proceedings of the International Institute of Space Law 2011* (2012), 101–6; *cf.* also e.g. Marboe & Hafner, *supra* n. 210, 29–71; von der Dunk, *Private Enterprise*, *supra* n. 67, 1–163; further *infra*, Chapter 3.

2.4 BEYOND THE CORE OF INTERNATIONAL SPACE LAW

2.4.1 The Fourth Phase: Space Law *Lato Sensu*

The changing role of COPUOS over the last few decades in terms of law-making and codification is closely related to the 'fourth phase' of space law already alluded to – which essentially boils down to moving beyond the core of the *corpus* discussed above, substantially changing its remit and occasionally even threatening its relevance, both in legal theory and in practice.

The fourth phase is, in short, where space activities started moving away from their pure Cold War-era, government-focused, politico-military and scientific origins – and took space law along with them. The latter started to encompass, firstly, more focused regimes on specific ventures or sectors, and, secondly, broadened even further as a consequence of increasing practical applications of a terrestrial nature, where space to a certain extent became a tangential yet still indispensable element of a much longer chain.[289]

The result was an overall lessening of the coherence of all international law relevant to space; and as a consequence, space law as of today should for comprehensiveness' sake not be taken to refer only to those global treaties, resolutions and other legal, para-legal or soft-law developments which principally originated from the bosom of COPUOS, or more precisely from the cooperation between most, if not all, of the major spacefaring states in that context.

As the first part of the process can be said to have started to some extent already in the late 1960s, overlapping the second, 'golden' phase of space law-making, the fourth phase could also be labelled a fourth 'layer', but it is especially in recent decades that it has been slowly yet visibly outgrowing the processes and results of the third phase, at least in terms of practical relevance – leading to increasing debates also about the viability of COPUOS as the central platform for developing international space law.[290]

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[289] An excellent illustration concerns satellite communications, where satellites from a 'bottom-up', applications-oriented approach are but one potential technical element in a network, if commercial business or other practical interests so dictate, easily discarded in favour of terrestrial wireless, cable or optical fibre networks – and satellite communications to that extent are regulated as a subset of telecommunications at large.

[290] *Cf.* e.g. von der Dunk, *supra* n. 32, 409–14.

The first three phases all had in common that states were the dominant, often exclusive, actors in outer space, and that the space law regime developed by those states all aimed – at least in principle – at establishing globally applicable rules, whether legally binding as per treaties or by way of UN Resolutions and other developments to the extent giving rise to customary international law.[291]

By contrast the fourth phase was ushered in with the advent of a few international organizations of an operational character, that is not only pooling quasi-regulatory resources but especially financial and technical resources, being established as of the early 1970s,[292] and broadened with the involvement of private entities interested in the potential commercial benefits that space activities could bring to certain terrestrial applications[293] – at first largely in the same area of telecommunications where those first few international organizations had also made their entry.[294]

Space law *lato sensu* now gradually came to encompass a number of other legal regimes, which may be summarily categorized, in more or less descending order as regards visibility and direct impact on international space law, as (1) the constitutions of, and further regulation and customary law developed within, international space organizations; (2) the specific regimes developed for specific major space projects, on an essentially ad hoc basis; (3) multilateral and bilateral agreements representing an effort to address a specific realm within space activities by a number of more like-minded states; (4) a whole range of bilateral agreements, ranging from ground station hosting arrangements to longer-term cooperation; and (5) an even much larger number of regimes developed completely outside of the space realm properly speaking, yet now having a major impact on at least one area of space activities.[295]

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[291] See on this *supra*, § 2.2.1.

[292] See for historical overviews F. Lyall, *Law and Space Telecommunications* (1989), 74–130; Cheng, *supra* n. 1, 511–71; more succinctly Smith, *supra* n. 121.

[293] See e.g. in detail on these developments von der Dunk, *supra* n. 62, 498–515.

[294] See further e.g. Lyall & Larsen, *supra* n. 2, 378–9.

[295] Focusing on treaty law and leaving the more complicated issue of customary international law and soft law out of the picture as far as this overview is concerned, such highly interesting developments as the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, established by the major operators of remote sensing satellite systems, cannot be discussed in the present context; see however Ito, *supra* n. 52, esp. 180 ff., text of the Charter at 317; also *infra*, § 9.4.3.4.

Formally speaking a sixth category, that of national law and regulation, could be added, which though of course by definition not international as such, may have a bearing on, for example, the formation of customary international law as representing state practice and/or *opinio juris*.[296] Beyond that role, this theme will be separately addressed below.[297]

Whilst it is obviously beyond the scope of this chapter to address the substance of all the elements of space law from such a broader perspective – and the most important ones are in any event discussed further below in separate chapters – it is appropriate to at least provide an overview of those in order to shed light on their often complicated relationship to the core *corpus* addressed above.

2.4.2 International Organizations' Special Legal Regimes[298]

2.4.2.1 The international satellite operators

The first proper international operational space organizations INTELSAT[299] and INTERSPUTNIK[300] were constituted in 1971,

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[296] See on the role of national law in the formation of customary international law e.g. Shaw, *supra* n. 1, 72 ff., esp. 82–3; Crawford, *supra* n. 2, 23–7; Malanczuk, *Akehurst*, *supra* n. 1, 39–43.

[297] See *infra*, Chapter 3.

[298] The years mentioned hereunder refer to the year the first constitutive treaty was opened for signature, not to the year of entry into force of such documents. See further on international organizations and their contributions to space law *infra*, Chapter 5, also Chapter 4 for the European organizations specifically.

[299] INTELSAT was established as per the Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 21; TIAS 7532; 23 UST 3813; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 909 (1971); and the Operating Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Operating Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 149; TIAS 7532; 23 UST 4091; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 946 (1971). *Cf.* on INTELSAT prior to privatization further *infra*, § 5.4.1; also esp. Lyall, *supra* n. 292, 74–208; briefly R.S. Jakhu, International Regulation of Satellite Telecommunications, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 92–4; Courteix, *supra* n. 50, 105–6; Cheng, *supra* n. 1, 545–8, 550–63.

[300] INTERSPUTNIK was established as per the Agreement on the Establishment of the 'INTERSPUTNIK' International System and Organization of Space Communications (hereafter INTERSPUTNIK Agreement), Moscow, done 15 November 1971, entered into force 12 July 1972; 862 UNTS 3; TIAS 859 (1973)

followed by ARABSAT[301] and INMARSAT[302] in 1976 and EUTELSAT[303] in 1982.[304] While differing in their focus as to, for example, the provision of fixed satellite, mobile satellite or satellite broadcasting services, they all combined member state resources to develop, launch or have launched, and operate a satellite system (including ground stations) for telecommunication purposes, offering transponder capacity to the member states' national telecom entities.

INTELSAT, INMARSAT and EUTELSAT from the beginning were constituted as hybrid public consortia, with member states through a convention or agreement setting out the general legal parameters for their operation whilst an operation agreement between their respective telecommunication entities took care of the more operationally oriented

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No. 12343; *Space Law – Basic Legal Documents*, C.VIII.1. *Cf.* further *infra*, § 5.7; also Lyall, *supra* n. 292, 296–303; Cheng, *supra* n. 1, 548–50.

301 ARABSAT was established as per the Agreement of the Arab Corporation for Space Communications (ARABSAT) (hereafter ARABSAT Agreement), Cairo, done 14 April 1976, entered into force 15 July 1976; *Space Law – Basic Legal Documents*, C.VII.1; 44 *Telecommunications Journal* (IX/1977), 422. *Cf.* further *infra*, § 5.8; also Lyall, *supra* n. 292, 303–8; Lyall & Larsen, *supra* n. 2, 375–7.

302 INMARSAT was established as per the Convention on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Convention), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 105; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 1052 (1976); and the Operating Agreement on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Operating Agreement), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 213; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 233, 1075 (1976). *Cf.* on INMARSAT prior to privatization further *infra*, § 5.5.1; also esp. Lyall, *supra* n. 292, 209–43; Jakhu, *supra* n. 299, 94–5.

303 EUTELSAT was established as per the Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9069; *Space Law – Basic Legal Documents*, C.II.1; and the Operating Agreement Relating to the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Operating Agreement), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9154; *Space Law – Basic Legal Documents*, C.II.2. *Cf.* on EUTELSAT prior to privatization further *infra*, §§ 4.2.6.2, 5.6.1; also esp. Lyall, *supra* n. 292, 264–95; Jakhu, *supra* n. 299, 95–6; Courteix, *supra* n. 50, 106–7.

304 See for more details on these organizations, their roles and legal regimes *infra*, Chapter 5; and for EUTELSAT also § 4.2.6.2.

aspects of the organization. The three organizations were privatized in the early 2000s, giving rise to private operators Intelsat, Inmarsat and Eutelsat operating to a limited extent under the tutelage of the residual intergovernmental oversight organizations the originally intergovernmental operators had turned into: INTELSAT into the International Telecommunications Satellite Organization ITSO,[305] INMARSAT into the International Mobile Satellite Organization IMSO,[306] and EUTELSAT into EUTELSAT IGO.[307]

Meanwhile, INTERSPUTNIK – originally the communist counterpart to INTELSAT – has also been partly hybridized along the model of the original INTELSAT, INMARSAT and EUTELSAT;[308] while ARABSAT remains a truly classical intergovernmental organization in recognizing only state governments as formal actors within the regime developed in its context.[309]

The constitutive treaties of those organizations most importantly provided for the rights and obligations the member states took upon themselves vis-à-vis the organization itself, its organs and other member states by their very partisanship in that organization, and the governance structure of the organization involving member states in key organs such as General Assemblies and Councils.[310]

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[305] See in detail P.K. McCormick, Intelsat: Pre and Post-Private Equity Ownership, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 81–117; M.J. Mechanick, The Role and Function of Residual International Intergovernmental Satellite Organisations Following Privatisation, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 175–221; also e.g. Lyall & Larsen, *supra* n. 2, 325–43; further *infra*, §§ 5.4.2, 5.10, more generally § 15.4.

[306] See in detail D. Sagar & P.K. McCormick, Inmarsat: In the Forefront of Mobile Satellite Communications, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 35–79; Mechanick, *supra* n. 305, 175–221; also e.g. Lyall & Larsen, *supra* n. 2, 344–55; further *infra*, §§ 5.5.2, 5.10, more generally § 15.4.

[307] See C. Roisse, The Evolution of EUTELSAT: A Challenge Successfully Met, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 119–73; Mechanick, *supra* n. 305, 175–221; also e.g. Lyall & Larsen, *supra* n. 2, 356–64; further *infra*, §§ 5.6.2, 5.10, more generally § 15.4.

[308] See e.g. Lyall & Larsen, *supra* n. 2, 364–75; further *infra*, § 5.7.

[309] See *ibid.*, 375–7; further *infra*, § 5.8.

[310] *Cf.* e.g. Arts. VI(a), VII ('Assembly of Parties'), IX ('Board of Governors'), INTELSAT Agreement, *supra* n. 299; Arts. 9, 10 ('Assembly'), 13 ('Council'), INMARSAT Convention, *supra* n. 302; Arts. VI(a), VII ('Assembly

On the other hand, the cooperative character, aim and spirit of the organizations caused two-thirds majorities to be entitled to amend the constitutive documents, with *all* member states, including any potentially opposing ones, then being bound to those amended versions.[311] This constitutes a deviation from general public international law practice, whereby (usually) amendments to treaties only enter into force for those states parties to the treaties that have *also* ratified the amendments.

Whilst it would be improper to characterize these *modi operandi* without further ado as constituting customary law to which other, non-party states might also be held, those institutional regimes may be viewed as comprising state practice with the attendant *opinio juris* for the states concerned (which certainly in the cases of the three more or less global organizations INTELSAT, INTERSPUTNIK and INMARSAT comprise the major spacefaring nations), in particular where these organizations operated in the same fashion.

Thus, by way of the above the international organizations provide for an exemplary fashion to implement the fundamental principles of making 'use of outer space … for the benefit and in the interest of all countries'[312] and 'in the interest of maintaining international peace and security and promoting international cooperation'.[313] This would notably include the compromise between state equality – reflected for example in 'one state, one vote' procedures in many more sovereignty-related aspects – and commercial practice – whereby those who invest more, harvest more, and those who use the system more, pay more; as reflected in the investment share-system.[314] INTELSAT set the standards in many

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of Parties'), EUTELSAT Convention, *supra* n. 303; Arts. 11(1), 12 ('Board'), INTERSPUTNIK Agreement, *supra* n. 300; Arts. 9, 10 ('General Body'), ARABSAT Agreement, *supra* n. 301. All organizations remained of an essentially intergovernmental character, with competences of the organization and its organs vis-à-vis member states described in quite some detail in the constitutive treaties.

311 See Art. XVII, INTELSAT Agreement, *supra* n. 299 (complicated by adding the requirement of approval covering two-thirds of the investment shares, with an alternative being an 85% majority); Art. 34, INMARSAT Convention, *supra* n. 302; Art. 24, INTERSPUTNIK Agreement, *supra* n. 300; Art. XIX, EUTELSAT Convention, *supra* n. 303; Art. 18, ARABSAT Agreement, *supra* n. 301.

312 Art. I, Outer Space Treaty, *supra* n. 1.

313 Art. III, Outer Space Treaty, *supra* n. 1.

314 See for further details on those *modi operandi* of the international satellite organizations *infra*, §§ 5.4.1, 5.5.2, 5.6.2. On the other hand, elements in those *modi operandi* generally the same amongst these international satellite operators

respects, INMARSAT and EUTELSAT followed suit, and later on even the formerly communist INTERSPUTNIK adapted major elements of the same approach.

2.4.2.2 Two non-satellite communication intergovernmental organizations

Outside of the telecommunications world, only two other truly intergovernmental organizations have been established in the space arena, combining substantial financial and technical resources of the respective sets of member states for the benefit of a continuing joint space programme – both in Europe.[315]

One of those concerns the field of meteorology, where a host of European countries in 1983 established the European Organization of Meteorological Satellites EUMETSAT.[316] EUMETSAT remained a 'traditional' governmental operation: whilst national meteorological services of the member states were the ultimate beneficiaries of the meteorological and climate change data generated by the system, they were not formally represented within the EUMETSAT structure.[317] An interesting feature of EUMETSAT was the concept of 'mandatory programmes', whereby member states were obliged to financially contribute to the baseline space programmes agreed to within the context of the organization.[318]

Whilst all the above intergovernmental organizations focused on one specific area of space activities only – satellite communications and satellite remote sensing – the other European space organization of importance here uniquely covers all substantive space activities, as long

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also became increasingly subject to dispute as time and the global environment for satellite communications started to change; *cf. infra*, § 15.4, also §§ 5.4.2, 5.5.2, 5.6.2.

[315] See *infra*, Chapter 5, which further outlines also the unique role the European Community/European Union, not mentioned here, plays in the legal and technical/operational European 'spacescape'.

[316] EUMETSAT was established by way of the Convention for the Establishment of a European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) (hereafter EUMETSAT Convention), Geneva, done 24 May 1983, entered into force 19 June 1986; as amended 14 July 1994, entered into force 27 July 1994; UKTS 1999 No. 32; Cm. 1067; Cmnd. 9483; *Space Law – Basic Legal Documents*, C.III.1; 44 *Zeitschrift für Luft- und Weltraumrecht* 68 (1995). See further *infra*, § 4.2.6.3.

[317] *Cf.* e.g. Arts. 1(2), (4), 4 (esp. (1)), 5, EUMETSAT Convention, *supra* n. 316.

[318] *Cf.* Arts. 2(7), 10(2), EUMETSAT Convention, *supra* n. 316.

as somehow related to research, development and exploration.[319] This concerns ESA, established in 1975 by formally combining two earlier European space organizations for cooperation in the area of launcher development (ELDO) and space research (ESRO).[320]

It was, for example, ESA from which EUMETSAT took its cue to introduce (the distinction between) mandatory and optional programmes in their space endeavours[321] – perhaps the most interesting legal/institutional feature of these European space organizations giving rise to both legal discussions[322] and continuing attention from other regions of the world where regional integration of space efforts is being attempted. Also, ESA and EUMETSAT – together with EUTELSAT – have so far been the only organizations making use of the opportunities under the Rescue Agreement, the Liability Convention and the Registration Convention to effectively become parties to those treaties.[323]

2.4.3 Special Legal Regimes Developed for Large-Scale Projects

In a general sense any international treaty comprising substantive rights and obligations as between two or more states constitutes part of international law, and if it concerns a treaty codifying a set of arrangements relative to a space project, thereby part of international space law *lato sensu*. Under the present heading, however, only a few international treaties will be briefly assessed as outstanding examples for future development of international space law, at some point extending beyond the current – limited – group of states parties.

2.4.3.1 The Intergovernmental Agreement on the ISS

The most prominent example thereof at the global level is the Intergovernmental Agreement concerning the development, construction, launch and operation of the International Space Station. Originally concluded in 1988 under the leadership of the United States and further involving Japan, Canada and a number of European spacefaring nations

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319 See Art. II, Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1.

320 See further *infra*, §§ 4.2.1, 4.2.2.

321 See Art. V(1), ESA Convention, *supra* n. 319.

322 See further the discussion on the compatibility of such programme procurement regimes with the EU competition regime, § 4.4.5.

323 See *supra*, § 2.3.2.2, § 2.3.3.7 and § 2.3.4.3; further *infra*, § 4.2.5.1.

members of ESA,[324] it was renegotiated after the end of the Cold War and political realities required partnering with Russia, with the 1998 (and currently ruling) version being applicable to 15 major spacefaring nations.[325]

The Intergovernmental Agreement, in particular in view of the importance of its membership in terms of spacefaring nations,[326] provides for a few interesting and rather novel contributions to international space law *lato sensu* already for that reason, and has sometimes been pointed out as a potential point of reference for either future world space organizations or for other long-term space projects of massive size and complexity.[327]

Firstly (as also occurred in the case of the ESA Convention), provisional application was agreed upon, with regard to both iterations of the Intergovernmental Agreement, in order not to wait for formal entry into force before beginning the process of development and construction of the ISS.[328] Space cooperation is something requiring both long-term agreement before any benefits might be reaped and a considerable amount of mutual trust amongst the cooperating states – and both conspire to arrive regularly at a level of willingness to start cooperation

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[324] Agreement Among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station, Washington, done 29 September 1988, entered into force 30 January 1992; Cm. 705; *Space Law – Basic Legal Documents*, D.II.4.2.

[325] Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4. See for an extended analysis of the ISS legal regime further *infra*, §§ 11.3–11.5.

[326] With Germany, France, the United Kingdom and Italy amongst the European states parties next to the United States, Russia, Japan and Canada as global partners, China, India and Brazil may be deemed the largest spacefaring nations *not* party to the Agreement.

[327] *Cf.* also further *infra*, §11.6.

[328] The 'rules of the game' were laid down in a specific arrangement, the Agreement concerning application of the Space Station Intergovernmental Agreement pending its entry into force, Washington, done 29 January 1998, entered into force 29 January 1998. See further e.g. F.G. von der Dunk, Legal Aspects of the International Space Station, in *The Highways of Air and Outer Space Over Asia* (Eds. C.J. Cheng & P.M.J. Mendes de Leon) (1992), 113–4.

without the legal certainty of a treaty formally in force, more so than in most other potential areas for international cooperation.

Secondly, the Agreement ruled a set of Memoranda of Understanding (MOUs) and lower-tier, strictly speaking non-legal documents on the actual details of cooperation in the context of the ISS.[329] For these reasons they also comprised the heart of the interim arrangements, and made for flexible instruments used on an almost daily basis.

Thirdly, the Agreement provided several examples of implementing standard space law provisions in an international context, such as applying the quasi-territoriality of jurisdiction over registered space objects to the individual elements of the ISS (as opposed to legally viewing the ISS as one space object)[330] or conversely creating a separate liability regime deviating from the (third-party) space law regime (amounting to a very broad waiver of liability as opposed to the default broad liability regime under the Liability Convention).[331] Again, the latter was evidence of the need to work together in such a highly innovative but risky area as space station operations without a chance of lawsuits spoiling the spirit of cooperation.

Fourthly, it recognized the unique situation where ESA acted as the space agency on behalf of ultimately 11 of its current 20 member states. The MOUs involved ESA at the highest level as a 'Partner',[332] and the Agreement itself allowed ESA to register the European ISS modules[333] as well as to internally handle the jurisdiction regarding intellectual property rights it would seemingly be able to exercise (but then could not, since ESA is not a state with governmental legislative authority).[334]

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[329] See further e.g. F.G. von der Dunk, The International Legal Framework for European Activities on Board the ISS, in *The International Space Station* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 20–5.

[330] See Art. 5 in conjunction with Art. 6, Intergovernmental Agreement, *supra* n. 325; this also gave rise to specific jurisdiction over patented inventions as per Art. 21. *Cf.* further Art. VIII, Outer Space Treaty, *supra* n. 1; Art. II, Registration Convention, *supra* n. 41.

[331] See Art. 16, Intergovernmental Agreement, *supra* n. 325; where Art. 17 continued to recognize the validity of the Liability Convention outside of the ISS cooperation framework. *Cf.* further Art. III, Liability Convention, *supra* n. 40.

[332] *Cf.* also Arts. 3(b), 4, Intergovernmental Agreement, *supra* n. 325.

[333] See Art. 5(1), Intergovernmental Agreement, *supra* n. 325, further to ESA having submitted its Declaration of acceptance of rights and obligations in conformity with Art. VII(1), Registration Convention, *supra* n. 41.

[334] See Art. 21(2), Intergovernmental Agreement, *supra* n. 325, providing that 'for ESA registered elements any European Partner State may deem the activity to have occurred within its territory'. See further *infra*, § 11.3.2.3.

2.4.3.2 The COSPAS-SARSAT Agreement

The other international treaty which warrants being mentioned here concerns the COSPAS-SARSAT Agreement of 1988, providing the institutional arrangements and attendant legal regime for a satellite system used for search and rescue.[335] One interesting feature, stemming from the recognition that the availability of satellite technology amongst countries does not cover the potential need or desire for being part of such a search and rescue system, is the layered system of partisanship to the treaty.

Four states (Canada, France, Russia and the United States) are parties at the highest level, providing the satellites which form the heart of the system.[336] In addition, however, states can become parties as ground segment providers contributing and operating elements of ground infrastructure[337] or user states essentially only following technical specifications pertaining to emergency beacons entitling the use of the satellites.[338]

Thereby, the COSPAS-SARSAT Agreement provides another example of a pragmatic approach in space law, deviating from the standard approach of public international law that all states parties to a treaty are legally equal in order to reflect the actual differences in financial and technical capability – and in this case not in the least to the detriment of the states relegated to legally speaking 'lower ranks', as they continue to enjoy the real-life benefits this convention brings. In that sense, the Agreement embodies a striking example of the lofty aims of Article I of the Outer Space Treaty to use space 'for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development'.

2.4.3.3 Three special bilateral agreements

Whilst the Intergovernmental Agreement on the ISS and the COSPAS-SARSAT Agreement constitute the major examples of multilateral treaties dealing with a complex space project in rather comprehensive fashion, three bilateral arrangements may also be mentioned here as providing, by way of example, interesting contributions to international space law.

The first one concerns the cooperation between China and Brazil in the realm of remote sensing, referring to the China-Brazil Earth Resources

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335 International COSPAS-SARSAT Programme Agreement (hereafter COSPAS-SARSAT Agreement), Paris, done 1 July 1988, entered into force on 30 August 1988; *Space Law – Basic Legal Documents*, D.II.6.

336 *Cf.* Arts. 1, 5, 20, COSPAS-SARSAT Agreement, *supra* n. 335 (referring to the Union of Soviet Socialist Republics, whose legal place is now taken by the Russian Federation).

337 *Cf.* Arts. 1, 11, COSPAS-SARSAT Agreement, *supra* n. 335.

338 *Cf.* Arts. 1, 12, COSPAS-SARSAT Agreement, *supra* n. 335.

Satellite programme, which was started in 1988.[339] The agreement *inter alia* provided for an open access approach to the data generated by the remote sensing system in Brazil, heralding a new approach in developing countries to stimulate private enterprise to use those data and generate new products, services and markets rather than keeping the information exclusively in government hands.[340]

The second one concerns the long-term cooperation between Ukraine and Brazil under an agreement initialled in 2003, whereby the rocket technology of the former was combined with the launch site of the latter at Alcantara, closest of all spaceports to the equator, to develop a feasible launch service provision business.[341] Most interestingly from a legal perspective is the establishment of a properly bi-national company to develop and run these operations, Alcantara Cyclone Space.[342]

The third one concerns the operation of the Baikonur Cosmodrome, the former Soviet launch port for all manned and the most important unmanned spacecraft which, after the demise of the Soviet Union, happened to find itself in the country of Kazakhstan whereas the Russian Federation was the one wishing to keep the base operating for its space programme. Consequently, a bilateral Kazakh–Russian treaty had to be concluded,[343] *inter alia* to take care of the potential international liability

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339 See J. Monserrat, Brazilian-Chinese Space Cooperation: An Analysis of its Legal Performance, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 164–75; Y. Zhao, Evaluation of Space Cooperation between China and Brazil: An Excellent Example of South-South Co-operation, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 215–23; Y. Zhao, *Space Commercialization and the Development of Space Law from a Chinese Legal Perspective* (2009), 178–87.

340 *Cf.* J. Monserrat, Regulation of Space Activities in Brazil, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 69; J. Monserrat, Commentary Paper, in *Proceedings of the ISRO-IISL Space Law Conference 2005* (2006), 5*35–6; Zhao, *supra* n. 339, 179.

341 The key document here was the Treaty between the Federative Republic of Brazil and Ukraine on Long-Term Co-operation in Utilization of the Cyclone-4 Launch Vehicle at the Alcantara Launch Center, Brasilia, done 21 October 2003, entered into force 2004.

342 See J. Monserrat, Brazil-Ukraine Partnership for the Use of the Alcantara Launch Center, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 302–9; J. Monserrat, Brazilian-Ukrainian Agreement on Launching Cyclone-4 from Alcantara: Impact on Brazilian Legislation, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 37–46.

343 Agreement between the Russian Federation and the Republic of Kazakhstan on Basic Principles and Terms of the Utilization of the Baikonur Cosmodrome, Moscow, done 28 March 1994, entered into force 10 December 1994; 30

claims with respect to launches from Baikonur, qualifying both Kazakhstan (through the use of its territory) and Russia (as it continued to own, control and operate the launch facilities there) as 'launching States' under the Liability Convention.[344]

While these treaties all concern bilateral relationships, the states involved all belong to the major spacefaring nations (Brazil, China, Kazakhstan, Russia and Ukraine[345]) and refer to new and quite specific forms of cooperation; hence they may well serve as blueprints for future occasions where states want to combine their respective launcher technology and launch port operations or their launch operations and their remote sensing technology.

2.4.4 Multilateral Agreements on Specific Realms of Space Activities

Several multilateral international treaties have furthermore been concluded between groups of usually like-minded, and therefore regionally related, states on specific realms of space activities. They are fundamentally different from the treaties mentioned earlier, in particular the five UN treaties (or at least the first four) in that either their aim, if any, to achieve global partisanship was never even remotely reached, or their subject matter concerns only a very small and specific aspect of space activities – or possibly even both.

For those reasons, they will not be addressed as such in any detail here; where they provide a sizeable contribution to overall space law, they will be discussed further in the relevant chapters below. From the perspective of general international space law, their operation and application should usually be caveated by their limited scope both *ratione materiae* and *ratione personae*. Though *lex specialis* when compared to the *lex generalis* of the *corpus juris spatialis internationalis*, it only

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Journal of Space Law (2004), at 26; see also Agreement between the Russian Federation and the Republic of Kazakhstan on the Cooperation in the Effective Use of the Baikonur Facility, Astana, done 9 January 2004; 30 *Journal of Space Law* (2004), at 32.

344 *Cf.* the definition of the 'launching State' in Art. I(c), Liability Convention, *supra* n. 40. More in general on the Kazakh–Russian relationship relative to Baikonur, M. Hosková, The 1994 Baikonur Agreements in Operation, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 263–72.

345 Note furthermore that, with the exception of Russia, these states were not parties to the ISS Intergovernmental Agreement, one of the other main ad hoc regimes for international cooperation discussed before.

overrides such *lex generalis* as far as the states parties to the *lex specialis* are concerned – and then of course only as to the, usually, more detailed and specific level of the subject matter of the latter.

This in itself provides a considerable incentive for the states parties to those special treaties to remain in line with the global space treaties and other globally applicable elements of space law in order not to be confronted with two rather divergent, possibly conflicting legal regimes – in the end, obligations under the *lex generalis* to all those not a party to the specialized treaty remain unchallenged by the latter.

Some of the more well-known examples of space-oriented treaties falling into this category are the so-called Brussels Convention of 1974 dealing with programme-carrying satellite signals,[346] a Council of Europe Convention of 1989 on trans-frontier television,[347] and the so-called Moscow Convention of 1978 on remote sensing data.[348] A set of legal arrangements in the context of ESA's involvement with Arianespace operations from French Guyana territory, furthermore, will be discussed in some detail in the context of European space law.[349]

2.4.5 Bilateral (and Multilateral) Agreements on Space and Space-Related Cooperation

Formally, bilateral agreements or multilateral agreements with a limited number of states parties on space and space-related cooperation also form part and parcel of international law – albeit binding only upon those states respectively party thereto. Here, the focus is not so much on efforts

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[346] Convention relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, Brussels, done 21 May 1974, entered into force 25 August 1979; 1144 UNTS 3; TIAS 11078; ATS 1990 No. 30; 13 ILM 1444 (1974). It enjoyed the partisanship of 28 states as of November 2006; see *Space Law – Basic Legal Documents*, B.I.2.2.

[347] European Convention on Transfrontier Television, Strasbourg, done 5 May 1989; entered into force 1 May 1993; ETS No. 132; as amended by the Protocol amending the Convention, Strasbourg, done 9 September 1998, entered into force 1 March 2002; ETS No. 171; *Space Law – Basic Legal Documents, B.1.5.1*. Its membership was restricted to Europe, read member states of the Council of Europe; *cf. Space Law – Basic Legal Documents*, B.I.5.2.

[348] Convention on the Transfer and Use of Data of Remote Sensing of the Earth from Outer Space, Moscow, done 19 May 1978, entry into force 21 August 1979; *Space Law – Basic Legal Documents*, B.II.1. Its membership remained restricted to the Soviet Union and some of its then-communist allies.

[349] See *infra*, § 4.2.6.1.

to regulate a specific realm or category of space activities, but to provide a legal framework for specific cooperation projects.

These may range from hosting ground stations for satellites[350] to hosting astronauts on board of a space station,[351] from the launch of specific rockets[352] to providing launch services to foreign satellites,[353] and from cooperation on specific satellite projects[354] to cooperation on the use of terminals to access specific satellite infrastructures.[355]

Often going into the intricate details, including technical ones, of international space cooperation further to the general clarion call of Articles I and III of the Outer Space Treaty to strive for such international cooperation, many of those treaties may provide helpful clues as to how the technical, operational, political and financial issues particular to space activities are translated into legal texts, rights and obligations,

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350 *Cf.* e.g. the Exchange of Notes constituting an Agreement between the Government of Australia and the Government of the United States of America Relating to Space Vehicle Tracking and Communication, Canberra, done 26 February 1960, entered into force 26 February 1960; 354 UNTS 95; TIAS 4435; ATS 1960 No. 2; renewed every ten years.

351 *Cf.* e.g. Implementing Arrangement Between the Government of the United States of America and the Government of the Federative Republic of Brazil for the Design, Development, Operation and Use of Flight Equipment and Payloads for the International Space Station Program, Brasilia, done 14 October 1997, entered into force 14 October 1997, www.state.gov/documents/organization/106612.pdf, last accessed 12 April 2014.

352 *Cf.* e.g. Agreement between the Government of the Commonwealth of Australia and the European Space Research Organisation for the Provision and Operation of Trials Facilities at Woomera for Launching of a SKYLARK Rocket in January/February 1970, Paris, done 10 January 1970, entered into force 10 January 1970; ATS 1970, No. 1.

353 *Cf.* e.g. Agreement between the Government of Australia and the Government of the United States of America concerning the furnishing of Launch and Associated Services for Australia's National Satellite System, Washington, done 7 March 1985, entered into force 7 March 1985; ATS 1985 No. 7.

354 *Cf.* e.g. Exchange of Notes constituting an Agreement between the Government of Australia and the Government of Japan concerning Co-operation on the Project for the Geostationary Meteorological Satellite-3 System, Canberra, done 1 May 1985, entered into force 1 May 1985, ATS 1985 No. 14; Agreement between the Government of Canada and the Government of the United States of America concerning the Operation of Commercial Remote Sensing Satellite Systems, Washington, done 16 June 2000, entered into force 16 June 2000; 2000 CTS No. 2000/14.

355 *Cf.* e.g. International Agreement on the Use of INMARSAT Ship Earth Stations within the Territorial Sea and Ports, London, done 16 October 1985, entered into force 12 September 1993; ATS 1993 No. 42.

presumably promoting not only greater efficiency, but also greater net benefit for mankind.

Subject to verification by further study, it might be expected that the intrinsically international, highly technological and at the same time fascinating ventures of mankind into outer space have given rise to a perhaps relatively speaking extraordinary number of bilateral engagements, of which good examples followed by others may ultimately rise to the level of customary international law of a more global scope. One specific and important, though by now historical, example thereof concerns the set of bilateral arrangements in the 1990s trying to develop a level playing field in the global launch services sector.[356]

2.4.6 Legal Regimes *Stricto Sensu* Not Developed for, yet Relevant for Space Activities

The interest of mankind finally not only requires international law, or at least international rules of the road, for the realm of outer space and space activities, but also that these space activities bring some benefit down to earth. Whilst international security and the advancement of science, the two old strongholds of international space activity, are certainly not without enormous benefit to mankind, these benefits are usually difficult to quantify or even to specify otherwise. Not incidentally, the Outer Space Treaty, often hailed – somewhat imprecisely – as the 'Magna Carta' for outer space, has equally often been criticized for its imprecision, vagueness and impracticable aspirations, as summarized by its other nickname – the 'Principles Treaty'.[357]

It is therefore, in particular, the advent of the possibilities to reap other, more down-to-earth and directly quantifiable benefits from the space adventure that has changed, and is still changing, the landscape of space law in a fundamental way. 'Space law' can no longer be viewed as, at heart, a somewhat isolated set of international space treaties and other instruments, plus some domestic implementation – it can no longer be circumscribed comprehensively as 'all legal instruments exclusively dedicated to outer space'. Its increasing down-to-earth importance – from communications to meteorology, from navigation to, yes, tourism – calls for space law to be now defined *lato sensu*, as *the collection of*

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356 See further *infra*, § 7.5.4, also § 15.3.2.

357 Cf. also Hobe, *supra* n. 24, 12 ff.; S. Hobe & N. Hedman, Preamble, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 19–24.

principles, norms and rules relevant for at least one particular branch of space activity, regardless of which particular sources they stem from.[358]

All of those, by definition, did not first and foremost address the space aspects, and many were even drafted, agreed upon and elaborated before Sputnik-1 went up, or before anyone fathomed that this particular set of rules might one day have a serious impact on at least one branch of space activities. The most important of those, already comprising an imposing array of treaties and other key international legal documents, will be discussed as appropriate in many other chapters below, as indicated, so that at this point a simple sample of those treaties should suffice.

Starting with the most extended range of application of space activities in terms of practical and financial importance, the area of satellite communications is not only ruled by the various treaties establishing intergovernmental satellite operators as discussed above,[359] or as far as direct broadcasting is concerned, the relevant set of UN principles,[360] but most importantly by the regime developed under the auspices of the ITU, established as far back as 1865.[361] More recently, also the international regime on trade liberalization, as originally developed from the 1947 General Agreement on Tariffs and Trade (GATT),[362] has started to address the cross-border provision specifically of satellite communication services.[363] Regionally, within Europe the European Community, then

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358 For an extended version of this analysis, see again von der Dunk, *supra* n. 62, 505 ff.

359 See *supra*, § 2.4.2.1; also *infra*, §§ 5.4–5.8.

360 See *supra*, § 2.2.1.3; also *infra*, § 8.3.1.

361 The current regime for international satellite communications, as far as the ITU is concerned, is based on the 1992 ITU Constitution (Constitution of the International Telecommunication Union, Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1) and ITU Convention (Convention of the International Telecommunication Union, Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71), as revised in 1994 and 1998, as well as the Radio Regulations (as per Art. 4, ITU Constitution); see further *infra*, § 8.2.

362 General Agreement on Tariffs and Trade, Geneva, done 30 October 1947, entered into force 1 January 1948; 55 UNTS 194; TIAS 1700; ATS 1948 No. 23.

363 The GATT was institutionalized with the establishment in 1994 of the World Trade Organization (WTO), as per the Agreement Establishing the World Trade Organization (WTO Agreement), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1867 UNTS; UKTS 1996 No. 57; ATS 1995 No. 8; 33 ILM 1125, 1144 (1994); and at the same time extended to services by way of the

Union[364] started to make inroads into satellite communications along the same lines of trade liberalization, and around the same time, with the 1994 Satellite Directive.[365]

In the context of satellite remote sensing, the copyright concept of intellectual property rights, developed centuries ago and first internationally harmonized with the 1886 Berne Convention,[366] turned out to be the starting point for drafting specific intellectual property rights to protect investment in satellite data,[367] just as the tool of patent law, internationalized as early as the 1883 Paris Convention,[368] turned out to be used *inter alia* for inventions on board the ISS.[369]

Another satellite application making great progress in recent years concerns the use of space infrastructure for satellite positioning, timing and navigation services. As these services are increasingly being used by various transport (aviation, maritime, rail and road) and non-transport (banking and telecommunications) sectors, the providers of relevant satellite services are increasingly being confronted with the consequence

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GATS (General Agreement on Trade in Services, Marrakesh, done 15 April 1994, entered into force 1 January 1995; UKTS 1996 No. 58; Cm. 3276; ATS 1995 No. 8), which then presented the platform for addressing international trade in satellite communication services; see further *infra*, § 15.4.

364 Currently, the legal framework of the European Union is fundamentally based on the Treaty on European Union as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/1 (2009), and the Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/47 (2009).

365 Commission Directive amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications, 94/46/EC, of 13 October 1994; OJ L 268/15 (1994). See further *infra*, § 4.3.2.2.

366 Berne Convention for the protection of literary and artistic works, Berne, done 9 September 1886, entered into force 5 December 1887; 828 UNTS 221; 331 UNTS 217; ATS 1901 No. 126.

367 See further *infra*, § 18.2.2.

368 Convention for the Protection of Industrial Property as Modified by Additional Act of 14 December 1900 and Final Protocol, Paris, done 20 March 1883, entered into force 6 July 1884; 828 UNTS 305; USTS 379; UKTS 1907 No. 21; ATS 1907 No. 6.

369 *Cf.* Art. 21, Intergovernmental Agreement, *supra* n. 325, for the ISS regime; see also *infra*, § 11.4.2, *cf.* also § 18.3.

of the sector-specific regimes for those sectors.[370] Liability, for example, is handled quite differently in aviation as compared to maritime or rail transport.[371]

The same goes for those space applications requiring asset-based financing, where the private operators cannot use existing infrastructure or non-space assets as collateral. It is for that reason that under the aegis of UNIDROIT, the International Institute for the Unification of Private

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370 See further *infra*, §§ 10.6–10.9.

371 For air law, third-party liability is handled by the – relatively marginally ratified! – Rome Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (Rome Convention), Rome, done 7 October 1952, entered into force 4 February 1958; 310 UNTS 181; ATS 1959 No. 1; ICAO Doc. 7364; amended by the Protocol to Amend the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface Signed at Rome on 7 October 1952 (Montreal Protocol), Montreal, done 23 September 1978, entered into force 25 July 2002; ICAO Doc. 9257; as the most recent international efforts in this area have not yet achieved sufficient ratifications: the Convention on Compensation for Damage Caused by Aircraft to Third Parties, Montreal, done 2 May 2009; not yet entered into force; ICAO Doc. 9919; and the Convention on Compensation for Damage to Third Parties, Resulting from Acts of Unlawful Interference Involving Aircraft, Montreal, done 2 May 2009; not yet entered into force; ICAO Doc. 9920. Contractual liability in aviation is currently largely regulated by the Convention for the Unification of Certain Rules for International Carriage by Air (Montreal Convention), Montreal, done 28 May 1999, entered into force 4 November 2003; 2242 UNTS 350; ICAO Doc. 9740; 48 *Zeitschrift für Luft- und Weltraumrecht* 326 (1999).

In maritime transport, by contrast, only contractual liability is regulated internationally, by such treaties as the Athens Convention Relating to the Carriage of Passengers and Their Luggage by Sea, Athens, done 13 December 1974, entered into force 28 April 1987; UKTS 1987 No. 40; Cmnd. 6326; International Transport Treaties, Suppl. 1-10 (Jan. 1986), I-229; and the United Nations Convention on the Carriage of Goods by Sea, Hamburg, done 31 March 1978, entered into force 1 November 1992; International Transport Treaties, Suppl. 1-10 (Jan. 1986), I-278.

Also railway transport knows international harmonization of liability rules only in the context of contracts of carriage, as per the International Convention concerning the International Transport by Rail, Berne, done 9 May 1980, entered into force 1 May 1985; International Transport Treaties, Suppl. 1-10 (Jan. 1986), V-183.

See for a comparative analysis of those regimes and their relation to satellite navigation activities, F.G. von der Dunk, The European Equation: GNSS = Multimodality + Liability, in *Air and Space Law in the 21st Century* (2001), esp. 236–43.

Law, a Protocol has been drafted complementing the Cape Town Convention to apply its general regime to the financing of space assets.[372]

With the Sea Launch venture seeking the high seas as an area for launch, specific elements of the law of the sea became of importance for this space venture;[373] with the advent of commercial sub-orbital spaceflight, as discussed, elements of air law achieved the same attention by space lawyers;[374] and with the dual-use character of most space technology, international (the Missile Technology Control Regime[375] and the Wassenaar Arrangement[376]) and national (in particular the US International Traffic in Arms Regulations[377]) arrangements regarding the export of such technology became of key importance for the space industry.[378]

And of course this list is only scratching the surface …

2.5 CONCLUDING REMARKS

In sum, space has started to host all sorts of human activities, or better, play a fundamental role in them: military, scientific, administrative, crime fighting and anti-terrorism, commercial, and humanitarian – and thus in regulating the behaviour of all sorts of humans to go with them. Tourists have flown into outer space as well as cremated human remains; we may soon see advertisers trying to hang giant billboards up there and miners going for mineral resources, but also criminals and (some think) soon even proper colonists. And wherever man goes, the taxman soon follows.

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[372] Respectively Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets, Berlin, done 9 March 2012, not yet entered into force; UNIDROIT Doc., DCME-SP–Doc. 43; and Convention on International Interests in Mobile Equipment, Cape Town, done 16 November 2001, entered into force 1 April 2004; ICAO Doc. 9793. See further *infra*, § 16.4.

[373] *Cf.* further *infra*, § 7.2.

[374] See more in detail *infra*, § 12.3.2.

[375] In its original version Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles, done 16 April 1987; 26 ILM 599 (1987).

[376] Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies, Wassenaar, done 19 December 1995, effective 12 July 1996, www.wassenaar.org/.

[377] The ITARs are the implementing regulations under the Arms Export Control Act of 1976, 22 U.S.C. 2751.

[378] See further *infra*, § 6.6.

Thus, space is now truly becoming the fourth realm for mankind to venture into – and presumably the last, unless one considers 'cyber' to constitute its own realm; after the landmasses, the oceans and the airspaces of this world. Not accidentally, recently the US military has started to seriously consider establishing a fourth branch of the armed forces: next to the army, the navy and the air force, a space force would thus be envisaged.

For a proper understanding of the way law and regulation – and this then also includes national legislation, in the framework of international space law – impact all space activities or at least a substantial element or aspect thereof, analysis and proposals for further development should never fail to take this effectively broad scope of space law *lato sensu* into due consideration. Of the many overlaps, inconsistencies or gaps between the myriad legal regimes interacting, the present chapter, and even the present book, can only address a limited number of the most important ones – but sufficient, it is submitted, to understand the basic mechanisms in this respect.

Noting that most actors, certainly smaller countries and private entities not employing large bureaucracies, would prefer to be faced with at least a coherent set of rights and obligations, rather than with a simple list of various regimes applicable to their particular field of activity without even so much as a 'do-it-yourself kit' on making sense of how these regimes interact and where one might take precedence over the other, it is clear that a lot remains to be done in this fascinating area of public international law.

3. National space law

Irmgard Marboe

3.1 INTRODUCTION

National space legislation has recently attracted a lot of attention both in theory and in practice. The need for national space laws or regulations has arisen due to the increasing activities of private actors in the exploration and use of outer space. Traditional law on outer space does not cover private space activities but only addresses states and international organizations.[1]

This is understandable as, for a long time, those subjects of public international law were the only actors in outer space. The technology necessary to launch objects into outer space was almost entirely controlled by states, originating from the military sector. Since the end of the Cold War, however, the civilian and private uses of outer space have increasingly played an important role. While the states continue to use satellites for important public interest purposes, such as weather forecasting, earth observation, communication, navigation, science and research, private companies have discovered the potential of the use of outer space for commercial purposes, in particular in the area of telecommunication services. The increasing commercialization of space activities has also led to the privatization of some space-related intergovernmental organizations, such as INTELSAT, INMARSAT or EUTELSAT, which became private operators that are not subjects of public international law anymore but companies incorporated in one particular country, thus private legal persons under national law.[2] Furthermore, research institutions and universities have started to develop space activities for their own purposes which are less complex and more affordable. These include small-sized satellites, such as the so-called 'cube-sats'.

It follows from the above that many different kinds of non-governmental entities are active in outer space today. They have one thing in common: they are not directly bound by international treaties

[1] See further on this *supra*, § 2.2.2.3.

[2] See on these international satellite organizations and their privatization further *infra*, §§ 5.4.2, 5.5.2, 5.6.2.

and other norms of public international law. In order to preserve the aims and principles established by the existing legal framework of public international law, it is necessary to implement national law which is applicable to space activities carried out by such non-governmental actors. This serves the interest of both the actors themselves and that of the general public because of the hazardous nature of space activities and the high risks involved.

The advantage of national legal norms is that they are directly applicable and enforceable, which is not necessarily the case with obligations of a public international law nature. The disadvantage is that they do not exist in all countries. Unfortunately, national space legislation is available in only a few states. There are sufficient and forward-looking legal regimes in some countries, but this is not the case in others. This is an obstacle to the creation of a level playing field in the space sector. If all the actors were bound by similar and fair rules in the carrying out of space activities, this would be to the long-term benefit of all. By contrast, in a situation of many diverse national legal frameworks, the phenomena of 'nationality planning'[3] or the choice of 'flags of convenience',[4] as known from the law of the sea, are also potential problems relevant in the law of outer space.

There have been several efforts in academia and practice to raise the awareness for the need of national space legislation and to define the most important elements which should be contained in such legislation. A number of books have been published which put together examples of

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[3] See M. Feldman, Setting Limits on Corporate Nationality Planning in Investment Treaty Arbitration, 27 *ICSID Review – Foreign Investment Law Journal* (2012), 281–302; E. Schlemmer, Investment, Investor, Nationality, and Shareholders, in *The Oxford Handbook of International Investment Law* (Eds. P. Muchlinsky, F. Ortino & C. Schreuer) (2008), 49–88; C. Schreuer, Nationality of Investors: Legitimate Restrictions vs. Business Interests, 24 *ICSID Review – Foreign Investment Law Journal* (2009), 521–7.

[4] See Y. Tanaka, *The International Law of the Sea* (2012), 157–9; D. König, Flags of Convenience, in *Encyclopedia of Public International Law* (Ed. Rüdiger Wolfrum) Vol. IV (2012), 118–26; T. Treves, Flags of Convenience before the Law of the Sea Tribunal, 6 *San Diego International Law Journal* (2004), 179–89; H.E. Anderson, The Nationality of Ships and Flags of Convenience: Economics, Politics, and Alternatives, 21 *Tulane Maritime Law Journal* (1996), 139–70; OECD Study on Flags of Convenience, 4 *Journal of Maritime Law and Commerce* (1973), 231–54.

national space legislation and discuss pertinent issues.[5] The German 'Project 2001' and 'Project 2001 Plus' have resulted in the definition of five 'building blocks' which should be the basis of any space law.[6] The International Law Association (ILA) has also taken up the topic and worked on a 'Model Law on National Space Legislation' which was eventually adopted in 2012.[7] The General Assembly of the United Nations adopted a resolution on Recommendations on national legislation relevant to the peaceful exploration and use of outer space in 2013, based on a text prepared by the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space (UN COPUOS).[8] All of these initiatives identify the need for national space legislation and try to provide some practical guidelines for putting it into practice.

The present chapter will introduce some of the existing space laws and categorize them in several groups in order to provide an overview over the legal regimes of space activities in various countries. Furthermore,

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[5] Such as *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011); *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010); *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008); *Le Cadre Institutionnel des Activités Spatiales des États* (Ed. S. Courteix) (1997); J. Hermida, *Legal Basis for a National Space Legislation* (2004); *cf.* also *'Project 2001 Plus' – Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2006), 65–92; M. Bourély, Quelques réflexions au sujet des legislations spatiales nationales, 16 *Annals of Air and Space Law* (1991), 245 ff.; A. Kerrest de Rozavel, The Need to Implement the Outer Space Treaty through National Law in the Light of the Current and Foreseeable Space Activity, in *Proceedings of the International Institute of Space Law 2010* (2011), 551–9.

[6] See further M. Gerhard & K.U. Schrogl, Report of the 'Project 2001' Working Group on National Space Legislation, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 552–8; M. Gerhard & K. Moll, The Gradual Change from 'Building Blocks' to a Common Shape of National Space Legislation in Europe – Summary of Findings and Conclusions, in *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004), 48–9.

[7] See Resolution No. 6/2012 adopting the 'Sofia Guidelines for a Model Law on National Space Legislation', adopted at the ILA Conference in Sofia, Bulgaria, September 2012, www.ila-hq.org/en/committees/index.cfm/cid/29, last accessed 12 January 2014.

[8] See UNGA Resolution on 'Recommendations on national legislation relevant to the peaceful exploration and use of outer space', UNGA Res 68/74 of 11 December 2013, UN Doc. A/68/74; see also the Report of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, UN Doc. A/AC.105/C.2/101, 3 April 2012.

the work on national space legislation within the United Nations and the ILA Model Law will be presented.

3.2 INTERNATIONAL LAW REQUIREMENTS

International law and, in particular, the five UN treaties on outer space,[9] aim to regulate the conduct of subjects of public international law and establish rights and obligations of states in the exploration and use of outer space.[10] These 'legal principles' should govern activities in outer

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[9] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968); Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971); Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975); Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979). See further on this international legal framework esp. *supra*, § 2.3.

[10] Apart from the five UN space treaties there are also other sources of public international law, such as treaties in other areas of international law, as well as customary international law and general principles of law which have to be respected in the exploration and use of outer space. See Art. III, Outer Space Treaty, *supra* n. 9, and the 'catalogue' of sources of public international law in Art. 38, Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1. On this subject, see e.g. the various papers in the session on the International Legal Regulation of Outer Space within the Scope of Public International Law', *Proceedings of the International Institute of Space Law 2012* (2013), 299–423.

space,[11] for the benefit of a safe and sustainable use of outer space, regardless of whether the nature of the actor is public or private. Therefore, the states parties to the treaties agreed to be responsible for making sure that not only governmental agencies but also non-governmental entities comply with these obligations. This is formulated in Article VI of the Outer Space Treaty in the following way:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.

The 'responsibility' of states for non-governmental activities was a compromise between the Soviet Union and the United States during the drafting process of the Outer Space Treaty. While the former wanted to prohibit private activities in outer space altogether, the United States did not want to rule out this possibility.[12] The compromise was to allow private activities in outer space but to keep the ultimate responsibility with the states. The second sentence of Article VI regulates more explicitly how this should be done: 'The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.'

States are thus under an obligation of 'authorization' and 'continuing supervision' of non-governmental space activities. 'Responsibility' in this context has a slightly different meaning than under the general law of state responsibility.[13] It does not mean that all national space activities are directly attributable to the state but that the state has an international

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[11] See the early UNGA Resolution entitled 'Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space', UNGA Res. 1962(XVIII), of 13 December 1963; UN Doc. A/AC.105/572/Rev.1, at 37.

[12] See F.G. von der Dunk, The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 3; M. Gerhard, Article VI, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 105–6.

[13] According to Art. 2, ILC Articles on the International Responsibility of States for Internationally Wrongful Acts; UN Doc A/56/10(2001); a state is responsible if, when conduct consisting of an action or omission: (a) is attributable to the state under international law; and (b) constitutes a breach of an international obligation of the state. See J. Crawford, *The International Law*

obligation to ensure that those activities are conducted in compliance with the obligations contained in the Outer Space Treaty.[14] Article VI does not necessarily demand the enactment of a specific national space act[15] but the state must have at its disposal legal mechanisms to authorize and supervise non-governmental space activities.[16]

While Article VI of the Outer Space Treaty represents the most important legal basis for national space legislation, there are also other obligations which must be respected by the states and which usually require implementation through national law.[17] Furthermore, there are a number of non-binding norms dealing with the conduct of outer space activities.[18] Such norms, often termed 'soft law', do not establish a legal

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Commission's Articles on State Responsibility: Introduction, Text and Commentaries (2002), 81.

[14] This follows from a 'contextual interpretation' of Art VI, Outer Space Treaty, *supra* n. 9, in accordance with Art. 31(1), Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969). Following this, a treaty 'shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose'. The context here is Art. VI, second sentence, which demands authorization and continuing supervision of space activities carried out by non-governmental entities. To this extent, the 'responsibility' of the state is defined and delimited.

[15] *Cf.* Hermida, *supra* n. 5, 29–32; V. Kayser, Commercial Exploitation of Space: Developing Domestic Regulation, 17-II *Annals of Air and Space Law* (1992), 190; Bourély, *supra* n. 5, 247.

[16] See F.G. von der Dunk, *Private Enterprise and Public Interest in the European 'Spacescape'* (1998), 19; Gerhard, *supra* n. 12, 117.

[17] For example, the obligation to register also requires some sort of national legislation, in particular if private entities undertake to launch space objects. The obligation of the 'launching State' to pay compensation for damage caused by space objects is another incentive for enacting national space legislation.

[18] See, e.g., the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, UNGA Res. 37/92, of 10 December 1982; UN Doc. A/AC.105/572/Rev.1, at 39; Principles Relating to Remote Sensing of the Earth from Outer Space, UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986); Principles Relevant to the Use of Nuclear Power Sources in Outer Space, UNGA Res. 47/68, of 14 December 1992; UN Doc. A/AC.105/572/Rev.1, at 47; and Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries, UNGA Res. 51/122, of 13 December 1996; UN Doc. A/RES/51/122; the UN Resolution on Application of the concept of the 'launching State', UNGA Res. 59/115, of 10 December 2004;

obligation of states but can be regarded as recommendations for the responsible and diligent use of outer space.[19] States might have an interest that private entities act in conformity with such recommendations for the benefit of the safe and sustainable use of outer space. They may thus choose to transform such recommendations into binding obligations under their national laws. In the following, some of the most important issues in the process of transforming international legal obligations and non-binding recommendations into national law will be discussed.

3.2.1 Authorization and Supervision by the 'Appropriate State'

Article VI of the Outer Space Treaty requires 'authorization' and 'continuing supervision' by the 'appropriate State' party to the treaty. It is, however, far from clear which state the 'appropriate' state is. Some authors maintain that it should be the 'launching State' as it is the 'liable State' when damage is caused by a space object in accordance with Article VII of the Outer Space Treaty.[20] Others refer to the 'state of registry' because, according to Article VIII of the Outer Space Treaty, this state retains 'jurisdiction and control' over the space object.[21]

However, the disadvantage of the 'launching State' concept is that it cannot be discarded later on. There are no rules that would allow the change of the status of the launching state in the UN treaties on outer space. This leads to the conclusion that 'once a launching State, always a launching State'. This is particularly problematic when space objects are

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UN Doc. A/RES/59/115; and the Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects, UNGA Res. 62/101, of 17 December 2007; UN Doc. A/RES/62/101. Furthermore, guidelines on the mitigation of space debris are important, such as the 2002 IADC Space Debris Mitigation Guidelines and the 2007 UN COPUOS Space Debris Mitigation Guidelines.

[19] See I. Marboe, The Importance of Guidelines and Codes of Conduct for Liability of States and Private Actors, in *Soft Law in Outer Space. The Function of Non-Binding Norms under International Space Law* (Ed. I. Marboe) (2012), 135.

[20] *Cf.* e.g. H.L. van Traa-Engelman, *Commercial Utilization of Outer Space* (1993), 62–3.

[21] See e.g. G.C.M. Reijnen, *The United Nations Space Treaties Analysed* (1992), 114.

bought and sold in orbit on a regular basis, as is the case today.[22] This was not envisaged at the time of the formulation of the Outer Space Treaty.

It follows that the rigid concept of the 'launching State' should not be used to interpret the much more flexible concept of the 'appropriate State'. And, indeed, state practice is very diverse in its interpretation of the concept of the 'appropriate State'. The different approaches by states become evident when we analyse the different scopes of application of existing space laws.

As a matter of principle, the scope of application with respect to a space activity hinges on the right and the possibility to exercise jurisdiction over it. Under general international law, there are two generally accepted ways of exercising jurisdiction over an activity: territorial jurisdiction and personal jurisdiction.[23] This means that the activity can be regulated by a state if it takes place on its territory or if it is carried out by a person possessing its nationality. How the existing space laws have applied the term 'appropriate State' will analysed further below.

The requirement of 'authorization' is the most important instrument of states for the regulation of space activities. It not only allows or prohibits a specific space activity and continuously supervises it, but it also serves other purposes, such as ensuring that private space activities fulfil certain safety standards and certain 'soft law' guidelines, for example, on space debris mitigation.[24] Furthermore, states can ensure that the respective private space activities do not run against their national security and foreign policy interests.[25] The 'conditions for authorization' are thus of

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[22] For example, the company New Skies Satellites, which is incorporated in the Netherlands, was bequeathed with a number of INTELSAT's satellites, see F.G. von der Dunk, Regulation of Space Activities in The Netherlands, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 233 ff.; see on transfer of ownership in general B. Schmidt-Tedd & M. Gerhard, Registration of Space Objects: Which are the Advantages for States Resulting from Registration? in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 121, 131–2; A. Ito, *Legal Aspects of Satellite Remote Sensing* (2011), 72 ff.

[23] See J. Crawford, *Brownlie's Principles of Public International Law* (2012), 456, 486; M.N. Shaw, International Law (6th edn., 2008), 645–96.

[24] See *supra*, n. 10.

[25] See Gerhard & Schrogl, *supra* n. 6, 530; S. Hobe, Harmonization of National Laws as an Answer to the Phenomenon of Globalization, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 639–40; K.U. Schrogl, Annex to the Working Group Report:

utmost importance for the regulation of private space activities as will be analysed in the example of existing national space laws further below.

3.2.2 Registration

Under international law, the registration of space objects is required both on the national and on the international level.[26] While the Outer Space Treaty is not very explicit on the registration of space objects – it only implies that space objects are, in fact, registered[27] – the Registration Convention of 1975 regulates in detail the establishment of an international register for space objects with the UN Secretary-General[28] and demands the establishment of a national register for space objects by the respective states.[29]

The obligation to register is incumbent on the 'launching State'. According to the definition of the Registration Convention, this term means '(i) a State which launches or procures the launching of a space object; [or] (ii) a State from whose territory or facility a space object is launched'.[30] As the launch of a space object frequently involves more

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Responsibility and Liability – Need for National Regulation (incl. Harmonisation), in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 109–12; A. Kerrest de Rozavel, Sharing the Risk of Space Activities: Three Questions, Three Solutions, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 135–9.

26 Even before the Outer Space Treaty, *supra* n. 9, had been elaborated, Resolution 1721(XVI) called upon states launching objects into orbit or beyond to furnish information promptly for the registration of launchings; UNGA Res. 1721(XVI)B, of 20 December 1961; General Assembly – Sixteenth Session, Resolutions adopted on reports of the First Committee, at 6.

27 See Art. VIII, Outer Space Treaty, *supra* n. 9; B. Schmidt-Tedd & S. Mick, Article VIII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 147–8.

28 See Art. III(1), Registration Convention, *supra* n. 9. Today, the United Nations Office for Outer Space Affairs in Vienna keeps and administers the UN registry on behalf of the UN Secretary-General. See www.oosa.unvienna.org/oosa/en/SORegister/index.html, last accessed 12 January 2014. As many states are still reluctant to ratify the Registration Convention, the office keeps two registers: one for registrations on the basis of the Convention and one for registrations on the basis of Resolution 1721(XVI)B. See Schmidt-Tedd & Mick, *supra* n. 27, 150; Schmidt-Tedd & Gerhard, *supra* n. 22, 122–3.

29 See Art. II(1), Registration Convention, *supra* n. 9.

30 Art. I(a), Registration Convention, *supra* n. 9. The same definition of the 'launching State' is to be found in Art I(c), Liability Convention, *supra* n. 9. See

than one state, there are up to four different ways for states of potentially qualifying as a 'launching State' for one launch.[31] However, only one of them shall register the space object because jurisdiction and control should only be exercised by one state.[32]

The plurality of launching states has triggered discussions about the most appropriate state to register. The UN General Assembly Resolution on 'Recommendations on enhancing the practice of States and international intergovernmental organisations in registering space objects'[33] suggests a unification of jurisdiction and control over a space object with the responsibility for it.[34] The idea is to read Article VI and Article VIII of the Outer Space Treaty in conjunction. This means that the most appropriate state to register would be the state which is responsible for it. The reason for this equation of the 'launching State' and the 'responsible State' is that it seems to be unfair to ask for responsibility over a space object if the state does not have the right or the possibility to exercise jurisdiction over it. However, the equation of the 'launching State' with the 'responsible State' is not generally accepted, in particular with regard to launches procured by private entities. Some states do not see sufficient

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further V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001), 301; Schmidt-Tedd & Gerhard, *supra* n. 22, 124.

[31] As for the concept of the 'launching State' see A. Kerrest de Rozavel, Remarks on the notion of launching State, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 308; M. Gerhard, *Nationale Weltraumgesetzgebung. Völkerrechtliche Voraussetzungen und Handlungserfordernisse* (2001), 125–6; Schmidt-Tedd & Mick, *supra* n. 27, 152; for further information see M. Benkö & K.U. Schrogl, The UN Committee on the Peaceful Uses of Outer Space: Adoption of a Resolution on Application of the Concept of the 'Launching State' and Other Recent Developments, 54 *Zeitschrift für Luft- und Weltraumrecht* (2005), 57–67; as for the distinction of the 'launching States' and the state which 'procures' the launch, see B. Schmidt-Tedd & M. Gerhard, How to adapt the present regime for registration of space objects to new developments in space applications?, in *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space* (2006), 359; Schmidt-Tedd & Gerhard, *supra* n. 22, 132–3.

[32] See Art. VIII, Outer Space Treaty, *supra* n. 9, as already discussed above; this makes it necessary to determine jointly which state shall register the object. See further Art. II(2), Registration Convention, *supra* n. 9.

[33] UN GA Res 62/101, of 17 December 2007, 'Recommendations on enhancing the practice of States and international intergovernmental organisations in registering space objects', UN Doc A/AC.105/RES/62/101.

[34] See A. Kerrest de Rozavel & L.J. Smith, Article VII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 128 ff.

connection with the space objects in such cases and deny that they have 'procured' their launch. This implies that they are ready to accept (an overall) responsibility for the space activity, but not (potentially absolute) liability for damage caused by the space object.

National space laws should regulate clearly in which cases the state considers itself as the 'launching State' for the purpose of registration. Then it can demand that private operators submit the necessary information, which can then be forwarded to the UN registry.[35] States usually establish a certain procedure about how and when the operator of the space object must provide this information.

Concerning the national registry, Article II(3) of the Registration Convention provides that the contents of each registry and the conditions under which it is maintained can be determined by the state concerned. This is usually done in national space law, which sometimes also demands information additional to that required for the international register from the operator to be furnished for inclusion in the national registry.

3.2.3 Liability

The liability of states for damage caused by space objects is one of the most remarkable characteristics of international space law.[36] According to Article VII of the Outer Space Treaty, each state that launches or procures the launching of an object into outer space, and each state from whose territory or facility an object is launched, is internationally liable for damage to another state or to its natural or juridical persons by such object or its component parts.[37] This concept of state liability that has no ceiling and is not limited in time or territory[38] represents an incentive for states to take appropriate steps to minimize the risk of damage and to avoid this liability from becoming engaged. The state has a vital interest to ensure that the technology used is safe and that the operator is

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[35] Art. IV, Registration Convention, *supra* n. 9, establishes what kind of information shall be included in the UN registry, namely (a) the name of the 'launching State(s)'; (b) an appropriate designator of the space object or its registration number; (c) date and territory or location of launch; (d) basic orbital parameters, including (i) nodal period, (ii) inclination, (iii) apogee, (iv) perigee; and, finally, (e) the general function of the space object.

[36] See *supra*, esp. § 2.3.3.

[37] See also Kerrest de Rozavel & Smith, *supra* n. 34, 135–6.

[38] *Cf.* also Kerrest de Rozavel, *supra* n. 25, 135–9, esp. 136.

competent and reliable. These can best be achieved through national space legislation.

The Liability Convention elaborates the liability regime in more detail. It provides for absolute liability of the 'launching State' for damage caused by a space object on the surface of the earth or to aircraft in flight,[39] but fault liability in the event of damage being caused elsewhere.[40] This liability regime cannot be altered by national space laws. However, states can establish procedures and verification processes to minimize the risk of damage and their liability. Several states have also established a right of recourse, if the state has paid compensation for damage caused by a space object operated by a non-governmental operator. Frequently, states demand that the operator takes out insurance in order to guarantee that the amount is also recoverable in practice.[41]

As this brief overview of international law requirements has shown, the enactment of national space legislation is necessary and at least advisable for states which allow private enterprise to be involved in space activities. This is so because international law requires their 'authorization' and 'continuing supervision'. If there is no private sector involvement, national space legislation is not an immediate need. Nevertheless, states also tend to enact national space legislation, even if space activities there are still predominantly governmental. It can provide a practical legal framework and helps to formulate aims and priorities in the exploration and use of outer space. Furthermore, these states are then prepared for the day when private actors will also enter the scene. China, for instance, prepares comprehensive national space legislation even though space activities are still carried out only by state-owned entities.[42] Australia, on

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[39] See Art. II, Liability Convention, *supra* n. 9; further V. Kayser, *supra* n. 30, 50; A. Kerrest de Rozavel, Liability for Damage caused by Space Activities, in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 96.

[40] See Art. III, Liability Convention, *supra* n. 9. So far, no case of fault liability has been the subject of a dispute. The reason is that 'fault' in the conduct of space activities is difficult to establish. See the criticism by Kerrest de Rozavel, *supra* n. 39, 102.

[41] *Cf.* Kerrest de Rozavel, *supra* n. 39, 109; for further examples see Gerhard, *supra* n. 31, 150 ff.

[42] See Y. Zhao, Regulation of Space Activities in the People's Republic of China, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 247–65; F. Lyall & P.B. Larsen, *Space Law: A Treatise* (2009), 479–81.

the other hand, worked on its space law specifically for preparing the establishment of a significant commercial space launch industry.[43]

3.3 EXAMPLES OF NATIONAL SPACE LAWS

In the following, various types of national space law will be presented. They include comprehensive space acts as well as rudimentary acts, space laws of traditional spacefaring nations and laws enacted by small or emerging countries. The presentation begins with the traditional spacefaring nations, the United States and the Russian Federation, and some other Soviet Union successor states. Then, the European scene will be explored, which includes space laws pioneers as well as recent trends to comprehensive space acts and some examples of rudimentary laws. Outside Europe, there are also a few comprehensive space acts, but predominantly rather basic laws, which contain either national space policies and/or the establishment of national space agencies. An overview of some of these laws is provided in a table in the Appendix to this chapter.[44]

3.3.1 The Spacefaring Pioneers

3.3.1.1 The United States

Legal regulations relating to governmental and commercial space activities in the United States have developed over more than five decades. They have generally followed the development of space technology and geopolitical events.[45] As a result, US national space law has been

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[43] This did, however not take place to the extent expected. The Act about Space Activities, and for Related Purposes (hereafter Australian Space Activities Act), No. 123 of 1998, passed on 21 December 1998; *National Space Legislation of the World*, Vol. I (2001), 197 (as amended), see *Space Law – Basic Legal Documents*, E.VII.1; see also www.comlaw.gov.au/Details/C2010C00193, last accessed 12 April 2014. See further N. Siemon & S.R. Freeland, Regulation of Space Activities in Australia, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 40.

[44] The author wishes to thank Ms. Karin Traunmüller and Ms. Cordula Steinkogler, research assistants at the University of Vienna, for their invaluable help in putting together the table in the Appendix to this chapter.

[45] *Cf.* J.I. Gabrynowicz, One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues, 4 *Harvard Law and Policy Review* (2010), 405. See further e.g. I. Marboe & F. Hafner, Brief Overview over National Authorization Mechanisms in Implementation of

dispersed in a variety of different Acts, which has made the situation rather difficult and complex. However, on 18 December 2010, by way of Bill H.R.3237, a new title was inserted into the United States Code, namely Title 51, National and Commercial Space Programs, which brought a new structure into the existing laws and was intended to remove ambiguities.[46]

The new title replaces, first, the National Aeronautics and Space Act of 1958, which created the National Aeronautics and Space Administration (NASA) as the institution to execute the US civil space programme.[47] The new Chapter 201, henceforth also to be cited as the 'National Aeronautics and Space Act', contains a programmatic declaration of policy[48] and defines the functions and powers of NASA.[49] In addition, it includes general administrative provisions which regulate a number of issues, such as insurance, indemnification, contracts and intellectual property.[50] Other chapters deal with budget and accounting, contracting and procurement,[51] management and review,[52] international cooperation and competition,[53] and other issues.

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the UN International Space Treaties, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 40–2; P.G. Dembling, The National Aeronautics and Space Act of 1958: Revisited, 34 *Journal of Space Law* (2008), 203–20; S. Gorove, The Growth of Domestic Space Law: a U.S. Example, 18 *Journal of Space Law* (1990), 99 ff.; V. Kayser, An Achievement of Domestic Space Law: US Legislation of Private Commercial Launch Services, 16 *Annals of Air and Space Law* (1991), 341 ff.; M.J. Kleiman, J.K. Lamie & M.V. Carminati, *The Laws of Spaceflight* (2012), 71 ff.; P.A. Salin, An Overview of US Commercial Space Legislation and Policies – Present and Future, 27 *Air and Space Law* (2002), 209–36; P.A. Salin, US Space-Related Rules Adopted in 2005–2006, 32 *Air and Space Law* (2007), 179–94; P.A. Salin, An Illustration of the Privatisation Process of Outer Space, 50 *Zeitschrift für Luft- und Weltraumrecht* (2001), 217–36; P.A. Salin, Impact of Recent US Legislation and Regulations on International Satellite Communication Regulations, 48 *Zeitschrift für Luft- und Weltraumrecht* (1999), 52–5.

[46] See J.I. Gabrynowicz, United States. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.III, 1.

[47] National Aeronautics and Space Act, Public Law 85-568, 85th Congress, H.R. 12575, 29 July 1958; as amended through 1983; 72 Stat. 426; *Space Law – Basic Legal Documents*, E.III.1 (original instalment).

[48] See Sec. 20102, 51 U.S.C.

[49] See Secs. 20101–20117, 51 U.S.C.

[50] See Secs. 20131–20147, 51 U.S.C.

[51] See Ch. 310, 51 U.S.C.; Ch. 303, 51 U.S.C.

[52] See Ch. 305, 51 U.S.C.

[53] See Ch. 307, 51 U.S.C.

Chapter 601 replaces the 1992 Land Remote Sensing Policy Act[54] and regulates the Landsat programme as well as the licensing of private remote sensing space systems.[55] It reflects the US policy that since, in this sector, government funding continues to be necessary, commercialization is unachievable within the foreseeable future.[56] In compliance with Article VI of the Outer Space Treaty, the licensing regime makes it unlawful for any person subject to the jurisdiction and control of the United States to operate a private remote sensing space system without a licence.[57] At the same time it encourages accessibility of remote sensing data as well as commercial and scientific cooperation.[58]

The new Title 51 of the United States Code on 'National and Commercial Space Programs' by way of Chapter 509 now also includes the Commercial Space Launch Act of 1984, as amended in 1988, 1998 and 2004.[59] It is to encourage, facilitate and promote commercial space launches by the private sector. It contains the licensing regime for private space launches and deals with the issuance and transfer of launch and re-entry licences. The issuance of the respective licences is a competence

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54 Land Remote Sensing Policy Act, Public Law 102-555, 102nd Congress, H.R. 6133, 28 October 1992; 15 U.S.C. 5601; 106 Stat. 4163.

55 Chapter 601 – Land Remote Sensing Policy. While the Landsat programme, which deals with data generated by the US governmental remote sensing satellite Landsat-7, is managed by the NASA Administrator together with the Secretary of Defense, the licensing of a private remote sensing space system falls under the responsibility of the Secretary of Commerce. See Sec. 60101(11), in conjunction with Sec. 60121, in contrast to Sec. 60111, 51 U.S.C.

56 *Cf.* Gabrynowicz, *supra* n. 45, 414.

57 See also Overview of U.S. Law Governing Space Activities, UN Doc. A/AC.105/C.2/2008/CRP.9, 7.

58 See Overview of U.S. Law Governing Space Activities, *supra* n. 57; also E. Sadeh, Politics and Regulation of Earth Observation Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 452 ff.

59 Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law – Basic Legal Documents*, E.III.3; as amended in 1988 by the Commercial Space Launch Act Amendments, Public Law 100-657, 100th Congress, H.R. 4399, 15 November 1988; 49 U.S.C. App. 2615; 102 Stat. 3900; *Space Law – Basic Legal Documents*, E.III.3, 13 ff.; in 1998 by the Commercial Space Act, Public Law 105-303, 105th Congress, H.R. 1702, 27 January 1998; 42 U.S.C. 14731; and in 2004 by the Commercial Space Launch Amendments Act, Public Law 108-492, 108th Congress, H.R. 3752, 23 December 2004, 49 U.S.C.; 118 Stat. 3974. See *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.III.3.1-4. See also *infra*, § 12.3.4.2, 3.

of the Office of Commercial Space Transportation of the Federal Aviation Administration (FAA) of the US Department of Transportation.[60]

A licence is required for the launch of a launch vehicle or the operation of a launch site or re-entry site, or the re-entry of a re-entry vehicle, in the United States. For the same activities outside the United States, citizens of the United States or corporations or other entities organized or existing under the law of the United States also need a licence. Outside the United States, corporations or other entities under the controlling interest of US citizens or corporations are only covered by the law if there is a pertinent agreement between the foreign government and the United States.[61]

Licence applicants must obtain policy and safety approvals from the FAA.[62] In addition, they are required to take out insurance or otherwise demonstrate their ability to compensate liability claims brought by third parties or the US government for damage to government property resulting from the licensed activity. The amount to be covered is the 'maximum probable loss', which is determined by the FAA. For third-party claims, this amount should not exceed US$ 500 million or 'the maximum liability insurance available on the world market at a reasonable cost',[63] while for governmental claims the limit is US$ 100 million or the maximum insurance available at a reasonable cost.[64] In the event a third party succeeds in bringing a claim in excess of the licensee's insurance, the US government will cover the additional amount up to a total claim of US$ 1.5 billion (as adjusted for inflation after 1 January 1989).[65] This system of limited liability of the licensee, of insurance, of the state warranty and the concept of a 'maximum probable loss' represents a model which has been followed by national legislation in several other countries.

The Commercial Space Launch Amendments Act of 2004 added a number of provisions which relate to recent developments in 'space tourism'.[66] The Act requires commercial sub-orbital flight operators to

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[60] See Kayser, *supra* n. 30, 79–86, 94–6; P. Vorwig, Regulation of Private Launch Service in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 405.

[61] See Sec. 50904(a) (4), 51 U.S.C.

[62] See Vorwig, *supra* n. 60, 405, 409–10.

[63] See 14 C.F.R. § 440.9(c).

[64] See 14 C.F.R. § 440.9(e).

[65] See 14 C.F.R. § 440.19(a).

[66] See e.g. Gabrynowicz, *supra* n. 45, 418; T.R. Hughes & E. Rosenberg, Space Travel Law (and Politics): The Evolution of the Commercial Space

make several written informational disclosures in order to obtain the 'informed consent' of customers, the so-called 'space flight participants'.[67] This system establishes that the space flight participants, and not the operator, bear the risk and that they are not entitled to the benefits of the liability insurance coverage.[68]

As regards registration, each licensee is required to provide the Office of Commercial Space Transportation with the information necessary to enable the US government's implementation of Article IV of the Registration Convention, unless the object is owned and registered by a foreign entity.[69]

In addition to these Acts specifically addressed to space activities, a number of existing laws from other areas were declared applicable to space activities. One prominent example is the 1934 Communications Act,[70] which was declared to be applicable to private operators of space communications activities in 1970.[71] The Federal Communications Commission (FCC) is responsible for regulating the use of radio spectrum in the United States and for assigning licences for space stations and earth stations.[72] The FCC issues licences based upon a demonstration that the proposed operations will serve the public interest, convenience and necessity.[73] The FCC may also adopt rules to carry out the Communications Act. It has done so, among other things, to address the problem of space debris and now requires the submission of an orbital debris mitigation plan.[74]

Launch Amendments Act of 2004, 31 *Journal of Space Law* (2005), 3 ff. See also further *infra*, § 12.3.4.3.

67 See 14 C.F.R. § 460.45 (2009).

68 *Cf.* further in detail *infra*, §§ 12.3.4.3, 12.3.4.3.4.

69 See 14 C.F.R., § 417.19; see also Vorwig, *supra* n. 60, 413.

70 Communications Act, 19 June 1934; 47 U.S.C. 151 (1988); 48 Stat. 1064; see also Federal Communications Commission (FCC), www.fcc.gov/Reports/1934new.pdf, last accessed 12 April 2014. It is the purpose of the US Communications Act of 1934, among other things, to maintain the control of the United States over all the channels of radio transmission. Up to now there have been several amendments to this Act. Space activities in the field of radio communications are authorized by the FCC.

71 Communications Satellite Facilities, First Report and Order, 22 FCC 2d 86 (1970), Appendix C, p. 1; see further P. Meredith, Licensing of Private Space Activities in the United States, 22 *Annals of Air and Space Law* (1997), 414.

72 See Sec. 151, 47 U.S.C.; also Vorwig, *supra* n. 60, 405, 421.

73 See Overview of U.S. Law Governing Space Activities, *supra* n. 57, 10.

74 See Overview of U.S. Law Governing Space Activities, *supra* n. 57, 10.

As this brief overview shows, US national space law comprises a series of laws and regulations applicable to space activities. The codification and creation of the new Title 51 of the U.S.C. has improved this situation, but the legal framework of space activities in the United States remains complex.

3.3.1.2 The Russian Federation

Even though the Union of Soviet Socialist Republics (Soviet Union) was one of the world's two space pioneers and launched the first satellite in 1957, Sputnik-1, and the first man on board a spacecraft in 1961, it did not have national laws regulating space activities. Space activities were mainly regulated by special resolutions and decisions of state and political bodies.[75] Only after the collapse of the Soviet Union in 1991 did the process of establishing an appropriate legal framework for space activities start.

The first step was the creation of the Russian Space Agency by a presidential decree,[76] later transformed into the Space Agency of the Russian Federation (Roskosmos),[77] which is responsible for the overall conduct of space activities. On the one hand, its task is to draft and implement the federal space policy, while on the other it is also responsible for the organization, coordination and implementation of commercial space projects. This includes the issuance of licences for various types of space activities. Roscosmos is also the competent body to ensure the safety of space activities and for equipment and technology certification, as well as for many other tasks assigned to it by the government.[78]

The core piece of Russian space legislation is the Federal Law on Space Activities of 20 August 1993.[79] It is a general framework which

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[75] See S.P. Malkov & C. Doldirina, Regulation of Space Activities in the Russian Federation, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 315.

[76] Decree No. 185 on Space Activities Administration Structure in the Russian Federation, of 25 February 1992. In 1999, it was transformed into the Russian Aero-Space Agency by Decree No. 651 on Federal Executive Power Bodies Structure.

[77] As per Decree No. 314, of 9 March 2004.

[78] The organization and the functions of Roscosmos are regulated in detail in the Charter of the Federal Space Agency, Government Regulation No. 314 of 26 June 2004, as amended on 14 December 2006. See Malkov & Doldirina, *supra* n. 75, 320.

[79] Law of the Russian Federation on Space Activities (hereafter Russian Law on Space Activities), No. 5663-1, 20 August 1993, effective 6 October

does not contain exhaustive provisions on all aspects of space activities but refers to other special laws and government regulations in many aspects.[80] The Law primarily regulates the Russian Federal Space Programme, the long-term planning instrument and basis for the development and use of outer space technology for scientific and socio-economic purposes by the state.[81]

The definition of 'space activities' contained in the Law is rather broad. It covers 'any activity connected with direct operations to explore and use outer space, including the Moon and celestial bodies'.[82] The main areas of space activities include scientific space research, use of space technology for communications, television and radio broadcasting, remote sensing of the earth from outer space, including environmental monitoring and meteorology, use of navigation, topographical and geodesic satellite systems, manned space missions, use of space technology, materials and techniques to ensure defence and security of the Russian Federation, observation of objects in outer space conditions, manufacturing of materials and other products in outer space and other types of activity performed by means of space technology.[83]

1993; *National Space Legislation of the World*, Vol. I (2001), at 101; *Space Law – Basic Legal Documents*, E.IV.1; see also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/russian_federation/decree_5663-1_E.html, last accessed 12 April 2014.

[80] See D. Marenkov & B. Schmidt-Tedd, Russian Federation. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.IV, 1. Further e.g. H.J. Heintze, Das russische Weltraumgesetz vom 20. August 1993, 44 *Zeitschrift für Luft- und Weltraumrecht* (1995), 35–7; E. Kamenetskaya, V.S. Vereshchetin & E. Zhukova, Legal Regulation of Space Activities in Russia, 9 *Space Policy* (1993), e.g. 121; Marboe & Hafner, *supra* n. 45, 42–3; A. Fassakhova, Russian Space Legislation, in *Proceedings of the United Nations/International Institute of Air and Space Law Workshop: Capacity Building in Space Law* (2003), 192 ff.; M. Gerhard & D. Marenkov, Zur Lizenzierung von Weltraumaktivitäten in Russland, 56 *Zeitschrift für Luft- und Weltraumrecht* (2007), 211–29; D. Marenkov, Zum Russischen Weltraumgesetz in seiner aktualisierten Fassung vom 2. Februar 2006, 56 *Zeitschrift für Luft- und Weltraumrecht* (2007), 58–86; F. Tesselkin & D. Marenkov, Änderungen im Gesetz der Russischen Föderation über Weltraumaktivitäten vom 20. August 1993, 51 *Zeitschrift für Luft- und Weltraumrecht* (2002), 25–47.

[81] *Cf.* Art. 8(1), Russian Law on Space Activities, *supra* n. 79. The current Federal Space Programme was adopted by Federal Government Resolution No. 635 of 22 October 2005 and covers the period from 2006 to 2015. See Malkov & Doldirina, *supra* n. 75, 320.

[82] Art. 2, Russian Law on Space Activities, *supra* n. 79.

[83] See Art. 2, Russian Law on Space Activities, *supra* n. 79.

As regards the authorization procedure required by Article VI of the Outer Space Treaty, the Russian Law on Space Activities determines that space activities need a licence.[84] As regards the scope of application of such an obligation, the Law refers to organizations and citizens of the Russian Federation or space activities of foreign organizations and citizens under the jurisdiction of the Russian Federation.[85]

The licensing procedure is regulated in more detail in the Law on Licensing of Certain Activities[86] and in the Statute on Licensing of Space Activities.[87] The licensing requirements and conditions are elaborated in detail in the Statute on Licensing of Space Activities. They include safety standards and technical quality control, ownership or legal titles to use premises, facilities and equipment, availability of qualified and professionally educated specialists and the observance of international obligations of the Russian Federation.[88] As regards compliance with safety standards, the Russian Law on Space Activities stipulates that space activities shall be performed with due attention to the permissible level of man-made contamination of the environment and near-earth space.[89] Roscosmos and the Ministry of Defence are the main controlling bodies, which must, amongst other things, inform relevant governing institutions and citizens about any threats to security caused by space activities.[90]

Concerning registration, the Russian Law on Space Activities provides that space objects of the Russian Federation shall be subject to registration and shall have marking certifying that they are owned by the Russian Federation.[91] With regard to space objects owned by private entities, the Law is silent. If a space object is designed and manufactured by Russian organizations and citizens jointly with foreign organizations and citizens or international organizations, the issues of the registration of such

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[84] See Art. 9, Russian Law on Space Activities, *supra* n. 79.

[85] See Art. 9(2), Russian Law on Space Activities, *supra* n. 179; also Schematic Overview of National Regulatory Frameworks for Space Activities, UN Doc. A/AC.105/C.2/2012/CRP.8, 36–7.

[86] Law on Licensing of Certain Activities No. 128-FZ of 8 August 2001, as amended. See Malkov & Doldirina, *supra* n. 75, 328.

[87] Statute on Licensing of Space Activities of 30 June 2006, approved by the Regulation of the Government of the Russian Federation Nr. 403 of 30 June 2006 (hereafter Russian Statute on Licensing), *Space Law – Basic Legal Documents*, E.IV.2.

[88] See Art. 4, Russian Statute on Licensing, *supra* n. 87.

[89] See Art. 22, Russian Law on Space Activities, *supra* n. 79.

[90] See Art. 22(1), Russian Law on Space Activities, *supra* n. 79; also Malkov & Doldirina, *supra* n. 75, 327.

[91] See Art. 17(1), Russian Law on Space Activities, *supra* n. 79.

object, the jurisdiction and control over it and the issues of the rights of ownership thereof shall be decided on the basis of the appropriate international treaties.[92]

With regard to liability, the Russian Law on Space Activities explicitly states that the Russian Federation is liable for damage caused by its space object within its territory or outside, with the exception of outer space, irrespective of fault.[93] This goes beyond Article VII of the Liability Convention as it also covers damage caused within the Russian territory.[94] The Law provides, however, for a right of recourse of the government against organizations and citizens responsible for the space object causing the damage. If the damage is caused in any place except on the surface of the earth to another space object, compensation is due according to the general rules established by the Civil Code of the Russian Federation.[95]

Concerning insurance, the Russian Law on Space Activities establishes a two-tier system of compulsory and voluntary insurance of space activities.[96] Insurance is compulsory with regard to the health and life of cosmonauts, space infrastructure personnel and liability for damage caused to the life, health or property of third parties. Compulsory insurance premiums shall be transferred to the Russian Space Fund or other insurance companies which have obtained a licence for the insurance of a space activity, and shall be used to compensate for damage as a result of accidents while carrying out a space activity on the basis of contracts of insurance with organizations and citizens carrying out such activity. Voluntary insurance may be taken out for space equipment and the risk of loss or damage to it.[97]

Despite the fact that legislation adopted in the Russian Federation developed relatively recently, the legal framework today is already very complex. In addition to the Russian Law on Space Activities numerous resolutions and decrees have been enacted which address various aspects of the different types of space activity, including the Russian Federation's participation in the International Space Station.[98] Under the existing laws

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92 *Cf.* Art. 17(4), Russian Law on Space Activities, *supra* n. 79.

93 See Art. 30(1), Russian Law on Space Activities, *supra* n. 79.

94 Art. VII, Liability Convention, *supra* n. 9, excludes all claims by Russian citizens or launch invitees on Russian territory from its scope.

95 *Cf.* Art. 30(2) Russian Law on Space Activities, *supra* n. 79.

96 *Cf.* Art. 25, Russian Law on Space Activities, *supra* n. 79; see also Malkov & Doldirina, *supra* n. 75, 327.

97 *Cf.* Art. 25(2), Russian Law on Space Activities, *supra* n. 79.

98 On the International Space Station, see further *infra*, §§ 11.2–11.7.

and regulations, private sector participation in space activities is possible but not yet addressed in more detail. In particular, the regulation of 'space tourists' is still done on a case-by-case basis.[99]

3.3.1.3 Other Soviet Union successor states: Ukraine and Kazakhstan

Ukraine has inherited a modern industrial base and sophisticated technologies from the former Soviet Union.[100] After it became independent, the first step in this area was the establishment of a Ukrainian National Space Agency by presidential decree.[101] The legislative act was then enacted in 1996, as the Law of the Ukraine on Space Activities.[102] The main motive for that legislation was to establish a reliable regulatory framework for the Ukrainian space industry.[103] The Law contains the competences of the National Space Agency and general rules applicable to space activities.

A licence is required for space activities carried out in Ukraine or under the jurisdiction of Ukraine outside its borders.[104] This likely does not comprise personal jurisdiction over space activities carried out by Ukrainian citizens abroad.[105] The definition of 'space activity' is rather wide, referring to 'scientific space research, the design and application of space technology and the use of outer space'.[106] It is the task of the National Space Agency to issue the licence and to supervise the space activities with regard to safety requirements and the protection of the

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[99] *Cf.* also further *infra*, § 11.4.3, incl. 1.

[100] See A. Grigorow, Ukraine. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.VIII, 1.

[101] Decree No. 117 of 29 February 1991 on the Creation of the Ukrainian National Space Agency.

[102] Law of the Ukraine on Space Activities (hereafter Ukrainian Law on Space Activities), No. 502/96-VR, 15 November 1996; *National Space Legislation of the World*, Vol. I (2001), at 36; www.oosa.unvienna.org/oosa/en/SpaceLaw/national/ukraine/ordinance_on_space_activity_1996E.html, last accessed 13 April 2014; see also *Space Law – Basic Legal Documents*, E.VIII.1. *Cf.* further e.g. Marboe & Hafner, *supra* n. 45, 43–4; F.G. von der Dunk & S.A. Negoda, Ukrainian National Space Law from an International Perspective, 18 *Space Policy* (2002), 15–23.

[103] See M. Gerhard, The Law of Ukraine on Space Activities, in 51 *Zeitschrift für Luft- und Weltraumrecht* (2002), 57.

[104] See Art. 10, Ukrainian Law on Space Activities, *supra* n. 102.

[105] *Cf.* Gerhard, *supra* n. 103, 58.

[106] Art. 1, Ukrainian Law on Space Activities, *supra* n. 102.

population and the environment.[107] It is notable that the conditions for a licence include a number of obligations explicitly contained in the UN treaties on outer space, for example the prohibition of insertion in orbit and placing in space by whatsoever means nuclear weapons or any other types of weapon of mass destruction.[108] With the exception of Australia and South Africa, national space laws do not contain similarly explicit provisions.[109]

The Ukrainian Law on Space Activities is very clear on the duty to register and provides detailed provision on the State Register of Space Facilities of Ukraine and how registration should be effected in accordance with Regulations Governing the Registration of Space Facilities in Ukraine.[110] It also contains provisions on the removal of space facilities from the State Register.[111]

Concerning liability, the Ukrainian Law on Space Activities does not contain a specific regime but establishes that compensation for damage shall be payable in conformity with Ukrainian legislation currently in force.[112] Similarly, the types of compulsory insurance to be taken out in connection with the pursuit of space activity shall be established by the Ukrainian legislation currently in force.[113] The procedures for compulsory insurance shall be established by the Cabinet of Ministers.[114] This leaves some important questions open so that it is difficult to say whether the legal situation in Ukraine is beneficial to private space activities or not.[115]

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107 See Arts. 20–25, Ukrainian Law on Space Activities, *supra* n. 102.

108 *Cf.* Art. 9, Ukrainian Law on Space Activities, *supra* n. 102. On the issue of weapons of mass destruction in the context of space law see also *infra*, § 6.3.1.

109 *Cf.* Arts. 26(3)(f) and 29(b), Australian Space Activities Act, *supra* n. 43, referencing dual-purpose technologies and weapons of mass destruction in the context of space and licensing policies respectively, Secs. 1, 6th & 29th bullet and 2(1)(b), Space Affairs Act (hereafter South African Space Affairs Act), 6 September 1993, assented to on 23 June 1993, No. 84 of 1993; Statutes of the Republic of South Africa – Trade and Industry, Issue No. 27, 21–44; *National Space Legislation of the World*, Vol. I (2001), at 413; as amended 1995, see *Basic Legal Documents*, *E.V*, see also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/south_africa/space_affairs_act_1993E.html, last accessed 13 April 2014.

110 See Art. 13, Ukrainian Law on Space Activities, *supra* n. 102.

111 *Cf.* Art. 14, Ukrainian Law on Space Activities, *supra* n. 102.

112 *Cf.* Art. 25, Ukrainian Law on Space Activities, *supra* n. 102.

113 *Cf.* Art. 24, Ukrainian Law on Space Activities, *supra* n. 102.

114 *Ibid*.

115 See also Gerhard, *supra* n. 103, 59.

Kazakhstan has most recently enacted its national space law.[116] The former Soviet Union has had a vital role for important space missions, as the Kazakh spaceport at Baikonur was one of the prime launching facilities in Soviet times. It is from there that the first satellite and the first person were sent to outer space. The new Kazakh Law on Space Activities lays down a comprehensive legal framework governing space activities under the jurisdiction of Kazakhstan. Prior to its adoption, space activities were regulated by a number of separate legislative acts, by-laws and bilateral and multilateral agreements.[117] In particular, the bilateral agreements between the Russian Federation and Kazakhstan on the use of the Baikonur Cosmodrome have played a central role.[118] It follows that also the new law has a clear emphasis on the regulation of launch services. It is notable that the law explicitly excludes the possibility of privatization of the launching facility at Baikonur.[119]

The Kazakh Law on Space Activities establishes that space activities carried out by natural or legal persons require a licence.[120] The licence is issued by the National Space Agency, which is responsible for the implementation of the national space policy and for securing compliance

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[116] Law No. 528-IV on Space Activities of the Republic of Kazakhstan (hereafter Kazakh Law on Space Activities), of 6 January 2012. For a brief overview see B. Schmidt-Tedd & O. Stelmakh, Einführung in das Gesetz der Republik Kasachstan über Weltraumaktivitäten, 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 426–50; *cf.* also G. Omarova, Perspectives for National Space Legislation in Kazakhstan, in *'Project 2001 Plus' – Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2006), 93–8.

[117] *Cf.* B. Schmidt-Tedd & O. Stelmakh, Capacity-Building of the National Space Legislation in Post-Soviet Countries: The Recent Contribution of Kazakhstan, Abstract; www.iafastro.net/iac/archive/tree/IAC-12/E7/5/IAC-12,E7,5,4,x13037.brief.pdf, last accessed 13 April 2014.

[118] See Agreement between the Russian Federation and the Republic of Kazakhstan on Basic Principles and Terms of the Utilization of the Baikonur Cosmodrome, Moscow, done 28 March 1994, entered into force 10 December 1994; 30 *Journal of Space Law* (2004), 26; see also Agreement between the Russian Federation and the Republic of Kazakhstan on the Cooperation in the Effective Use of the Baikonur Facility, Astana, done 9 January 2004; 30 *Journal of Space Law* (2004), 32; also M. Bjornerud, Baikonur Continues: The New Lease Agreement Between Russia and Kazakhstan, 30 *Journal of Space Law* (2004), 18 (with agreements appended). *Cf.* further M. Hosková, The 1994 Baikonur Agreements in Operation, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 263–72.

[119] See Art. 23, Kazakh Law on Space Activities, *supra* n. 116.

[120] See Art. 13, Kazakh Law on Space Activities, *supra* n. 116.

with technical safety standards and ensuring environmental protection.[121] Concerning registration, the Law distinguishes between space objects of natural and legal persons of the Republic of Kazakhstan and space objects launched by foreign natural or legal persons.[122] Concerning the former, the Law provides a detailed list of information which has to be provided and information on the procedure for registration. For registration of the latter, only basic information is required.[123]

The issues of liability for damage and insurance are only covered in a relatively vague manner, basically referring to more technical legislative acts.[124] It is remarkable, however, that the Kazakh Law on Space Activities provides that, in case of contradiction with an international treaty ratified by the Republic of Kazakhstan, the latter shall prevail.[125] In contrast to the space laws of the Russian Federation and Ukraine, the new Kazakh Law on Space Activities concentrates on one particular space activity, namely the use and exploitation of the cosmodrome at Baikonur. However, this is an important step to more legal certainty for prospective customers, public or private, from abroad.

3.3.2 European Space Law Pioneers

The first state to enact a national space law in Europe was Norway, which enacted a national law on space launches as early as 1969. Another Scandinavian country, Sweden, came next with its Act on Space Activities of 1982. The last of the early birds was the United Kingdom with its Outer Space Act of 1986.

3.3.2.1 Norway

The Act on launching objects from Norwegian territory into outer space[126] was enacted at a time when only the Outer Space Treaty had

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121 *Cf.* Art. 9, Kazakh Law on Space Activities, *supra* n. 116.

122 *Cf.* Art. 11, Kazakh Law on Space Activities, *supra* n. 116.

123 See Schmidt-Tedd & Stelmakh, *supra* n. 117, n. 47 and accompanying text.

124 *Cf.* Schmidt-Tedd & Stelmakh, *supra* n. 117, n. 52 and accompanying text.

125 See Art. 2(2), Kazakh Law on Space Activities, *supra* n. 116.

126 Act on launching objects from Norwegian territory into outer space (hereafter Norwegian Act on Launching), No. 38, 13 June 1969; *National Space Legislation of the World*, Vol. I (2001), at 286; *Space Law – Basic Legal Documents*, E.XVII; see also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/norway/act_38_1969E.html, last accessed 13 April 2014. *Cf.* further e.g. Marboe & Hafner, *supra* n. 45, 33–4; F.G von der Dunk & A. Nikolaisen,Vikings

been concluded, but not any of the subsequent treaties. Norway even published its national space law before it became a party to the Outer Space Treaty on 1 July 1969.[127]

The Norwegian Act on Launching is very short and consists of only three articles. It provides that, without permission from the Norwegian ministry concerned, it is forbidden to launch any object into outer space from Norwegian territory or Norwegian vessels, aircrafts and such like. In this regard, the requirement of authorization pursuant to Article VI of the Outer Space Treaty is met. Yet, Norway only applies territorial jurisdiction, not personal jurisdiction. Furthermore, the scope of application of the law is limited to 'launches', so that other space activities are not covered. The Act does not specify the requirements or conditions for obtaining permission so that the competent ministry, the Ministry of Trade and Industry, enjoys large discretion.[128] In addition, the Act does not contain any provision on registration, liability or insurance.

It follows that the Norwegian Act only covers a very small segment of space activities and related legal issues. However, so far, the Act seems to respond to the actual needs of the state. The cases for application of the law are the launches carried out from the Andøya rocket launch site.[129]

3.3.2.2 Sweden

Sweden was the next European state that enacted national space legislation. Both the Act on Space Activities[130] and the Decree on Space

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First in National Space Law: Other Europeans to Follow – The Continuing Story of National Implementation of International Responsibility and Liability, in *Proceedings of the Forty-Fourth Colloquium on the Law of Outer Space* (2002), 111–21.

[127] *Cf.* F.G. von der Dunk, Current and Future Development of National Space Law and Policy, in *Disseminating and Developing International and National Space Law: The Latin America and Caribbean Perspective* (2005), 41.

[128] See further von der Dunk, *supra* n. 127, 42.

[129] *Cf.* F.G. von der Dunk, The Legal Basis for National Space Legislation – With Special Reference to the Old/New Norwegian Act on Launching Objects from Norwegian Territory into Outer Space, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 578.

[130] Act on Space Activities (hereafter Swedish Act on Space Activities), 1982: 963, 18 November 1982; *National Space Legislation of the World*, Vol. I (2001), 398; *Space Law – Basic Legal Documents*, E.II.1; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 11; also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/sweden/act_on_space_activities_1982E.html, last accessed 13 April 2014.

Activities[131] were adopted in 1982. The Swedish Act on Space Activities requires a licence for non-governmental space activities carried out from Swedish territory or by a Swedish natural or juridical person.[132] It thus encompasses territorial and personal jurisdiction over space activities. Space activities requiring a licence are the launching of objects into outer space and all measures to manoeuvre or in any other way affect objects launched into outer space. Explicitly excluded are the reception of signals or information in some other form from objects in outer space and the launching of sounding rockets.[133]

An application for a licence shall be submitted to the Swedish National Space Board, which is a central governmental agency under the Ministry of Industry, Employment and Communications[134] and which exercises control over the space activities of licensees.[135] As the Swedish Act on Space Activities does not provide details on the conditions for authorization, the Board enjoys wide discretion.

The national register for space objects required by the Registration Convention is established in the Swedish Decree on Space Activities.[136] The information to be submitted corresponds to the requirements of Article IV of the Registration Convention.[137] With regard to liability for damage, the Swedish Act on Space Activities provides that, if the Swedish state on the basis of international agreements has been liable for damage caused by a space activity, the persons who have carried on the space activity shall reimburse the state that which has been disbursed,

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131 Decree on Space Activities (hereafter Swedish Decree on Space Activities), 1982: 1069; *National Space Legislation of the World*, Vol. I (2001), 399; *Space Law – Basic Legal Documents*, E.II.2; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 11; also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/sweden/decree_on_space_activities_1982E.html, last accessed 13 April 2014.

132 See N. Hedman, Swedish Legislation on Space Activities, in *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008), 74; N. Hedman, Vertices of an Administrative Procedure/Costs: The Swedish Experience, in *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004), 75; Marboe & Hafner, *supra* n. 45, 34.

133 See Sec. 1, Swedish Act on Space Activities, *supra* n. 130.

134 *Cf.* Hedman, Vertices, *supra* n. 132, 77.

135 See Sec. 3, Swedish Act on Space Activities, *supra* n. 130; Sec. 1, Swedish Decree on Space Activities, *supra* n. 131.

136 See Sec. 4, Swedish Decree on Space Activities, *supra* n. 131.

137 *Cf. supra*, § 3.2.2, esp. n. 35.

unless special reasons tell against this.[138] Here, the divergence from the language of the UN treaties, which establish liability for damage caused by 'space objects' and not for 'space activities', is notable. This difference can be regarded as an extension of the duty to reimburse, not merely in cases of liability under Article VII (and the respective provisions of the Liability Convention) but also in cases of responsibility under Article VI of the Outer Space Treaty, where the state has to pay compensation. Finally, Swedish space legislation does not contain a provision on insurance. An insurance requirement can, however, be included in the conditions for authorization.

3.3.2.3 The United Kingdom

The United Kingdom has enacted national space legislation as a response to the activities of British companies engaging in procuring the launch of, and subsequently operating, satellites.[139] The Outer Space Act of 1986[140] was thus a consequence of the start of commercialization of space activities.

The United Kingdom was primarily concerned with compliance with the obligations of the state deriving from international space law.[141] The

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[138] See Sec. 6, Swedish Act on Space Activities, *supra* n. 130.

[139] See R. Close, UK Outer Space Act 1986: Scope and Implementation, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 579; M. Sánchez Aranzamendi, *Economic and Policy Aspects of Space Regulations in Europe*, *ESPI Report* (2009), 17. *Cf.* further e.g. Marboe & Hafner, *supra* n. 45, 35–6; T. Ballard, United Kingdom Outer Space Act, in *Proceedings of the United Nations/International Institute of Air and Space Law Workshop: Capacity Building in Space Law* (2003), 206 ff.

[140] Outer Space Act (hereafter UK Outer Space Act), 18 July 1986, 1986 Chapter 38; *National Space Legislation of the World*, Vol. I (2001), at 293; *Space Law – Basic Legal Documents*, E.I; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 12; also www.legislation.gov.uk/ukpga/1986/38/introduction, last accessed 13 April 2014; as to the applicability of the Law to the Crown dependencies and the British overseas territories see S. Mosteshar, Regulation of Space Activities in the United Kingdom, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 359–60. See further on satellite communications in general e.g. P.J. Dann, *Law and Regulation of Satellite Communications in the United Kingdom*, 20 Journal of Space Law (1992), 17–21; on space debris-related regulation R. Tremayne-Smith, Environmental Protection and Space Debris Issues in the Context of Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 185–7.

[141] See R. Crowther & R. Tremayne-Smith, Safety Evaluation within the United Kingdom's Outer Space Act, in *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004), 79.

UK Outer Space Act conferred licensing of space activities and other powers to the Secretary of State for Innovation, Universities and Skills, who carried these powers out through the British National Space Centre (BNSC).[142] On 1 April 2010, following a public consultation on the funding and management of UK civil space activities and recommendations in the Space Innovation and Growth Strategy report, the new UK Space Agency was established to replace the BNSC with the objective of unification of all UK civil space activities under one single management.[143]

The core of the Act is the licensing regime which covers launching or procuring the launch of a space object, the operation of a space object and 'any other activity in outer space'.[144] Licences must be obtained for activities carried out in the United Kingdom or elsewhere by UK nationals and bodies incorporated under the law of any part of the United Kingdom, as well as 'Scottish firms'.[145] The UK Outer Space Act contains relatively detailed conditions for licences, but additional conditions may be prescribed in the licence.[146] These conditions address public health and safety, contamination of outer space or adverse changes in the environment of the earth, international obligations of the United Kingdom and national security concerns.

A national register of space objects shall be maintained by the Secretary of State in which the particulars of the space objects should be entered, as laid down by the Secretary of State to ensure compliance by the United Kingdom with its international obligations.[147] However, the United Kingdom does not consider itself as a 'launching State' in the case of space objects launched by private entities.[148] This is a rather limited interpretation of the expression 'procurement', which seems to run counter to efforts at unifying jurisdiction and control over a space object with responsibility over it.[149]

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[142] See Sec. 4, UK Outer Space Act, *supra* n. 140; Mosteshar, *supra* n. 140, 360.

[143] See S. Mosteshar, *supra* n. 140, 358.

[144] See Sec. 1, UK Outer Space Act, *supra* n. 140.

[145] See Sec. 2, UK Outer Space Act, *supra* n. 140. A 'Scottish firm' is a specific type of company established under Scottish law.

[146] See Secs. 4, 5, UK Outer Space Act, *supra* n. 140.

[147] See Sec. 7, UK Outer Space Act, *supra* n. 140.

[148] See R. Tremayne-Smith, UK Registration Policy and Practice, in *Proceedings of the Project 2001 Plus Workshop: Current Issues in the Registration of Space Objects* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2005), 59.

[149] *Cf.* Schmidt-Tedd & Mick, *supra* n. 27, 137; see also the discussion about the most appropriate state to register, *supra*, § 3.2.2.

A person to whom the UK Outer Space Act applies has an obligation to indemnify the government against any successful claims in respect of damage or loss arising out of activities carried on by him.[150] Otherwise, general tort and contract law applies to space activities. The licence may contain an obligation to take out insurance against liability in respect of damage or loss suffered by third parties.[151]

The UK Outer Space Act is a comprehensive act of national legislation, which responds to all requirements of international law mentioned above and, in addition, ensures that space activities are in compliance with the state's other international obligations and national security interest. It does not, however, contain provisions which are particularly favourable for space operators and likely to foster the national space industry. The most striking aspect in this regard is the lack of a ceiling for the right of recourse of the government in case of the state's liability; as indicated, at present consultations regarding a cap of the indemnity at an insurable level, possibly to be determined at €60 million, are still continuing.

3.3.3 European Comprehensive Space Acts

In the first decade of the 21st century, a number of European states started actively to debate the development of national space legislation. This was primarily due to the increasing engagement of private and commercial entities in space activities. They included both large commercial companies and small research projects undertaken by universities and research institutions. These recent European laws have in common that they intend to provide a comprehensive legal framework for national space activities and are intended to address specific private space activities existing in the particular countries.

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[150] See Sec. 10(1), UK Outer Space Act, *supra* n. 140.

[151] See Sec. 5(2)(f), UK Outer Space Act, *supra* n. 140. The insurance requirement was reduced from £100 million to €60 million on 4 July 2011. Following up these changes, the government has started a consultation process on proposed changes to the UK Outer Space Act as to whether a cap to the unlimited liability requirement of €60 million should be introduced. See UK Space Agency, *Reform of the Outer Space Act 1986*, Consultation Document, of 31 May 2012; www.bis.gov.uk/assets/ukspaceagency/docs/osa/consultation-reform-of-the-outer-space-act.pdf, last accessed 13 April 2014; also UK Space Agency, *Reform of the Outer Space Act 1986: Summary of responses and Government response to consultation*, UKSA/13/1326, of 6 December 2013, www.bis.gov.uk/assets/ukspaceagency/docs-2013/gov-response-osa-consultation.pdf, last accessed 13 April 2014.

3.3.3.1 France

France is one of the most important spacefaring states in Europe, but nevertheless has not enacted national space legislation for a long time.[152] Until June 2008, the regulatory framework for space activities had been determined by general civil, administrative and criminal law, and by specific laws applicable to certain activities, such as telecommunication and broadcasting, as well as by administrative practices.[153] This situation changed when the French Law on Space Operations (*Loi relative aux opérations spatiales*) of June 2008[154] entered into force. Its main purpose was to set up a national regime to authorize and control space operations in conformity with the French government's international commitments.[155] Several decrees followed, which contained detailed provisions necessary for the implementation of the French Law on Space Operations in practice.[156]

The 2008 Law applies to 'space operations', which comprise any activity consisting in launching or attempting to launch an object into

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[152] See Sánchez Aranzamendi, *supra* n. 139, 20, who emphasizes the significance of France as the third major spacefaring country in the world and the main launching state in Europe.

[153] See P. Achilleas, Regulation of Space Activities in France, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 111.

[154] Law on Space Operations (Loi relative aux opérations spatiales; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; Journal Officiel de la République Française du 4 juni 2008; see also *Légifrance*, *service public de la diffusion du droit par l'internet*, http://legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000018931380, last accessed 13 April 2014; unofficial English version 34 *Journal of Space Law* (2008), 453; *Space Law – Basic Legal Documents*, E.XVI. See further e.g. Marboe & Hafner, *supra* n. 45, 39–40; M. Couston, La loi française sur les opérations spatiales, 58 *Zeitschrift für Luft- und Weltraumrecht* (2009), 253–82; A. Kerrest de Rozavel, *La responsabilité des États du fait des activités spatiales nationales: Quel environnement juridique pour les activités spatiales en France?* (2003); L. Rapp, When France Puts Its Own Stamp on the Space Law Landscape: Comments on Act no. 2008-518 of 3 June 2008 Relative to Space Operations, 34 *Air and Space Law* (2009), 87–103.

[155] See M. Couston, France. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.XVI, 1.

[156] Décret no 2009-640 du 9 juin 2009 portant application des disposition prévues au titre VII de la loi no 2008-518 du 3 juin 2008 relative aux opérations spatiales; décret no 2009-643 du 9 juin 2009 relatif aux autorisations délivrées en application de la loi no 2008-518 du 3 juin 2008 relative aux opérations spatiales; décret no 2009-644 du 9 juin 2009 modifiant le décret no 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales, Journal Officiel de la République Française, of 10 June 2009.

outer space, or of ensuring the commanding of a space object during its journey into outer space and its return to earth.[157] A licence for such activities is required under the French Law on Space Operations by any operator of any nationality who conducts space operations from French territory or by means of installations located under French jurisdiction; any French operator conducting space operations from foreign territories or installations; and any physical person or any legal entity having its seat in France, including non-operators who intend to procure a space operation.[158] It thus combines territorial and personal jurisdiction in a broad sense.

Authorization is granted only after the competent state authority has examined the moral, financial and professional qualifications of the applicant and the compliance of the systems and procedures applied with technical regulations relating to the safety of persons and property and the protection of public health and the environment.[159] Furthermore, authorizations cannot be granted when the planned operations are likely to compromise national security or France's international obligations.[160] The authorization can be made subjected to conditions, including the above-mentioned concerns and the prevention of space debris.[161]

The French Law on Space Operations also contains provisions on registration. It refers to Article II of the Registration Convention and determines that, in the event that France has a registration obligation on that basis or through other international agreements, the launched space objects are registered in a registry which is kept by the Centre National d'Etudes Spatiales (CNES).[162] The respective conditions and procedures shall be set out in the implementing decree.

Concerning liability, the French Law on Space Operations establishes that the operator shall be absolutely liable for damage caused to third parties on the surface of the earth or in airspace by a space operation.[163] If the damage is caused elsewhere, it shall only be liable to the extent of its fault.[164] This liability may be reduced or set aside where fault of the

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157 See Art. 1, French Law on Space Operations, *supra* n. 154.

158 See Art. 2, French Law on Space Operations, *supra* n. 154.

159 See Art. 4, French Law on Space Operations, *supra* n. 154.

160 *Ibid.*

161 See Art. 5, French Law on Space Operations, *supra* n. 154.

162 See Art. 12, French Law on Space Operations, *supra* n. 154. Art. II, Registration Convention, *supra* n. 9, provides for the obligation to establish a national register.

163 See Art. 13, French Law on Space Operations, *supra* n. 154.

164 *Ibid.*

victim is proven. Even though this provision seems to be inspired by Articles II and III respectively of the Liability Convention, it goes further than that, as it establishes liability for space operations and not only for damage caused by a space object.

A special feature of the French Law on Space Operations is the possibility of a state guarantee for space operations licensed under it. However, the operators must insure themselves to the amount for which they are responsible, based on the authorization they have been granted.[165] The state takes upon itself the responsibility for damage exceeding the amount in question.[166] The amount beyond which the claim for indemnification the governmental guarantee is granted is set out in each individual authorization, that is on a case-by-case basis, and depends primarily on the risks involved.[167]

This state guarantee (which has already been applied to Arianespace since its establishment) should be applied equally to persons who are not third parties pursuant to the French Law on Space Operations where the damage occurs during the launching phase.[168] The state guarantee might be considered as a public subsidy contrary to European competition law, but the European Commission communicated in a note addressed to the drafters of the French Law that the Law was not regarded as being incompatible as such with European Union law.[169] When the French government has paid compensation according to its international liability, it has the right to make a claim for indemnification by the operator.[170] However, this recourse is mitigated by the respective insurance coverage.

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165 See Art. 6, French Law on Space Operations, *supra* n. 154.

166 The state guarantee currently amounts to €60 million. It might be considered as a public subsidy contrary to competition law. However, in a note addressed to the drafters of the French Law on Space Operations (*supra* n. 154), the European Commission considered the Act not to be incompatible as such with European Union law. See further Achilleas, *supra* n. 153, 111–2.

167 *Cf.* Art. 17, French Law on Space Operations, *supra* n. 154.

168 *Cf.* Couston, *supra* n. 155, 6; Art. 15, French Law on Space Operations, *supra* n. 154. The guarantee is laid down in the Finance Act.

169 See Achilleas, *supra* n. 153, 111–2. The relevant provisions of EU competition law are now provided by Arts. 107–109, Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/47 (2009), prohibiting 'any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods'.

170 See Art. 14, French Law on Space Operations, *supra* n. 154.

Insurance can, however, be avoided if the operator prefers and provides another form of financial guarantee.[171]

The French Law on Space Operations represents a comprehensive legal basis for the implementation both of the French aspirations in the space sector, its national safety and security concerns and its international obligations and foreign policy priorities. It has similarities with the US Commercial Space Launch Act,[172] but its scope of application is broader than the US model and covers not only launches but also other kinds of space activities, as well as registration. It may serve as an example for future national space legislation of other European countries. Not all of them, however, have the same supportive attitude as France. They are generally more reluctant, for example, to grant a state guarantee. In practice, this is likely to provide a competitive advantage for France in the European space industry.

3.3.3.2 Belgium

Belgium has devoted particular attention to the legal aspects of space activities in recent years, even if it is not a major spacefaring nation. These efforts culminated in the enactment of the Belgian Law on the Activities of Launching, Flight Operations or Guidance of Space Objects of 28 June 2005.[173] The main reason for a Belgian space law was to provide a legal basis for space activities that Belgian citizens and companies had started to undertake in Belgium. The purpose of the Belgian Space Law was to ensure compliance with the obligations of the Belgian state deriving from international law.[174] Furthermore, as an ESA

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171 See Art. 6, French Law on Space Operations, *supra* n. 154.

172 See further *supra*, § 3.3.1.1.

173 Law on the Activities of Launching, Flight Operations or Guidance of Space Objects (hereafter Belgian Space Law), 17 September 2005, adopted 28 June 2005; *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008), 183; *Space Law – Basic Legal Documents*, E.X.1; see also www.belspo.be/belspo/space/doc/beLaw/Loi_en.pdf, last accessed 13 April 2014.

174 See J.F. Mayence, Belgium. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.X, 1; J.F. Mayence, Towards a Legal Framework for Space Activities and Applications: Belgian, Comparative and European Perspectives, The Belgian Law on the Activities of Launching, Operating and Monitoring of Space Objects, www.belspo.be/belspo/eisc/pdf/docu1law/mayence.pdf, last accessed 13 April 2014; M. Gerhard, Samples of National (Draft) Legislation and Harmonisation – Contributions by State Representatives, in *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004), 155; also J.F. Mayence, Implementing

member state, Belgium considered itself as a (co-)'launching State' of space objects launched by ESA.[175]

The Belgian Space Law contains a legal regime for authorization and supervision of space activities performed under Belgian jurisdiction,[176] the establishment of a national registry for space objects,[177] and the avoidance of liability which may arise according to Article VII of the Outer Space Treaty.[178] It has been supplemented by a Royal Decree implementing certain provisions of the Law.[179] The Law confers a number of competences upon the Belgian King[180] and to the Belgian Minister responsible for space research and its applications in the framework of international cooperation.[181]

In order to respond to recent developments in space research and applications, in particular with regard to small satellites such as cube-sats and to sub-orbital flights, a process to amend the Belgian Space Law was started, leading to several changes which entered into force on 15 January 2014.[182]

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the United Nations Outer Space Treaties – The Belgian Space Act in the Making, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 134–8; Sánchez Aranzamendi, *supra* n. 139, 18; Marboe & Hafner, *supra* n. 45, 36–7.

175 *Cf.* Mayence, Belgium, *supra* n. 174, 1. See for ESA further *infra*, § 4.2.

176 See Arts. 4–13, Belgian Space Law, *supra* n. 173.

177 See Art. 14, Belgian Space Law, *supra* n. 173.

178 See Arts. 15–17, Belgian Space Law, *supra* n. 173.

179 Royal Decree implementing certain provisions of the law of 17 September 2005 on the activities of launching, flight operations and guidance of space objects of 19 March 2008 (English translation); see *Space Law – Basic Legal Documents*, E.X.2.

180 The King may, for example, determine the conditions for granting authorizations, the conditions applying to the control and supervision and the limitation of the operator's liability. See Art. 5(1), (2); Art. 15(3), Belgian Space Law, *supra* n. 173; see also J.F. Mayence, The Belgian Space Law, Presentation at the 48th session of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space, www.oosa.unvienna.org/pdf/pres/lsc2009/pres-08.pdf, last accessed 13 April 2014.

181 The Minister may, among other things, attach to any authorization such specific conditions that he deems useful, on a case-by-case basis, or may grant the authorization for a specific period, having regard to the activities covered by the authorization. See Art. 5(2)–(6), Belgian Space Law, *supra* n. 173.

182 See *Projet de loi relative aux operations spatiales. Examen des articles*, of 10 November 2012, www.senat.fr/rap/l07-161/l07-1613.html, last accessed 13 April 2014. See also I. Marboe & K. Traunmüller, Small Satellites and Small States: New Incentives for National Space Legislation, 38 *Journal of Space Law* (2012), 289–320. The consolidated text of the Belgian Space Law as revised by the Law of 1 December 2013 is published in the Belgian Official Journal of 15

Following the amendments it is now clear that the operation of small satellites that are not manoeuvrable is also covered by the Belgian Space Law. By contrast, sub-orbital flights are to be excluded from its scope of application because the new definition of the term 'space object' only covers 'any object launched or intended to be launched, on an orbital trajectory around the Earth or to a destination beyond the earth orbit' (as well as its launching devices and component parts).[183]

3.3.3.3 The Netherlands

The Dutch Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects[184] was adopted by the Parliament on 25 January 2007 and entered into force on 1 January 2008.[185] The need became apparent when Dutch companies started to engage in space activities.[186] The Law is only applicable to the European part of the Netherlands, not to its overseas territories.[187]

January 2014; for the English translation see www.belspo.be/belspo/space/doc/beLaw/Loi_en.pdf, last accessed 13 April 2014.

[183] Art. 3(1)(a), Belgian Space Law in its amended version of 1 December 2013, *supra* n. 182; see also §§ (1)(b), (c), (2) and (5). For further discussion of what a 'destination beyond earth orbit' might refer to, *cf. supra*, § 2.3.1.3 and *infra*, § 12.2.2.

[184] Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (hereafter Dutch Space Law), 24 January 2007; 80 *Staatsblad* (2007), at 1; *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008), 201; *Space Law – Basic Legal Documents*, E.XIV; also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/netherlands/space_activities_actE.html, last accessed 13 April 2014.

[185] See H. den Brabander-Ypes, The Netherlands. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.XIV, 1; Marboe & Hafner, *supra* n. 45, 37–8.

[186] See F.G. von der Dunk, Implementing the United Nations Outer Space Treaties – The Case of the Netherlands, in *National Space Law* (Eds. C. Brünner & E. Walter) (2008), 81, 92; F.G. von der Dunk, Recent Developments and Status of National Space Legislation, in *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004), 67–8; H. den Brabander-Ypes, The Netherlands Space Law – An Introduction to Contents and Dilemmas, Presentation at the 47th Session of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space, www.oosa.unvienna.org/pdf/pres/lsc2008/pres-02.pdf, last accessed 13 April 2014; see also Sánchez Aranzamendi, *supra* n. 139, 19; for an overview of Dutch space activities and participation in international space law see von der Dunk, *supra* n. 22, 225–35.

[187] The Kingdom of the Netherlands also includes six islands in the Caribbean, the Netherlands Antilles. As of 10 October 2010, three of them –

The Dutch Space Law regulates registration, authorization and supervision and gives the possibility of redress in cases of the state's liability for damage caused by space activities.[188] The scope of application comprises 'the launch, the flight operation or the guidance of space objects in outer space'.[189] In practice, this provision has so far been interpreted in a way that small satellites, such as cube-sats which are not manoeuvrable, are not covered by the law because they are not 'operated' or 'guided' by the operator. Presently, this practice is about to be changed, possibly by way of a regulatory amendment.[190]

Concerning registration, the Dutch Space Law provides for registration procedures of space objects 'in connection with space activities that are performed under the responsibility of one or more of Our Ministers'.[191] There has been concern that this formulation would not include space objects whose launch outside the Netherlands had been procured not by the state itself but by a private national of the Netherlands.[192] However, the state from whose territory or facility the space object is launched

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Aruba (since 1985), Curacao and Sint Maarten – have a '*status aparte*' as autonomous territories within the Kingdom. Those territories eventually preferred to retain their autonomy in respect of the regulation of space activities. Aruba declared that it would ban all space activities and the Netherlands Antilles will draft their own space legislation on the basis of the Dutch Space Law. See Den Brabander-Ypes, *supra* n. 185, 'Introduction', 4. On the other hand, Bonaire, Saba and Sint Eustatius have now become 'special municipalities' of the Netherlands. See von der Dunk, *supra* n. 22, 237.

188 See von der Dunk, Implementing, *supra* n. 186, 99.

189 Sec. 1(b), Dutch Space Law, *supra* n. 184.

190 See N. Palkovitz & T.L. Masson-Zwaan, Orbiting under the Radar: Nano-Satellites, International Obligations and National Space Laws, in *Proceedings of the International Institute of Space Law 2012* (2013), 566–78; see also Marboe & Traunmüller, *supra* n. 182, 309.

191 Sec. 11, Dutch Space Law, *supra* n. 184.

192 *Cf.* e.g. D. Howard, A Comparative Look at National Space Laws and Their International Implications. Report of the 6th Eileen Galloway Space Symposium on Critical Issues in Space Law, in *Proceedings of the International Institute of Space Law 2011* (2012), 525, 528; Palkovitz & Masson-Zwaan, *supra* n. 190, 4; Schmidt-Tedd & Mick, *supra* n. 27, 153. This interpretation by the Netherlands of the term 'launching State' for registration purposes already existed before the entering into force of the Dutch Space Law, see O.M. Ribbelink, The Registration Policy of the Netherlands, in *Proceedings of the Project 2001 Plus Workshop: Current Issues in the Registration of Space Objects* (Eds. S. Hobe, B. Schmidt-Tedd, K.U. Schrogl) (2005), 53, 56.

usually does not register those objects, either. As a result, the danger arises that no state registers such space objects.[193]

If the state is obliged to pay compensation under Article VII of the Outer Space Treaty or the Liability Convention, it is entitled to recover the sum, in full or in part, from the party whose space activity has caused the damage.[194] However, the Dutch Space Law introduces compulsory insurance for space activities as a condition for obtaining a licence.[195] The licence-holder is liable for damage caused by its space activities only up to the value of the sum insured.[196] The amount of the insurance shall be determined by the Minister of Economic Affairs, who takes account of the maximum possible cover for the liability arising from space activities and of what can reasonably be covered by insurance.[197]

3.3.3.4 Austria

The most recent of the European comprehensive space laws is that of Austria, which entered into force on 28 December 2011.[198] In contrast to the two previous national space laws, the new Austrian Law on Space Activities clearly does cover small satellites. This is emphasized in the

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[193] Therefore, this approach is criticized by commentators, see e.g. Schmidt-Tedd & Mick, *supra* n. 27, 153.

[194] See Sec. 12(1), Dutch Space Law, *supra* n. 184.

[195] See Sec. 3(4), Dutch Space Law, *supra* n. 184.

[196] See Sec. 12(2), Dutch Space Law, *supra* n. 184.

[197] See Sec. 3(4), of the Dutch Space Law, *supra* n. 184.

[198] Bundesgesetz über die Genehmigung von Weltraumaktivitäten und die Einrichtung eines Weltraumregisters (Austrian Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry; hereafter Austrian Law on Space Activities) of 28 December 2011, Federal Law Gazette of 27 December 2011; published in English and German also in 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 37–42, 56–61; see also www.oosa.unvienna.org/pdf/spacelaw/national/austria/austrian-outer-space-actE.pdf, last accessed 13 April 2014. *Cf.* further E. Walter, The Constitutional Basis for an Austrian Space Law, in *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008), 157–65; I. Marboe, Culmination of Efforts in the Area of National Space Legislation in 2012, in *Proceedings of the International Institute of Space Law 2012* (2013), 524–6; F.G. von der Dunk, Another Addition to National Space Legislation: The Austrian Outer Space Act, Adopted 6 December 2011, in *Proceedings of the International Institute of Space Law 2012* (2013), 643–54.

Explanatory Report, which declares that the main reason for enacting the law was the launch of two cube-sats developed by two Austrian universities.[199]

The Austrian Law on Space Activities provides for an authorization regime for space activities carried out on Austrian territory, on board vessels or aeroplanes registered in Austria, or by a natural person with Austrian citizenship or juridical persons seated in Austria.[200] The launch, operation or control of a space object, as well as the operation of a launch facility, require authorization by the Minister for Transport, Innovation and Technology.[201] The conditions for authorization refer to the qualification of the operator, the safety of the operation, Austria's international and national interests, and protection of the environment, and they emphasize compliance with internationally recognized guidelines for the mitigation of space debris.[202]

A national registry is established into which all space objects for which Austria is considered to be the 'launching State' in accordance with the Registration Convention shall be entered.[203] This leaves some room for interpretation if purely private space objects should be entered. However, the Explanatory Report makes it clear that Austria takes up its responsibility as a responsible state under Article VI of the Outer Space Treaty and is ready to register space objects which require a licence under the Austrian Law on Space Activities.[204]

Where the Republic of Austria has compensated damage caused by a space activity in accordance with international law, the federal government has a right of recourse against the operator.[205] In order to cover liability for damage caused to persons and property, the operator is under an obligation to take out insurance.[206] However, if the space activity is in the public interest, the Minister for Transport, Innovation and Technology may determine a lower sum or release the operator from the insurance

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199 See Explanatory Report, 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 42.

200 *Cf.* Art. 1, Austrian Law on Space Activities, *supra* n. 198.

201 See Arts. 2, 3, Austrian Law on Space Activities, *supra* n. 198.

202 See Arts. 4, 5, Austrian Law on Space Activities, *supra* n. 198.

203 See Art. 9, Austrian Law on Space Activities, *supra* n. 198.

204 See Explanatory Report, *supra* n. 199, 51.

205 See Art. 11, Austrian Law on Space Activities, *supra* n. 198. As to the complicated drafting process of the regime on liability and recourse see I. Marboe, The New Austrian Outer Space Act, in 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 26, 33–5.

206 See Art. 4(4), Austrian Law on Space Activities, *supra* n. 198. The insurance must cover a minimum amount of €60 million.

requirement, taking into account the risks connected to the activity and the operator's financial capacity.[207] The possibility to waive the obligation of insurance provides the Minister for Transport, Innovation and Technology with the necessary discretion and allows support for the emerging space technology research and industry in Austria.

3.3.4 Comprehensive Space Acts Outside Europe

Outside Europe, only a few national space laws exist which regulate space activities in a comprehensive fashion, thus including issues such as authorization, registration, liability and insurance.

Perhaps the most prominent example is Australia which enacted its national space law in 1998[208] in view of ambitious plans for the development of commercial launch services on Australian territory.[209] The Australian Space Activities Act provides for a very detailed licensing and safety regime in order to ensure that Australia's international obligations are respected and its national interests safeguarded. It is supplemented by the Australian Space Activities Regulations 2001,[210] which contain further details about the licensing of space activities.

The Australian Space Activities Act applies to space activities that take place in Australia or are undertaken by Australian citizens outside Australia.[211] Only launch activities, including the operation of launch

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[207] Space activities are in the public interest if they serve science, research or education. Taking out insurance is not necessary if the federal state itself is the operator. See Art. 4(4), Austrian Law on Space Activities, *supra* n. 198, and the Explanatory Report, 48–9 *supra* n. 199.

[208] Australian Space Activities Act, *supra* n. 43. *Cf.* further e.g. Marboe & Hafner, *supra* n. 45, 45–6.

[209] *Cf.* also Siemon & Freeland, *supra* n. 43, 37; V. Nase, Australia. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.VII, 1; M.E. Davis, The Regulation of the Australian Space Launch Industry, 49 *Zeitschrift für Luft- und Weltraumrecht* (2000), 65–73; S.R. Freeland, Difficulties of Implementing National Space Legislation Exemplified by the Australian Approach, in *'Project 2001 Plus' – Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2006), 65–92.

[210] Space Activities Regulations (hereafter Australian Space Activities Regulation), Statutory Rules 2001 No. 186, 28 June 2001; *National Space Legislation of the World*, Vol. II (2002), at 307; *Space Law – Basic Legal Documents*, E.VII.2; also http://www.comlaw.gov.au/Details/F2004C00906, last accessed 13 April 2014.

[211] See Secs. 11 and 12, Australian Space Activities Act, *supra* n. 43.

sites, and the return of space objects to earth, are covered by the Act.[212] Such activities require a launch permit or an exemption certificate. The Australian regulatory regime is characterized by the different types of authorization. It distinguishes between (1) a space licence, which is required for the operation of a launch facility in Australia, a particular kind of launch vehicle and particular flight paths,[213] (2) a launch permit, which is required for the launch of a particular space object or a particular series of launches of space objects or for the return to Australia of an Australian-launched space object,[214] and (3) an overseas launch certificate required for launches from launch facilities outside Australia, if the responsible person for the launch is an Australian national.[215] Finally, the return of a space object launched outside Australia to Australia requires an authorization.[216]

All types of authorization are issued under the authority of the Minister for Industry, Finance and Resources upon the fulfilment of certain criteria. Important criteria for the authorization include the technical and financial capability of the applicant, the protection of public health, the environment and national and international security interests as well as the safety of people and property.[217] It is required that the person seeking a licence is a corporation to which paragraph 51 (XX) of the Constitution applies.[218] After the launch of a space object the holder of a launch permit is required to submit information to the Minister, who maintains the Register of Space Objects, having regard to the Registration Convention and other international agreements binding upon Australia.[219] Part 4 of the Australian Space Activities Act covers liability issues and the reimbursement of the Australian government by licensees of any international liability claims paid for by Australia.[220] According to Section 7.02 of the Australian Space Activities Regulations, the holder of the authorization is required to take out insurance to cover the maximum probable loss against any liability incurred for third-party damage.

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212 See further e.g. F.G. von der Dunk, Launching from 'Down Under': The New Australian Space Activities Act of 1998, in *Proceedings of the Forty-Third Colloquium on the Law of Outer Space* (2001), 135–6.

213 See Sec. 18, Australian Space Activities Act, *supra* n. 43.

214 See Sec. 26, Australian Space Activities Act, *supra* n. 43.

215 See Sec. 35, Australian Space Activities Act, *supra* n. 43.

216 See Sec. 14, Australian Space Activities Act, *supra* n. 43.

217 See Secs. 18, 26, 29 and 35, Australian Space Activities Act, *supra* n. 43.

218 *Ibid.*

219 See Sec. 76, Australian Space Activities Act, *supra* n. 43.

220 *Cf.* e.g. von der Dunk, *supra* n. 212, 138.

In order to administer the Australian Space Activities Act, the Space Licensing and Safety Office (SLASO) has been established by the government. Its main functions are to assess applications for approval under the Act and to ensure that space activities do not jeopardize public safety, property or the environment and Australia's national security, foreign policy or international obligations.[221]

The Republic of Korea has recently attracted attention by its successful efforts with regard to the development of comprehensive national space legislation. After the Korean Space Development Promotion Act of 2005,[222] the Korean Space Liability Act of 2007 followed.[223] These two pieces of national space legislation set out a basic plan for the development of space activities in the Republic of Korea, establish a national space committee, allow for the registration of space objects, establish a national authorization system and contain provisions about liability.[224]

The Korean Space Development Promotion Act consists of 29 articles and covers a number of issues such as government responsibilities, the establishment of a basic plan for promoting space development, the designation of a space development institute for space exploration, the domestic and international registration of space objects, licensing of space launch vehicles and cancellation of licences, compensation for damage as a result of space accidents and suchlike.[225] The purpose of the

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[221] See e.g. M.E. Davis, Space Launch Safety in Australia, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2010), 98–9; Siemon & Freeland, *supra* n. 43, 52–3.

[222] Space Development Promotion Act (hereafter Korean Space Development Promotion Act), Law No. 7538, of 31 May 2005, entered into force 1 December 2005; unofficial translation 33 *Journal of Space Law* (2007), 175; see Committee on the Peaceful Uses of Outer Space, *Exchange of Information on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space*, UN Document A/AC.105/C.2/2009/CRP.14, of 30 March 2009; see also www.oosa.unvienna.org/oosa/en/SpaceLaw/national/republic_of_korea/space_development_promotions_actE.html, last accessed 13 April 2014.

[223] Space Liability Act (hereafter Korean Space Liability Act), Law No. 8852, of 21 December 2007; UNOOSA National Space Law Database, see Committee on the Peaceful Uses of Outer Space, *Exchange of Information on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space*, UN Document A/AC.105/C.2/2009/CRP.14, of 30 March 2009; see also www.oosa.unvienna.org/oosaddb/showDocument.do?documentUid=402&level2=none&node=ROK1970&level1=countries&cmd=add, last accessed 13 April 2014.

[224] See D.H. Kim, Korea's Space Development Programme: Policy and Law, in 22 *Space Policy* (2006), 110–7.

[225] See D.H. Kim, The Main Contents, Comment and Future Task for the Space Laws in Korea, 24 *The Korean Journal of Air and Space Law* (2009), 128;

Korean Space Development Promotion Act is 'to promote the peaceful use and scientific exploration of outer space, to ensure national security, to further develop the national economy, and to raise the national standard of living through the systematic promotion of space development and the effective use and management of space objects'.[226]

Persons who desire to launch a space object, must seek preliminary registration, which shall be made to the Minister of Science and Technology 180 days before the scheduled launch date.[227] Persons who have made such a preliminary registration have to formally register the space objects with the Minister of Science and Technology 90 days after the space object reaches its planned orbit if there is no agreement under the Registration Convention providing for registration by another 'launching State'.[228]

For launches undertaken from South Korean territory or its jurisdiction as well as launches undertaken with Korean-owned launch vehicles elsewhere, a licence has to be obtained.[229] The authorization procedure is set out in Article 11 of the Korean Space Development Promotion Act and provides for obtaining a licence from the Minister of Science and Technology. The Minister shall consider the use and purpose of the space launch vehicle, the safety management of the space launch vehicle and the financial capability of the applicant including liability insurance for damage occurring from a space accident when granting the launch permit.[230] Furthermore, the Minister may make any further necessary stipulations.[231] In certain situations, the launch licence can be cancelled. These are general causes such as if the licence has been obtained by false means or a lack of compliance with imposed conditions. Also, the licence can be revoked when the head of related administrative authorities

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also Marboe & Hafner, *supra* n. 45, 46; S.M. Rhee, Current Status and Recent Developments in Korea's National Space Laws, 35 *Journal of Space Law* (2009), 523–38.

[226] Art. 1, Korean Space Development Promotion Act, *supra* n. 222.

[227] See as regards Korean citizens Art. 8(1), Korean Space Development Promotion Act, *supra* n. 222; as regards foreigners Art. 8(2).

[228] See Art. 8(5), Korean Space Development Promotion Act, *supra* n. 222.

[229] See Art. 11(1), Korean Space Development Promotion Act, *supra* n. 222.

[230] See Art. 11(3), Korean Space Development Promotion Act, *supra* n. 222.

[231] See Art. 11(4), Korean Space Development Promotion Act, *supra* n. 222. On the special national-security context of this provision see F.G. von der Dunk, The Issue of National Security in the Context of National Space Legislation – Comparing European and Non-European States, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 256–7.

demand the cancellation of the licence in anticipation of serious threats to national security.[232]

The Korean Space Development Promotion Act provides for third-party liability insurance. The liability shall be of an amount capable of compensating for damage possibly occurring due to space accidents, the minimum amount of which is set by ministerial decree of the Ministry of Science and Technology with consideration of the domestic and foreign insurance markets.[233] Further provisions concerning third-party liability can be found in the Korean Space Liability Act, which provides for a limitation of the amount of compensation to be paid by the launching party to 200 billion Won.[234]

The South African Space Affairs Act,[235] was elaborated to accommodate the country's growing interest in space.[236] Enacted in 1993 and amended in 1995, it regulates the conduct of space activities in an all-embracing manner.[237] Its purpose is to 'provide for the establishment of a Council to manage and control certain space affairs in the Republic; to determine its objects and functions; to prescribe the manner in which it is to be managed and controlled; and to provide for matters connected therewith'.[238]

The South African Space Affairs Act focuses on the composition, organization and tasks of the South African Council for Space Affairs, as well as on the licensing of space activities. Section 11 of the Act requires a licence for space activities, which is issued by the Council.[239] Activities requiring a licence are the launching from South African territory or by a juridical person incorporated or registered in South Africa, the operation of a launch facility, the participation of a legal person in certain space activities as well as other space-related activities prescribed by the Minister.[240]

When taking the decision to issue a licence, in particular minimum safety standards, national interests and international obligations and

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232 See Art. 13, Korean Space Development Promotion Act, *supra* n. 222.

233 See Art. 15, Korean Space Development Promotion Act, *supra* n. 222.

234 See Art. 5, Korean Space Liability Act, *supra* n. 223.

235 South African Space Affairs Act, *supra* n. 109. *Cf.* further e.g. I. de Villiers Lessing, South Africa: Recent Developments in Space Law, 1 *Telecommunications & Space Journal* (1994), 139–42; Marboe & Hafner, *supra* n. 45, 44–5.

236 See von der Dunk, *supra* n. 231, 249–50.

237 See Marboe & Hafner, *supra* n. 45, 44.

238 Preamble, South African Space Affairs Act, *supra* n. 109.

239 See Secs. 6 and 11, South African Space Affairs Act, *supra* n. 109.

240 See Sec. 11(1), South African Space Affairs Act, *supra* n. 109.

responsibilities of South Africa have to be taken into account by the Council.[241] The licence may further contain conditions concerning liability for damage and security to be given for the case of such damage, and may determine, limit or exclude the liability of the licensee concerned regarding damage that may be caused.[242] The conditions of a specific licence may be amended when deemed necessary, and under certain conditions, the licence may be suspended.[243] Inspectors are appointed by the Council to monitor compliance with the licence.[244] If the licensee performs activities without a licence or fails to comply with the conditions contained therein, imprisonment or fines can be imposed.[245]

3.3.5 Laws Regulating Certain Aspects of Space Activities

A number of relevant spacefaring nations have not yet enacted a comprehensive national space law, but have started to regulate certain aspects of the conduct of space activities.

In Spain, a Royal Decree of 1995 established a national registry for space objects which should be maintained by the Ministry of Foreign Affairs.[246] It provides that entries shall be made in the Spanish registry in respect of space objects that have been launched or whose launching has been procured by the Spanish state or that have been launched from Spain or from a Spanish facility.[247] It obliges enterprises and institutions in possession of the relevant information to communicate it to the Department of Industrial Technology of the Ministry of Industry and Energy.[248] Rather than providing for an authorization or any discretion to refuse it, the purpose of the provision seems mainly to oblige industry to furnish information so that the state knows what is going on.

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241 See Sec. 11(2), South African Space Affairs Act, *supra* n. 109.

242 See Sec. 14, South African Space Affairs Act, *supra* n. 109.

243 See Sec. 13(1) and (2), South African Space Affairs Act, *supra* n. 109.

244 See Sec. 10(4), South African Space Affairs Act, *supra* n. 109.

245 See Sec. 23, South African Space Affairs Act, *supra* n. 109.

246 Royal Decree No. 278/1995 of 24 February 1995 on the establishment in the Kingdom of Spain of the Registry of Objects Launched into Outer Space as provided for in the Convention adopted by the United Nations General Assembly on 2nd November 1974 (RCL 1979, 269 and ApNDL 8191). See www.oosa.unvienna.org/oosa/en/SpaceLaw/national/spain/royal_decree_278_1995E.html, last accessed 13 April 2014.

247 See Art. 5, Royal Decree No. 278/1995 *supra* n. 246.

248 See Art. 7, Royal Decree No. 278/1995 *supra* n. 246.

Italy has enacted a law which regulates the implementation of the Liability Convention.[249] In essence, it establishes the right of Italian citizens and legal persons to obtain compensation from the Italian state to the extent that the latter has requested and obtained, in accordance with Article VIII of the Liability Convention, compensation for damage caused by space objects. In addition, the registration of space objects is regulated by law.[250] The Italian Space Agency is entrusted with the institution and maintenance of the national registry and also collects the information related to the implementation of the Registration Convention.[251]

Germany has been active in promoting the idea of a unified legal framework for space activities for some time[252] and considers it as a priority in its current national space policy.[253] However, until now, it has had only rudimentary space law. In view of the launch of the German high-resolution satellite, TerraSAR-X, the enactment of the German Act

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[249] Law No. 23 of 25 January 1983, Official Gazette No. 35 of 5 February 1983, for the implementation of the Liability Convention (*supra* n. 9). See *United Nations/Nigeria Workshop on Space Law: Meeting International Responsibilities and Addressing Domestic Needs* (21–24 November 2005), 140. See also S. Marchisio, The 1983 Italian Law N. 23 on the Compensation for Damage Caused by Space Objects, 54 *Zeitschrift für Luft- und Weltraumrecht* (2005), 261–70; *cf.* further on the legal situation in Italy G. Catalano Sgrosso, Report on Changes in Space Law in Italy: Proposal of a Draft Legislation, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 117–29; S. Marchisio, Italian Space Legislation Between International Obligations and EU Law, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 106 ff.

[250] Registration of objects launched into outer space, by Law No. 153 of 12 July 2005, Official Gazette No. 177 of 1 August 2005; see Schematic Overview of National Regulatory Frameworks for Space Activities, UN Doc. A/AC.105/C.2/CRP.8/Add.1, of 26 March 2012, 2.

[251] See further *supra*, § 3.2.2, on the Registration Convention (*supra* n. 9).

[252] See the remarkable initiatives of *Project 2001* and *Project 2001 Plus*, see *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002) and *Project 2001 Plus – Towards a Harmonised Approach for National Space Legislation in Europe* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2004) respectively; *cf.* further e.g. H. Ersfeld, Elaboration of a German National Space Law: Proposals on Behalf of the Space Industry, 59 *Zeitschrift für Luft- und Weltraumrecht* (2010), 241–52.

[253] See Federal Ministry of Economy and Technology, *Making Germany's Space Sector Fit for the Future. The Space Strategy of the German Federal Government* (Federal Ministry of Economics and Technology, Berlin, 2010), 13–5.

on Satellite Data Security[254] became necessary. The Act is influenced by national security concerns and aims at addressing Germany's security-related and foreign policy interests in the distribution of remote sensing data.[255]

The material scope of application of the Act covers the operation of high-grade earth remote sensing systems and handling of data generated by such systems until the moment of their dissemination. Activities in this field require a licence or permit and are subject to supervision, when they are conducted by German nationals, legal persons or associations under German law, or by foreign legal persons or foreign associations of persons with their head office within the territory of Germany.[256] Thus, compared with other Acts, the application of the German Act is limited to certain kinds of space activity only.

The operation of a high-grade earth remote sensing system requires an operator licence.[257] In order to obtain this licence for the operation of a high-grade earth remote sensing system, the operator has to fulfil several conditions, such as possession of a requisite degree of reliability, certain sequences of instructions concerning control and command and the provision of technical and organizational measures preventing unauthorized persons from gaining access to the command installations.[258] The operator is obliged to record certain sequences and to hold the records available for inspection by the relevant authority.[259]

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[254] Satellitendatensicherheitsgesetz (Act Protecting Against the Endangerment of German Security Through the Proliferation of High Resolution Aerial Imagery of the Earth; hereafter German Act on Satellite Data Security), of 23 November 2007, effective 1 December 2007; Federal Gazette (BGBl.) Year 2007 Part I No. 58, of 28 November 2007. See further on this § 9.4.2.5; *cf.* also M. Gerhard, M. Kroymann & B. Schmidt-Tedd, Ein Gesetz für die Raumfahrt: Das neue Satellitendatensicherheitsgesetz, 57 *Zeitschrift für Luft- und Weltraumrecht* (2008), 40–54; E. Wins-Seemann, Das Satellitendatensicherheitsgesetz aus industrieller Sicht – Angemessener Rahmen für die kommerzielle Nutzung von weltraumgestützten Fernerkundungssystemen?, 57 *Zeitschrift für Luft- und Weltraumrecht* (2008), 55–66.

[255] See S. Hobe & J. Neumann, Regulation of Space Activities in Germany, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 144.

[256] See Sec. 1, German Act on Satellite Data Security, *supra* n. 254; also Schematic Overview of National Regulatory Frameworks for Space Activities, UN Doc. A/AC.105/C.2/CRP.8, of 16 March 2012, 5.

[257] See Sec. 3, German Act on Satellite Data Security, *supra* n. 254.

[258] See Sec. 4, German Act on Satellite Data Security, *supra* n. 254.

[259] See Sec. 5, German Act on Satellite Data Security, *supra* n. 254.

In order to obtain a licence for the dissemination of data, the operator must, in particular, ensure that the transmission of the data between various locations of the ground segment of the data provider and the transmission of the data to a different data provider are protected from becoming known to unauthorized third parties, and that the 'dissemination of the data generated by a high-grade earth remote sensing system is guaranteed to be secure according to the state of the art'.[260] Besides the German Act on Satellite Data Security, the German Aviation Code also partly applies to spacecraft and rockets, as it provides that 'spacecraft, rockets and related flying objects are deemed to be aircraft as long as they are within the airspace' and therefore are subject to the rules concerning the licensing of aircraft.[261]

Canada's national legislation on outer space is scattered through a few statutes enacted by the Canadian Parliament, as well as a number of regulations.[262] The Canadian Aeronautics Act governs civil aviation,[263] while the respective Canadian Aviation Regulations also contain certain provisions which are applicable to the launching of rockets.[264] The Canadian Space Agency Act[265] provides the legal framework for the activities of the Canadian Space Agency, which has the task of promoting, coordinating and implementing the space programmes and policies of the government of Canada. The Canadian Remote Sensing Space

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[260] Sec. 12, German Act on Satellite Data Security, *supra* n. 254.

[261] Sec. 1(2), Luftverkehrsgesetz (hereafter German Aviation Code); see further Hobe & Neumann, *supra* n. 255, 130. On the discussion regarding the definition of 'aircraft', esp. in relation to that of 'space object', *cf.* further *supra*, §§ 12.3.2.2 *juncto* 12.3.3.2.

[262] *Cf.* M. Bourbonnière & B. Legendre, Canada. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.XIII., 1. See for a comprehensive overview over the legal situation in Canada, R.S. Jakhu, Regulation of Space Activities in Canada, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 81–107; *cf.* also R.S. Jakhu, Regulation of Space Activities in Canada, in *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space* (2006), 267–81; B. Mann, Current Status and Recent Developments in Canada's National Space Law and its Relevance to Pacific Rim Space Law and Activities, in 35 *Journal of Space Law* (2009), 511–22.

[263] Aeronautics Act of 1954, Revised Statutes of Canada (R.S.C.) 1985, c. A-2.

[264] See Regulation No. 602.43 and Regulation No. 602.44 of the Canadian Aviation Regulations, SOR/96-433, http://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/page-180.html#docCont, last accessed 13 April 2014.

[265] Canadian Space Agency Act, S.C. 1990, c.3; http://laws.justice.gc.ca/eng/acts/C-23.2/, last accessed 13 April 2014.

Systems Act[266] regulates the operation of remote sensing systems from Canada. Such activities need authorization by a licence which is issued by the competent Minister.[267] The Canadian Remote Sensing Space Systems Regulations[268] set out in more detail the conditions for the licence and the transformation of raw data.

In China a number of different laws and regulations govern the increasing range of space activities.[269] There is also a plurality of entities responsible for different aspects of space activities, such as the State Administration for Science, Technology and Industry, for National Defence, as well as the Commission of Science, Technology and Industry (COSTIND).[270] China's National Space Administration (CNSA) is an internal organ of the latter and is responsible for the signing of governmental agreements in the space area, intergovernmental scientific and technical exchanges, the implementation of national space policies and the managing of national space science, technology and industry.[271] Important issues, such as the licensing of launches, the registration of space objects and the mitigation of space debris, are currently regulated

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[266] Remote Sensing Space Systems Act (hereafter Canadian Remote Sensing Space Systems Act), assented to 25 November 2005; S.C. 2005, c. 45; *Space Law – Basic Legal Documents*, E.XIII.1; also http://laws-lois.justice.gc.ca/eng/acts/R-5.4/, last accessed 13 April 2014. See further also *infra*, § 9.4.2.4.

[267] *Cf.* Secs. 5–9, Canadian Remote Sensing Space Systems Act, *supra*, n. 266.

[268] Remote Sensing Space Systems Regulations (hereafter Canadian Remote Sensing Space Systems Regulations), 29 March 2007; SOR/2007-66; Canada Gazette Vol. 141, No. 8; *Space Law – Basic Legal Documents*, E.XIII.2; also http://laws-lois.justice.gc.ca/eng/regulations/SOR-2007-66/index.html, last accessed 13 April 2014.

[269] See for a comprehensive overview: Y. Zhao, Regulation of Space Activities in the People's Republic of China, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 247–65. *Cf.* further J. Li, Progressing Towards New National Space Law: Current Status and Recent Developments in Chinese Space Law and its Relevance to Pacific Rim Space Law and Activities, 35 *Journal of Space Law* (2009), 439–70; S. Li, The Role of International Law in Chinese Space Law and Its Relevance to Pacific Rim Space Law and Activities, 35 *Journal of Space Law* (2009), 539–58; Y. Qi, A Study of Aerospace Legislation of China, 33 *Journal of Space Law* (2007), 405 ff.; H. Zhao, The Status Quo and the Future of Chinese Space Legislation, 58 *Zeitschrift für Luft- und Weltraumrecht* (2009), 94–122.

[270] *Cf.* Schematic Overview of National Regulatory Frameworks for Space Activities, UN Doc. A/AC.105/C.2/CRP.8, of 16 March 2012, 4.

[271] *Cf.* Y. Zhao, *supra* n. 269, 250.

by administrative measures but will be combined in a unified comprehensive space act in the near future.[272]

India has become another important emerging spacefaring nation, in particular because of the launching services it provides. The Indian launch facilities are owned by the government, and launch services are offered to national and foreign entities exclusively by the Indian Space Research Organization (ISRO).[273] However, since 2000, the government has permitted commercial satellite and operations facility ownership to national companies. Consequently, licensing mechanisms had to be introduced to control and supervise private space activities. India has, however, not yet enacted a specific law in this respect.[274] On the other hand, a number of laws, regulations and guidelines stemming from other fields are applicable to space activities in India, such as on satellite communications, satellite broadcasting, remote sensing and India's participation in global navigation satellite systems.

3.3.6 National Space Agencies and Basic Space Laws

Several more states have started to work on the formulation of national space laws in the past years. These efforts usually start with the formulation of a national space policy which sets out the aims and principles of the respective state in the area of space and usually also points to some concrete steps, including legislation.

The first legislative act is usually the establishment of a national space agency to be entrusted with the implementation of the national space policy. As those national space agencies carry out their activities in a determined regulatory framework, these legal or regulatory frameworks also constitute national space legislation.

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[272] See Y. Zhao, *supra* n. 269, 248–9.

[273] *Cf.* R. Kaul & R.S. Jakhu, Regulation of Space Activities in India, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 164–5.

[274] See Kaul & Jakhu, *supra* n. 273, 165; C. Jayaraj, India's Space Policy and Institutions, in *Proceedings of the United Nations/Republic of Korea Workshop on Space Law: United Nations Treaties on Outer Space: Actions at the National Level* (2004), 17–24; V.S. Mani, Space Policy and Law in India and its Relevance to the Pacific Rim, 35 *Journal of Space Law* (2009), 615–34; S. Narang, Commercialization and Privatization of Indian Space Activities: Need for a Regulatory Framework, 1 *The Gujarat National Law University Law Review* (2009), 82–100.

One example of such a legal framework for space activities is Brazil where the establishment of the Brazilian Space Agency (AEB)[275] marked the beginning of an intensification of space activity, primarily through launching from Brazilian territory, which also triggered the enactment of important administrative regulations.[276] Similarly, in Chile[277] and in Colombia[278] the first step to regulate space activities was the establishment of a national space agency.

A further step into the direction of a more comprehensive legal framework is the formulation of 'basic space laws'. Their aim is to define the basic principles and priorities and to provide the basis for the development of further, more detailed national space legislation. The Basic Space Law of Japan[279] is a good example of this approach. Based on the formulation of the most important principles that should guide the exploration and use of outer space by Japan,[280] the government is

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275 See Law Establishing the Brazilian Space Agency, No. 8.854, of 10 February 1994, www.planalto.gov.br/ccivil_03/leis/L8854.htm, last accessed 13 April 2014. Further e.g. J. Monserrat, The New Brazilian Space Agency: A Political and Legal Analysis, 11 *Space Policy* (1995), 121–30.

276 Most importantly, Administrative Edict No. 27, 20 June 2001; *National Space Legislation of the World*, Vol. II (2002), at 377. See for a comprehensive overview of the Brazilian regulatory framework for space activities J. Monserrat, Regulation of Space Activities in Brazil, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 61–80; *cf.* also O. de O. Bittencourt Neto, Private Launch Activities on Brazilian Territory: Current Legal Framework, in 58 *Zeitschrift für Luft- und Weltraumrecht* (2009), 429–49; J. Monserrat, Brazilian Launch Licensing and Authorizing Regimes, in *Proceedings of the United Nations/International Institute of Air and Space Law Workshop: Capacity Building in Space Law* (2003), 158.

277 See Supreme Decree No. 338 of 17 July 2011 on the Establishment of a Presidential Advisory Committee known as the Chilean Space Agency, www.oosa.unvienna.org/oosa/en/SpaceLaw/national/chile/supreme_decree_338_2001E.html, last accessed 13 April 2014.

278 See Decree 2442 of July 2006 on the creation of the Colombian Commission of Space (CEE); further Schematic Overview of National Regulatory Frameworks for Space Activities; UN Doc. A/AC.105/C.2/CRP.8, of 16 March 2012, 4.

279 Basic Space Law, Act No. 43/2008, see *Space Law – Basic Legal Documents*, E.V.1.

280 See S. Aoki, Japan. Introduction, in *Space Law – Basic Legal Documents* (Eds. K.H. Böckstiegel, M. Benkö & K.U. Schrogl), E.VI, 3; S. Aoki, Introduction to the Japanese Basic Space Law of 2008, 57 *Zeitschrift für Luft- und Weltraumrecht* (2008), 585–90; *cf.* further also S. Aoki, Current Status and Recent Developments in Japan's National Space Law and Its Relevance to Pacific Rim Space Law and Activities, 35 *Journal of Space Law* (2009),

currently in the process of formulating a more detailed legal framework covering a large variety of different legal aspects relating to Japanese space activities.[281]

Finally, a special case is presented by Hong Kong, which, as a consequence of the transition of sovereignty from the United Kingdom to the People's Republic of China in 1997, was no longer governed by the UK Outer Space Act.[282] As China, however, was interested in continuing to allow private space activities to be undertaken by Hong Kong entities but had no national space law in place to ensure appropriate implementation of the international obligations now resting upon China in that respect, a special ordinance was drafted to take care of the new situation.[283] Though strictly speaking, the Outer Space Ordinance for the Hong Kong region does not constitute national space legislation, it performs the same functions of implementing international responsibilities and liabilities following from the UN space treaties.[284]

Whilst such a sub-national approach to implementation of the UN space treaties is not wide-spread, also in the case of Curacao, as an outlying part of the Netherlands, the plans to conduct commercial space transportation have given rise to a process to establish sub-national regulation for Curacao alone, as the Dutch Space Law in itself does not apply to that island.[285]

363–438; H. Nobuaki, Briefing Memo: Establishment of the Basic Space Law – Japan's Space Security Policy (2008); M. Sawako, Transformation of Japanese Space Policy: From the 'Peaceful Use of Space' to 'the Basic Law on Space', 44-1-09 *The Asia-Pacific Journal* (2 November 2009).

[281] *Cf.* S. Aoki, Regulation of Space Activities in Japan, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 199.

[282] See *supra*, § 3.3.2.3.

[283] The Outer Space Ordinance, An Ordinance to confer licensing and other powers on the Chief Executive to secure compliance with the international obligations of the People's Republic of China with respect to the launching and operation of space objects and the carrying on of other activities in outer space, 13 June 1997, as amended 1999, Chapter 523; 51 *Zeitschrift für Luft- und Weltraumrecht* (2002), at 50.

[284] See further e.g. S.U. Reif, Space Law in the People's Republic of China – Hong Kong Special Administrative Region (HKSAR) Government: Outer Space Ordinance (last amended 55 of 1999 s. 3), 51 *Zeitschrift für Luft- und Weltraumrecht* (2002), 47–56; Y. Zhao, Satellite Application and Development of Space Law in Hong Kong, in *2004 Space Law Conference Assembled Papers* (2004), 107–17.

[285] See *supra*, § 3.3.3.3, esp. n. 187.

3.4 INTERNATIONAL INITIATIVES

3.4.1 The UNGA Resolution on national space legislation

In 2007, the Legal Sub-Committee of UN COPUOS introduced a new agenda item under a work plan entitled 'General exchange of information on national legislation relevant for the peaceful exploration and use of outer space'.[286] It established a working group under the chairmanship of the present author, which started its work according to a work plan.[287] In March 2012, at its final session, the working group concluded its final report.[288]

The working group agreed that the 'Conclusions' (part III) of the final report should provide the basis for 'Recommendations on national legislation relevant to the peaceful exploration and use of outer space', which should be presented to the UN COPUOS session in June 2012 as the basis for a draft General Assembly resolution.[289] Another proposal was to attach the text of the 'Recommendations' as an annex to the draft resolution on international cooperation in the peaceful uses of outer space, for adoption by the UN General Assembly.[290] The working group reached a consensus on the text of these Recommendations and included them as an Appendix to the report of the Chair of the Working Group in 2012.[291] The discussion on some formulations and on the form of the text to be submitted to the General Assembly took another year, but in 2013 consensus could be reached to submit the text on 'Recommendations on

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[286] See Report of the Legal Sub-Committee on its forty-sixth session, Vienna, 26 March–5 April 2007, UN Doc. A/AC./105/891, para 136.

[287] For a detailed report of the work of the Legal Sub-Committee on national space legislation between 2008 and 2011 see I. Marboe, National Space Legislation – the Work of the Legal Subcommittee of UN COPUOS 2008–2011, in *Proceedings of International Institute of Space Law 2011* (2012), 101–6.

[288] See Report of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, UN Doc. A/AC.105/C.2/101, 3 April 2012.

[289] See Report of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, *supra* n. 288, para. 6.

[290] See *ibid.*

[291] See Report of the Chair of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, UN Doc. A/AC.105/1003, of 10 April 2012, Annex III, Appendix.

national legislations relevant to the peaceful exploration and use of outer space' to the General Assembly for adoption in a separate resolution.[292]

The 'Recommendations' so adopted consist of a preamble and an operative paragraph, which contains 'elements for consideration' for states when enacting regulatory frameworks for national space activities. There are eight 'elements' that states could consider when enacting regulatory frameworks for national space activities, in accordance with their national law, taking into account their specific needs: (1) the scope of application (definition of space activities targeted by national regulatory frameworks); (2) the definition of national jurisdiction over space activities (territorial, quasi-territorial – which includes space activities from/at vessels/aircraft registered in the state or other stations under its jurisdiction – and/or personal jurisdiction over space activities); (3) the authorization procedure; (4) conditions for authorization; (5) ways and means of supervision of space activities; (6) establishment of a national register of objects launched into outer space; (7) possible recourse mechanisms and insurance requirements; and (8) transfer of ownership or control of a space object in orbit.[293]

These elements are currently present in existing national space legislation, albeit not in all of it and to a different extent. On the basis of the texts presented by UN COPUOS member states in the working group, the UN Office for Outer Space Affairs (UN OOSA) prepared a 'Schematic overview of national regulatory frameworks for space activities'.[294] It shows, in a table, how these elements are already integrated and formulated in practice.[295]

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[292] See Resolution adopted by the General Assembly on 11 December 2013, UN Doc. A/RES/68/74.

[293] The eight elements reflect the results of the discussion in the Working Group as summarized, particularly, in the 'Conclusions' of the Report of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, *supra* n. 288, para. 35. Furthermore, the 'Summary of the work conducted by the Working Group under its multi-year workplan' and the 'Findings of the Working Group' provide additional background information; see *ibid.*, paras. 1–28.

[294] See Schematic overview of national regulatory frameworks for space activities, UN Doc. A/AC.105/C.2/2013/CRP 7, of 9 April 2013.

[295] See also the table in the Appendix to this chapter and the tables in Marboe & Hafner, *supra* n. 45, 29, 63, as well as Sánchez-Aranzamendi, *supra* n. 139, 11–5.

In 2012, the Legal Sub-Committee introduced a new 'regular item' on its agenda entitled 'National legislation relevant to the peaceful exploration and use of outer space'.[296] This enables it to continue its work on the important issue of national space legislation, to update the schematic overview of national space legislation, and to make use of the recommendations contained in the General Assembly Resolution in its discussion on the practice of states regarding the national regulation of space activities.

3.4.2 The ILA Committee on Space Law

The Committee on Space Law of the ILA has been dealing with the commercialization of outer space and its legal aspects since the 2004 Conference in Berlin.[297] At the 2008 Conference, the Committee noticed a growing willingness of states to enter into a more concrete discussion and started to consider the elaboration of a model law.[298] Such a model law should be based on the so-called 'building blocks' which had already been recommended by the Committee in 2004.[299] The 'building blocks' resulted from Project 2001 and Project 2001 Plus, which considered them to be essential cornerstones of future space legislation in view of the international law obligations of states stemming from the Outer Space Treaty and the Liability Convention.

In 2010, at the Conference in The Hague, a first draft of the Model Law was presented. The rapporteur opened the discussion with the aim of deciding whether some kind of model law could be adopted.[300] In the view of the rapporteur, there was a core of clauses indispensable for any future legislation: the duty and details of authorization procedures and licensing, and respective requirements; the duty of supervision; and the necessary insurance for private space actors.[301] The so-called 'building

[296] See Report of the Legal Sub-Committee on its fifty-first session, Vienna, 19–30 March 2012, UN Doc. A/AC./105/1003, para. 177.

[297] See Report of the Space Law Committee, Part II, National Space Legislation – A Draft Model Law, in *Report of the Seventy-Fourth Conference – The Hague* (2010), 274.

[298] See Report of the Space Law Committee, Part II, National Space Legislation – A Draft Model Law, *supra* n. 297, 650.

[299] See Report of the Space Law Committee, Part II, National Space Legislation, in *Report of the Seventy-First Conference – Berlin* (2004), 759.

[300] See Report of the Space Law Committee, Part II, National Space Legislation – A Draft Model Law, *supra* n. 297, 275.

[301] See *ibid.*

blocks' encompassed: (1) authorization of space activities; (2) supervision of space activities; (3) registration of space objects; (4) indemnification regulation; and (5) additional regulation.[302]

These elements have already been addressed by the national space laws discussed above, as summarized in Table 3.1.[303]

The proposed Model Law consisted of nine articles, which largely correspond to the above-mentioned building blocks. Consultations were continued until the 2012 Sofia Conference, where a revised draft was presented by the rapporteur under the title of 'Draft Guidelines for a Model Law on National Space Legislation'. The new draft consisted of 14 articles and reflected the intensive exchange of views and proposals between members of the Committee in the inter-sessional period. It was accompanied by an article-by-article commentary by the rapporteur.

Article 2 of the revised Model Law contains a list of definitions of terms, among them 'space activity' and 'space object'. The term 'space activity' is defined as including 'launch, operation, guidance, and re-entry of space objects into, in and from outer space and other activities essential for the launch, operation, guidance and re-entry of space objects into, in and from outer space'. Authorization and the conditions for authorization are contained in Articles 3 and 4. Article 5 deals with supervision, which provides (differently from the previous draft) that space activities 'shall be subject to continuing supervision by the ministerial authority under conditions to be laid down in an implementing decree or regulation'. A new article on sanctions, Article 14, complements and confirms the obligation of the state to ensure that the obligations of space operators are complied with.

The article on insurance, Article 12, introduces a completely new element, namely the possibility that the licensing authority may waive the obligation to insure. This may be the case when (1) the operator has sufficient equity capital to cover the amount of his/her liability or (2) the space activity is not a commercial space activity and is in the public interest. The details of the content and conditions shall be laid down in an implementing decree/regulation. This possibility of waiver reflects concerns of private industry and universities, which feared that an insurance obligation could turn out to be prohibitive.

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302 See *ibid.*, 276.

303 The author wishes to thank Ms. Karin Traunmüller and Ms. Cordula Steinkogler, research assistants at the University of Vienna, for their help in putting together this table.

Table 3.1 Conditions for authorization in selected national space legislation

	Authorization	Supervision	Registration	Indemnification	Additional regulation
United States	X	X	X	X	X
Russian Federation	X	X	X	X	X
Ukraine	X	X	X	X	X
Kazakhstan	X	X	X		X
Norway	X	X			
Sweden	X	X	X	X	
United Kingdom	X	X	X	X	X
France	X	X	X	X	X
Belgium	X	X	X	X	X
The Netherlands	X	X	X	X	X
Austria	X	X	X	X	X
Australia	X	X	X	X	X
South Korea	X	X	X	X	X
Spain			X		
Italy			X	X	
Germany	X	X			
Canada	X	X			
China	X	X	X		
India					
South Africa	X	X		X	X
Brazil	X	X	X		
Chile		X			
Colombia					
Japan	X		X	X	

Protection of the environment is an important concern reflected in the Model Law, which keeps the requirement of an environmental impact assessment following Article 7. Furthermore, mitigation of space debris is identified in Article 8 as an important concern and specifies the condition for authorization as per Article 4(d) in more detail.

Article 13 on procedure refers to the possibility of resorting to arbitration and to the new Permanent Court of Arbitration (PCA) Rules on Outer Space Disputes of 2011.[304] However, generally the disputes in question are disputes between 'national' space operators and administrative authorities because only they are subjects targeted by the law. The respective authority usually could not or would not accept arbitration in such cases but would refer to the various stages of appeal available against administrative decisions. If, however, the applicant is a foreigner, international arbitration rules could become relevant.

At its working session at the ILA Sofia Conference, the Committee on Space Law adopted the draft which henceforth should be known as the 'Sofia Guidelines for a Model Law on National Space Legislation'. The Committee has dedicated a lot of work to the elaboration of the Guidelines, and their formulation is a great accomplishment. They contribute a lot to the clarification of many questions with regard to implementation of international space law at the national level. However, due to the diversity of legal systems, the different nature of space activities in various countries and the different priorities and policies of states in the area of outer space, it remains to be seen to what extent states will resort to these Guidelines when considering enacting national space legislation in the future.[305]

3.5 CONCLUSION

The overview of existing national space laws has shown that there exists a remarkable diversity in the way in which states regulate national space activities. The reason for this diversity is that states have enacted national legal frameworks in respect of their specific needs and practical considerations and often closely corresponding to the type of space activities conducted. Furthermore, the degree of commercialization and privatization of the space sector in the respective country plays an important

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[304] See further on this *infra*, § 19.3.

[305] For a first analysis of the new ILA Model Law see I. Marboe, Culmination of Efforts in the Area of National Space Legislation in 2012, in *Proceedings of the International Institute of Space Law 2012* (2013), 521–4.

role. The national regulatory frameworks for space activities represent different systems, some possessing comprehensive dedicated space laws (such as in the United Kingdom, France, Belgium, the Netherlands, Australia), others a combination of national legal instruments, ranging from administrative regulations to decrees and laws (such as in the United States, the Russian Federation, China, India).

The increasing exchange of information on the issue of national space legislation and the different initiatives at national and international levels towards a more harmonized approach seem, however, already to have led to a more coherent approach to national space legislation. For example, the recent space laws in Europe (France, Belgium, the Netherlands and Austria) cover a range of issues in a rather similar way. They all aim at regulating space activities in a comprehensive manner. They do not limit themselves to only certain aspects as was the case earlier, when Norway limited the application of the law to launches from its territory, or Spain to the duty to register.

On the contrary, the new laws establish general systems of authorization for all space activities and define 'space activities' in a rather broad manner. The right to authorize space activities – and to refuse such authorization – provides the states with the possibility to ask for the fulfilment of specific conditions. These conditions are formulated in a rather similar manner and address safety, public order, protection of the environment, international obligations and policy interests of the respective states. Registration is also an issue that is addressed in all recent space laws.

In addition, the new laws make sure that the states have a right of recourse against private space actors when they have paid compensation for damage pursuant to their liability under international law. In addition, the states apparently agree that insurance is an appropriate means of providing for the recoverability of the compensation paid – at least up to the amount which is insurable on the market. Compliance with national space laws is monitored by state organs, and violations are sanctioned by monetary fines – not any more by imprisonment as was the case in earlier laws (such as Sweden).

Furthermore, the 'elements for consideration' proposed by the UNGA Resolution on national space legislation are very closely related and quite similar to the different elements contained in the ILA Model Law on national space legislation. There is, however, still a difference as regards the level of detail in the proposals for the different elements in national space legislation. The UN 'elements' are more descriptive of the situation that currently exists and less ambitious as regards the achievement of an 'ideal'. They are rather a summary presentation of current state practice than a ‘progressive development’ of the law – making reference to Article 13 of the UN Charter.[306] The text used in the ‘elements’ avoids language that would indicate a preference for one particular solution over another. It is a reflection of the consensus principle that characterizes the work in UN COPUOS and its two subcommittees. It shows the attitude of most UN COPUOS members – that is, sovereign states – not to be ready to accept formulations which would restrict their freedom to draft their national space law in a way that fits their specific needs and interests and their particular national legal systems.

The ILA Committee on Space Law, by contrast, did not need to deal with such sensitivities in its work. Its membership is composed of independent experts who argue and formulate, ideally on the basis of objective and legal reasoning rather than of political and economic considerations. They have an international law perspective and not a national perspective upon the aim to be achieved. The ILA Committee could therefore take a position in favour of specific solutions and use a clearer language. This becomes particularly evident in the provisions on the protection of the environment and on the avoidance of space debris. Also the idea that international arbitration might be resorted to in cases of disputes does not appear in the UNGA Resolution.[307]

Both international initiatives are more than academic or abstract diplomatic endeavours. States are increasingly active in the drafting of national space law and it can be observed that they are in search of guidance or support in this matter. It seems logical and natural that states will consult the two documents and try to implement them as widely as possible. The cooperation between academia and practice is further reinforced by the continuous exchange of views in sessions and conferences of UN COPUOS and the ILA. It has become general practice that experts of international law and legal advisers of foreign ministries – who

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[306] Art. 13(1), Charter of the United Nations, San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1, reads: ‘The General Assembly shall initiate studies and make recommendations for the purpose of: a. promoting international co-operation in the political field and encouraging the progressive development of international law and its codification’.

[307] This is not necessarily due to the traditional scepticism of states about international dispute settlement by judicial means but perhaps simply to the fact that the new rules for arbitration of disputes relating to outer space activities of the PCA were only finalized and published in 2012; see further *infra*, § 19.3. The UN COPUOS members might not have felt ready to include them in their debate, which had already started years before.

are often members of the ILA – are part of the delegation of UN COPUOS member states in the sessions of the Legal Sub-Committee. This is another indication that the endeavours of UN COPUOS and the ILA on the implementation of international space law via national laws will play a significant role in the future processes of law-making relating to activities in outer space.

It seems, therefore, that, even though there is no deliberate plan to harmonize national space laws, either through the European Union or through a UN treaty, the contents of the existing space laws have a chance of becoming increasingly similar to each other. This would be a positive development for the increasingly international nature of space activities. The creation of a coherent legal framework, rather than too much diversity, would in the long run be beneficial to all.

Despite the divergence of national space laws, the risks of 'flags of convenience' in outer space is less apparent than in the law of the sea. The most important reason is that the UN space treaties provide for a specific regime of liability not existing in other areas of law.[308] There is, in principle, always a state who is responsible and liable. However, the fact that the 'launching State' (and not only the state of registry) is liable for damage caused by space objects does not help preventing damage caused by space objects that were not put in earth orbit in adequate technical conditions. In outer space, prevention is vital. Financial reparation can hardly compensate all the damage potentially caused by accidents or collissions. It is therefore in the interest of all space actors – governmental or private – to continue to strive for a responsible use of outer space in the future by all the actors involved. This is particularly important in view of the increasing problem of space debris. States without systems of authorization, reimbursement and insurance might be confronted with huge compensation claims and have problems getting their money back. National legislation will therefore keep and increase its significant role in shaping the future of a responsible and lasting use of outer space.

[308] See e.g. F.G. von der Dunk, Towards 'Flags of Convenience' in Space?, in *Proceedings of the International Institute of Space Law 2012* (2013), 811–30.

APPENDIX

Table 3A.1 Elements of regulation in national space legislation

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
United States *Title 51 of the United States Code (U.S.C.), National and Commercial Space Programs* *Title 47 of the United States Code (U.S.C.), Telecom-munications* *Title 14 Code of Federal Regulations (C.F.R.), Aeronautics and Space* *Title 47 Code of Federal Regulations (C.F.R.), Telecom-munication and others*	Different activities are regulated in different acts, including: construction, development, launch and operation of satellites, satellite communications, remote sensing (51 U.S.C. §§ 20103, 50902, 50904, 60101 and 60121; 47 U.S.C. §§ 301-309 and 702; 47 C.F.R. §§ 25.102-25.162 etc.)	Depending on type of activity: *commercial space launch activities* carried out by citizens of the US, entities organized under the laws of the US, or entities organized under the laws of a foreign country if the controlling interest is held by a US citizen or legal entity; operation of *private remote sensing* systems by persons subject to US jurisdiction or control; operation of an apparatus for	Different authorities depending on type of activity (51 U.S.C. §§ 50905, 50906, 50908 and 60121-60123; 14 C.F.R. Chapter III, Subchapter C; 47 C.F.R. §§ 5.51-5.95, 25.102, 25.110-25.165 and 97.207; 47 U.S.C. §§ 307-309)	Different conditions depending on type of activity, including: safety of people and property, protection of public health and environment, space debris mitigation, economic and strategic interests, national security, international obligations (51 U.S.C. §§ 50905, 50906, 60121 and 60122; 14 C.F.R. Chapter III, Subchapter C; 47 C.F.R.	Different authorities for different types of activity: Secretary of Transportation, Secretary of Commerce, Federal Communications Commission within their respective field of competence Different sanctions depending on type of activity and infringement, including the revocation of licence and civil penalties (51 U.S.C. Chapter 509 and	Office of Commercial Space Transportation receives information according to Art. IV of the Registration Convention (14 C.F.R. § 417.19)	In the case of *commercial space launch activities* operators shall have in effect liability insurance or demonstrate financial responsibility to compensate for the maximum probable loss (determined for each licence up to a maximum of $ 500 million) resulting from an activity under the licence; US carries burden of compensation for damage exceeding these	In case of *transmission of energy or communications* to or from the US, licenses can only be transferred upon finding by the Federal Communications Commission that doing so would serve the public interest or necessity (47 U.S.C. 310, (d))

		the *transmission of energy or communications* to or from the US, or by a mobile station under US jurisdiction (51 U.S.C. §§ 50902, 50904, 60121 and 60122; 47 U.S.C. §§ 301-309; 47 C.F.R. §§ 25.102-25.162)		§§ 5.51-5.95, 25.102 and 25.110-25.165; 47 U.S.C. §§ 307-309)	§§ 60121-60123; 14 C.F.R. § 405.1; 47 C.F.R. §§ 25.160-25.162 and 25.283)		amounts, up to the statutory maximum of app. 2,7 billion (in 2011 dollars) (51 U.S.C. §§ 50914 and 50915; 14 C.F.R. part 440)
Russian Federation *Law on Space Activity, Federal Law No. 5663-1 (1993) as amended* *Statute on Licensing Space Operations, Federal Government Decree No. 104 (1996)*	Activities directly connected with exploration and use of outer space, e.g. scientific space research, remote sensing, use of navigation satellite systems, piloted space missions, manufacturing of materials and products in outer space	Activities undertaken by foreign organizations and citizens under the jurisdiction of the Russian Federation; activities undertaken by organizations and citizens of the Russian Federation (Art. 9 Law on Space Activity)	Russian Space Agency (ROSCOSMOS) (Art. 6, para. 2 and Art. 9 Law on Space Activity; Statute on Licensing Space Operations)	Safety of people and property, national security, economic and strategic interest, protection of environment (Art. 5 et seq. Statute on Licensing Space Operations)	Russian Space Agency (ROSCOSMOS) various possibilities stipulated by law such as verification monitoring, shut down of operations and suspension or annulment of licenses (Art. 24 and 25 Statute on Licensing	Space objects of the Russian Federation are subject to registration (Art. 17, para. 1 Law on Space Activity)	Right of recourse of the government towards organizations and citizens responsible for the space object causing the damage compulsory insurance coverage for life and health of personnel of space infrastructure and liability for

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
	(Art. 2 Law on Space Activity)				Space Operations)		damage caused to third parties (Art. 25 and 30 Law on Space Activity)	
Ukraine *Law on Space Activity No. 503/96-VR (1996)*	Scientific space research, design and application of space technology and use of outer space (Art. 1 Law on Space Activity)	Any space activity in Ukraine or under the jurisdiction of Ukraine outside its borders (Art. 10 Law on Space Activity)	National Space Agency (Art. 6 and 10 Law on Space Activity)	Safety of people and property, public health, national security, economic interest, protection of environment (Art. 9 and 10 Law on Space Activity)	National Space Agency, Ministry of Defence and other executive authorities offences are punishable by disciplinary, civil-law or criminal penalties under general law (Art. 20 and 29 Law on Space Activity)	Space facilities are subject to mandatory registration in the State Register of Space Facilities of Ukraine, subject to approval by the Cabinet of Ministers of Ukraine (Art. 13 Law on Space Activity)	Compulsory insurance, amount to be determined by the government; procedures for compulsory insurance to be established by the Cabinet of Ministers of Ukraine (Art. 24 and 25 Law on Space Activity)	Removal from State Register, if space facility is transferred to another State or to an international or foreign enterprise, institution or organization (Art. 14 Law on Space Activity)

Kazakhstan *Law on Space Activities No.528-IV (2012)*	Activities aimed at the exploration and use of outer space for scientific, economic, environmental, defence, informational and commercial purposes (Art. 1, para. 7 Law on Space Activities)	Space objects launched from the territory of K., as well as outside the territory in case of their implementation by the Kazakhstan's participants of space activities; creation and operation of space systems in the territory of K., as well as in outer space; creation and operation of space rocket systems on the territory of K. (Art. 8 Law on Space Activities)	Authorized body in the field of space activities (Art. 12 and 13 Law on Space Activities)	Obligatory industrial expertise, sectoral expertise, safety of space activities, people's health, environmental protection, security of property of individuals and legal entities; prohibition of the deployment of weapons of mass destruction in outer space (Art. 10, 27 and 30 Law on Space Activities)	By authorized body in the field of space activities in the form of verification in accordance with the law "On the state control and supervision in the Republic of Kazakhstan" (Art. 12 Law on Space Activities)	Space objects are subject to registration by an authorized body in the field of space activities, if they belong to: - individuals or to legal entities of K. or - to foreign individuals or legal entities and are launched from the territory of K. (Art. 11 Law on Space Activities)	Indemnification for harm to the health of individuals or damage to the environment or the property of individuals, legal entities or the state, which have arisen from the implementation of the space activities, is made voluntarily or under the court decision according to the laws of K. (Art. 27 Law on Space Activities)	Lend-lease of a space sector object to international or foreign participant of space activities is governed by the legislation of K., unless otherwise provided by international treaties ratified by K. (Art. 26 Law on Space Activities)
Norway *Act on launching objects from Norwegian territory into outer space No. 38 (1969)*	Launch of objects into outer space (Art. 1 Act on launching objects from Norwegian territory into outer space)	Launches from Norwegian territory, including Svalbard, Jan Mayen and the external territories; launches from Norwegian	Ministry of Trade and Industry (Art. 1 Act on launching objects from Norwegian territory into outer space)		Ministry of Trade and Industry can issue regulations on the control of the launch of objects falling within the law's scope of application			

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
		vessels and aircrafts; launches by a Norwegian citizen or person with habitual residence in Norway in areas not subject to the sovereignty of any State (Art. 1 Act on launching objects from Norwegian territory into outer space)			(Art. 2 Act on launching objects from Norwegian territory into outer space)			
Sweden *Act on Space Activities (1982)* *Decree on Space Activities (1982)*	Activities carried on entirely in outer space, launching of objects into outer space, measures to manoeuvre objects launched (excluded: reception of signals or information and	Activities from Swedish territory and activities carried out by Swedish natural or juridical persons (Sec. 2 Act on Space Activities)	National Board for Space Activities (Sec. 3 and 4 Act on Space Activities; Sec. 1, para. 1 Decree on Space Activities)		National Board for Space Activities withdrawal of licence, fine or imprisonment up to 1 year (Sec. 4 and 5 Act on Space Activities; Sec. 2 Decree on Space Activities)	National Board for Space Activities (Sec. 4 Decree on Space Activities)	If the Swedish State has been internationally liable for damage which was caused by a space activity carried out by a person other than the Swedish State, that person shall reimburse the State, unless there are	

	launching of sounding rockets) (Sec. 1 Act on Space Activities)						reasons speaking against it (Sec. 6 Act on Space Activities)	
United Kingdom *Outer Space Act (1986)*	Launching or procuring the launch of a space object, operating a space object and any other activity in outer space (Sec. 1 Outer Space Act)	Activities carried on by UK nationals (including citizens of British dependent territories, British overseas citizens and British nationals located overseas), Scottish firms and bodies incorporated under the law of any part of the UK (Sec. 2 Outer Space Act)	Secretary of State, exercised on his behalf by the British National Space Centre (BNSC) (Sec. 4, para. 1 Outer Space Act)	Safety of people and property, public health, international obligations, national security, protection of the environment (Sec. 4, para. 2 and Sec. 5, para. 2 Outer Space Act)	Secretary of State person's liability on conviction on indictment to fines and on summary conviction to a fine not exceeding the statutory maximum (Sec. 5, para. 2 and Sec. 12 Outer Space Act)	Register maintained by the Secretary of State; particulars of space objects shall be entered as the Secretary of State considers appropriate to comply with international obligations of the UK (Sec. 7 Outer Space Act)	Licensee is required to insure himself against liability incurred in respect of damage or loss suffered by third parties right of recourse of the State without limitation (Sec. 5, para. 2 and Sec. 10 Outer Space Act)	Transfer of licence possible with the written consent of the Secretary of State (Sec. 6, para. 1 Outer Space Act)
France *French Space Operations Act No 2008-518 (2008)* *and others*	Any activity consisting in launching, attempting to launch or intending to procure the launch of an	Launches or returns from or to French territory or facilities falling under French jurisdiction; launches,	Administrative authority (Art. 2 and 4 Space Operations Act)	Moral, financial and professional guarantees of the applicant; compliance with technical regulations,	Agents from several public authorities Fine of up to €200 000 for various breaches by the operator	Registry held by the Centre National d'Etudes Spatiales (CNES) on behalf of the State	Compulsory insurance; amount to be determined by decree Right of the government to make a claim	Subject to prior authorization from the administrative authority (Art. 3 Space Operations Act)

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
	object into outer space or in ensuring the commanding of a space object during its journey (Art. 1, No. 3 Space Operations Act)	returns or command of space objects by French operators; procurement of launches by natural persons having French nationality or juridical persons whose headquarters are located in France (Art. 2 Space Operations Act)		national defence interests and international commitments; authorization may include requirements on safety of persons and property, protection of public health and the environment (Art. 4 and 5 Space Operations Act)	(Art. 7 and 11 Space Operations Act)	(Art. 12 Space Operations Act)	for indemnification against the operator, if it has paid compensation according to its international liability; this recourse is mitigated by the respective insurance coverage (Art. 6 and 14 Space Operations Act)	
Belgium *Law on the activities of launching, flight operations or guidance of space objects (2005)* *Royal Decree implementing certain provisions of the Law of 17 September*	Activities of launching, flight operations and guidance of space objects (Art. 2, § 1 Law on the activities of launching, flight operations or guidance of space objects)	Space activities in zones placed under the jurisdiction or control of the Belgian State or using installations, personal or real property, owned by the Belgian State or which are under its jurisdiction or control; space	Minister with responsibility for space research and its applications (Art. 3, 6° and Art. 4 Law on the activities of launching, flight operations or guidance of space objects)	Safety of people and property, protection of the environment, optimal use of air space and outer space, economic and strategic interests, international obligations (Art. 5, § 1 Law on the activities	Minister; conditions determined by the King Fines between € 25 and € 25 000 or imprisonment of between eight days and one year (Art. 6, Art. 10, § 1 and Art. 19, §§ 1 and 2 Law	Kept by the Minister; conditions determined by the King (Art. 14 Law on the activities of launching, flight operations or guidance of space objects)	Facultative insurance; amount subject to case-by-case evaluation; Minister may create an obligation for insurance as condition for authorization Right of direct recourse against the operator in the case	Requires Minister's prior authorization (Art. 13 Law on the activities of launching, flight operations or guidance of space objects)

2005 on the activities of launching, flight operations and guidance of space objects (2008)		activities carried out by natural or legal persons of Belgian nationality, if provided for under international agreements (Art. 2 Law on the activities of launching, flight operations or guidance of space objects)		of launching, flight operations or guidance of space objects)	on the activities of launching, flight operations or guidance of space objects; Art. 2 Royal Decree implementing certain provisions of the Law of 17 September 2005)		Belgium had to pay compensation (Art. 5, §2 and Art. 15 Law on the activities of launching, flight operations or guidance of space objects)	
The Netherlands *Rules Concerning Space Activities and the Establishment of a Registry of Space Objects – Space Activities Act (2007)* *Decree containing rules with*	Launch, flight operation and guidance of space objects (Sec. 1, (b) Space Activities Act)	Space activities in or from the Netherlands or from a Dutch ship or aircraft; by Order in Council: – space activities carried out by Dutch natural or juridical persons on or from the territory of a State that is not party to the	Minister of Economic Affairs (Sec. 1, (a) and Sec. 3, para. 1 Space Activities Act)	Safety of people and property, protection of the environment, public order, strategic interest, financial security, international obligations (Sec. 3, para. 3 Space Activities Act)	Officials designated by order of Minister of Economic Affairs Administrative orders and administrative penalties up to € 450 000 or € 100 000, depending on seriousness and duration of the infringement	Minister of Economic Affairs (Sec. 11 Space Activities Act)	Compulsory insurance; set by the Minister at the highest coverage available at the market Right of redress against the licence-holder up to the value of the sum insured, if State has paid compensation under Article	Licence not transferable; transfer of ownership to be reported to the Minister (Sec. 8 Space Activities Act; Art. 5, (1) of Space Objects Registry Decree)

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
regard to a registry of information concerning space objects – Space Objects Registry Decree (2007)		Outer Space Treaty – the organization of space activities by a natural or juridical person from within the Netherlands (Sec. 2, para. 1 Space Activities Act)			and extent of perpetrator's fault (Sec. 13 and 15 Space Activities Act)		VII of the Outer Space Treaty or the Liability Convention (Sec. 3, para. 4 and Sec. 12 Space Activities Act)	
Austria *Outer Space Act (2011)*	Launch, operation or control of a space object; operation of a launching site (§ 2, (1) Outer Space Act)	Space activities carried out on Austrian territory, on board of vessels or airplanes registered in Austria, by natural persons with Austrian citizenship or by legal persons seated in Austria (§ 1, subpara. 1 Outer Space Act)	Minister for Transport, Innovation and Technology (§ 3 Outer Space Act)	Public order, safety of persons and property, public health, national security, international obligations, Austrian foreign policy interests, mitigation of space debris, protection of the environment (§ 4, subpara. 1 and § 5 Outer Space Act)	Minister Fines up to € 100 000, minimum fine of € 20 000 for carrying out a space activity without a licence (§§ 13 and 14 Outer Space Act)	Established at the Ministry for Transport, Innovation and Technology (§ 9 Outer Space Act)	Insurance coverage (up to € 60 million) is a condition for authorization, if not waived for 'public purpose' activities Right of recourse against the operator in the case that Austria has compensated damage caused by a space activity (§ 4, subpara. 4 and § 11 Outer Space Act)	Needs authorization (§ 8 Outer Space Act)

Australia *Space Activities Act No. 123 (1998) as amended* Space Activities Regulations (2001) as amended	Launching and return of space objects; operation of a launching or return site (Part 3 Space Activities Act)	Space activities carried out from Australia or by Australian nationals outside Australia (Sec. 3 Space Activities Act)	Minister responsible for space activities (Sec. 18, 26 and 35 Space Activities Act)	Safety of people and property, protection of the environment, national security, public health, public safety, foreign policy, international obligations (Sec. 18, 26, 29 and 35 Space Activities Act)	Launch Safety Officer appointed by Minister for each licensed launch facility Civil penalty in case of operation of a launch facility without authorization Unauthorized launch or return of a space object is an offence punishable by a fine not exceeding 100 000 penalty units and/or by imprisonment not exceeding 10 years (Sec. 11-14, 50-51 and 80-82 Space Activities Act)	Minister (Sec. 76 Space Activities Act)	Insurance against any liability; insurance for benefit of Australia minimum insurance: maximum probable loss – amount set out in regulations In the event that Australia has to compensate a foreign State under international law, the responsible party for the relevant launch or return is liable to pay either the amount of that compensation or the insured amount for the permit or certificate (Sec. 48 and 74 Space Activities Act)	Transfer possible (Sec. 22-24, 31-33 and 38-40 Space Activities Act)

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
Republic of Korea *Space Development Promotion Act (2005)* *Space Liability Act (2007)*	Development, launch and operation of space objects (Art. 2 Space Development Promotion Act)	Launches carried out by legal or natural Korean citizens; launches from Korean territory or territory under its jurisdiction; launches utilizing a space launch vehicle owned by the Korean government or Korean citizens (Art. 8 Space Development Promotion Act)	Minister of Science and Technology (Art. 11 Space Development Promotion Act)	Use and purpose of the space launch vehicle, safety management of the space launch vehicle, financial capability of the applicant (Art. 11, (3) Space Development Promotion Act)	National Space Committee (established under the control of the President) deliberates provisions regarding space development Minister of Science and Technology may revoke a launch permit and may form an Inquiry Committee in case of accidents Imprisonment for up to five years or fines not exceeding fifty million Won for unauthorized launches (Art. 6, 13, 16 and 27 Space Development Promotion Act)	Minister of Science and Technology (Art. 8 and 10 Space Development Promotion Act)	Obligatory insurance against liability for damage possibly occurring; minimum amount of third-party liability insurance set by Ministerial decree of the Ministry of Science and Technology (Art. 15 Space Development Promotion Act)	In general, changes have to be permitted by Minister of Science and Technology (Art. 11, (1) Space Development Promotion Act)

Spain *Royal Decree establishing in the Kingdom of Spain the Registry (1995)*	Launching of a space object (Art. 5 Royal Decree)	Launches carried out or procured by the Spanish State; launches from Spain or a Spanish facility (Art. 5 Royal Decree)				Ministry of Foreign Affairs (Art. 2 Royal Decree)	
Italy *Law on the Implementation for the Convention on International Liability for Damage caused by Space Objects (1983)* *Law on registration of objects launched into outer space (2005)*						Italian Space Agency (ASI) (Art. 3, (2) Law on registration of objects launched into outer space)	Entitlement of natural and legal persons to receive compensation from the State for damages caused by space objects (Art. 2 and 3 Law on the Implementation of the Convention on International Liability)
Germany *Act to give Protection against the Security Risk to the Federal Republic of Germany by*	Operation of high-grade earth remote sensing systems; handling of data generated by such systems	Activities carried out by German nationals, by legal persons under German law or by foreign legal	Different responsible authorities depending on type of procedure e.g.: Federal Ministry of	Reliability of the applicant; sequences of instructions for control and command; technical and organizational	Federal Office of Economics and Export Control Fines up to € 500 000 or imprisonment		

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
the Dissemination of High-Grade Earth Remote Sensing Data (Satellite Data Security Act – SatDSiG) (2007)	until the moment of their dissemination (Sec. 1, (1) SatDSiG)	persons with their head office in Germany; transmission of command instruction sequences from German territory; dissemination of data from German territory (Sec. 1 SatDSiG)	Economics and Technology, Federal Office of Economics and Export Control, Federal Office for Information Security (Sec. 3, 4, 11, 12, 17, 19, 24 and 25 SatDSiG)	measures preventing unauthorized persons to get involved, national security and foreign policy interests, peaceful co-existence of nations (Sec. 4, 12 and 19 SatDSiG)	for up to five years (Sec. 5- 9, 13-16, 28 and 29 SatDSiG)			
Canada *Canadian Space Agency Act (1990) as amended* *Remote Sensing Space Systems Act (2005) as amended* *Radio communications Act (1985) as amended* *Canadian Aviation*	Different activities are regulated in different acts, including space research and development, construction, management and operation of space vehicles, facilities and systems (Art. 5 Canadian Space Agency Act)	Activities carried out by Canadian citizens, permanent residents, corporations under Canadian law and persons, having a substantial connection to Canada related to remote sensing space systems; activities	Minister of Industry for telecom-munications satellites (Art. 2 and 5 Radiocom-munications Act) Minister of Transport for launches from Canadian territory (Sec. 101.01, 602.43 and	National security, international relations and obligations, protection of the environment, public health, safety of persons and property (Art. 9 Remote Sensing Space Systems Act; Sec. 601.04	Ministry of Industry for telecommunications satellites (Art. 2 and 5 Radiocommunications Act) Minister of Foreign Affairs for remote sensing activities (Art. 10-14, 17 and 18 Remote Sensing Space Systems Act)			

Regulations (1996) as amended *and others*		carried out in Canada, on board of a ship, vessel or aircraft registered in Canada or under Canadian direction or control, a spacecraft under the direction or control of Canada, as well as on a platform, rig, structure or formation that is affixed or attached to land situated in the continental shelf of Canada (Art. 6 Remote Sensing Space Systems Act; Art. 3 Radiocom-munications Act)	602.44 Canadian Aviation Regulations) Minister of Foreign Affairs for remote sensing activities (Art. 2 and 5-8 Remote Sensing Space Systems Act) Canadian Space Agency (Art. 5 Canadian Space Agency Act)	Canadian Aviation Regulations)	Canadian Space Agency (Art. 5 Canadian Space Agency Act) Monetary penalty, fines and imprisonment depending on type of offence (Art. 9-13 Radiocommunications Act; Art. 23 Remote Sensing Space Systems Act)			
China *Measures for the Administration of Registration of Objects*	Development and operation of spacecraft and launching vehicles	Space objects launched in the territory of China or launched abroad by	Commission of Science, Technology and Industry for National Defence		COSTIND Administrative penalties, criminal responsibility,	COSTIND (Art. 4, 7, 8 and 11 Measures of 2001)	According to Article 19 of the Interim Measures on the Administration of Permits for	Licence not transferable (Art. 12 Measures of 2002)

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
Launched into Outer Space (2001) *Interim Measures on the Administration of Permits for Civil Space Launch Projects (2002)* *Interim measures on Administration of Mitigation of and Protection against Space Debris*	(Art. 3 Measures of 2001)	China and other States (Art. 3 Measures of 2001)	(COSTIND) responsible for examining and approving all civil space launch projects (Art. 5 Measures of 2001; Art. 3 Measures of 2002)		cessation of activities (Art. 4, 24, 25 and 26 Measures of 2002)		Civil Space Launch Projects released by COSTIND in 2002, the permit holder must purchase third-party liability insurance for launching a space object to be purchased by permit holder	
South Africa *Space Affairs Act (1993)* *Space Affairs Amendment Act (1995)* *South African National Space Act (2008)*	Launching, operation of a launch facility, participation in space activities (Sec. 11, para. 1 Space Affairs Act)	Launches from South African territory; launches from the territory of another state by or on behalf of juristic persons incorporated or registered in South Africa;	South African Council for Space Affairs (Sec. 11 and Sec. 5, para. 3, lit. (d) Space Affairs Act)	Minimum safety standards, national, economic and strategic interests, international obligations (Sec. 11, para. 2 and Sec. 14	Inspectors appointed by South African Council for Space Affairs Fines or imprisonment (Sec. 10, para. 4, Sec. 12, 13 and 23 Space Affairs Act)		Insurance may be a condition for authorization, amount subject to case-by-case evaluation (Sec. 14 Space Affairs Act)	

		participation by juristic persons incorporated or registered in South Africa in space activities entailing obligations to the State in terms of international conventions, treaties or agreements or affecting national interests (Sec. 11, para. 1 Space Affairs Act)		Space Affairs Act)			
Brazil *Law Establishing the Brazilian Space Agency (1994)* *Administrative Edict n. 27 (2001)* *Administrative Edict n. 5 (2002)*	Space launches (Art. 1 Administrative Edict n. 27)	Launching activities on Brazilian territory (Art. 1 Administrative Edict n. 27)	Brazilian Space Agency (AEB) (Art. 1 Administrative Edict n. 5; Art. 1 and 2 Administrative Edict n. 27; Art. 3 Law Establishing the Brazilian Space Agency)	Technical, economic and financial qualifications of applicant (Art. 6 Administrative Edict n. 27)	Brazilian Space Agency (AEB) Revocation of authorization (Art. 1 and 12 Administrative Edict n. 5; Art. 1, 3, 4 and 20 Administrative Edict n. 27; Art. 3 Law Establishing the Brazilian Space Agency)	Brazilian Space Agency (AEB) maintains a registry for enrolment of space objects launched from Brazilian territory (Art. 19 Administrative Edict n. 5)	Compulsory obligation to insure against third party liability in value established by AEB (Art. 4 Administrative Edict n. 5; Art. 9, (III) Administrative Edict n. 27)

	Definition of 'space activities'	Definition of 'national' activities	Authorization procedure	Conditions for authorization	Supervision of space activities & sanctions	National register	Indemnification and insurance	Transfer of ownership or control
Japan *Basic Space Law (2008)* *Law concerning Japan Aerospace Exploration Agency (2002)*	Research on space science and technology; development, launch, tracking and operation of satellites and activities relating thereto (Art. 4 and Art. 18, para. 1 Law concerning Japan Aerospace Exploration Agency)		Government of Japan (Art. 26 Law concerning Japan Aerospace Exploration Agency)	Launches have to be carried out in accordance with guidelines established by JAXA with authorization from the competent Ministers (Art. 18, para. 2 Law concerning Japan Aerospace Exploration Agency)	Government of Japan Imprisonment for a term not exceeding one year or fine not exceeding 500 000 yen, depending on type of violation (Art. 26, 30 and 31 Law concerning Japan Aerospace Exploration Agency)		Compulsory insurance and special liability arrangements (Art. 21 and 22 Law concerning Japan Aerospace Exploration Agency)	

4. European space law

Frans von der Dunk

4.1 INTRODUCTION

If the self-imposed isolation of both the United States and the Soviet Union following the First World War – though for entirely different reasons – still allowed Europe to harbour some illusions, the Second World War made it clear for all to see: the leading role of Europe in global politics had come to an end. The World Wars and the economic depression in between had ravaged the continent, given rise to untold atrocities and hardships, and morally questioned such concepts as nationalism, military power and colonialism – it was time to start anew and, hopefully, build a better Europe, from different moral, social, political and economic foundations, with international cooperation and fundamental attention to human rights replacing nationalistic and antagonistic scrambles for resources and political and economic power.[1]

Thus, the post-Second World War era in Europe saw a fundamental move towards integration of the nation-states on many levels. Only the United Kingdom, as a co-victor of both wars with its globe-spanning colonial empire seemingly still intact and for the remainder trusting in its 'special relationship' with the Anglo-Saxon amongst the two new superpowers, for a number of decades remained rather aloof from such developments. In particular France, however, energetically pursued various integration venues in efforts to combine the preservation of whatever was left of its great power status with conciliation with its long-standing archenemy Germany and somewhat less-longstanding enemy Italy, creating the foundations for rapid economic restoration of the continent and a healthy economic future.

[1] See e.g. C.W.A. Timmermans, The Genesis and Development of the European Communities and the European Union, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn, 2008), 2 ff.; J.H.H. Weiler, European Integration, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. III (2012), 934–44; A. Arnull *et al.*, *Wyatt & Dashwood's European Union Law* (5th edn, 2006), 3–4; R.H. Folsom, *Principles of European Union Law* (2nd edn, 2009), 3.

Such integration efforts, which from one angle could be seen as efforts also to keep up with the global superpowers that the United States and the Soviet Union had become in creating a third economic and political power 'Europe', indeed took on many shapes and met with different levels of success; from the perspective of outer space and space law, however, essentially two strands are important and will therefore be addressed in the present chapter.

On the one hand, there was the 'operational' integration of European knowledge, resources and needs in the space arena through several international intergovernmental organizations,[2] of which the European Space Agency (ESA) for all intents and purposes turned out to be the pivotal one – and as of today plays a very visible and distinct role, not only in outer space activities, but also in the context of space law.

On the other hand, the much more fundamental, 'legislative' integration through the establishment of firstly the European Economic Community (EEC), then the European Community (EC) and finally the European Union (EU), while for many years not touching upon outer space and space activities at all, has for a few decades now also impacted the space domain in Europe – and to a considerable extent even globally.[3]

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[2] See for a broader analysis of the phenomenon of operational organizations on a global scale *infra*, §§ 5.3–5.10.

[3] For completeness' sake, in this context reference should also be made to two other intergovernmental European organizations with some impact on legal and regulatory aspects of space activities:

- The Council of Europe, established by way of the European Convention on Human Rights (Convention for the Protection of Human Rights and Fundamental Freedoms, Rome, done 4 November 1950, entered into force 3 September 1953; ETS No. 005), mainly active in the field of human rights and, from a space law perspective, in such issues as e.g. privacy and the right to information; *cf.* e.g. F.G. von der Dunk, The European Convention on Human Rights and EU Law – Two European Legal Approaches to Privacy, as Relevant to High-Resolution Imaging, in *Current Legal Issues for Satellite Earth Observation* (2010), ESPI Report 25, 55–60.
- The Western European Union (WEU), originally established by way of the WEU Treaty (Paris Agreements amending the Brussels Treaty, Paris, done 23 October 1954, entered into force 5 May 1955; 211 UNTS 342; UKTS 39 (1955) Cmd. 9498), mainly active in the field of defence and security and hence, from a space law perspective, also in *space* defence and security issues, meanwhile, however, being subsumed by the EU institutional structure; *cf.* however F.G. von der Dunk, Europe and Security Issues in Space: The Institutional Setting, 4 *Space and Defense* (2010), 84–5.

As from a global perspective the Western part of Europe through this multiplicity of integration efforts has seen an unrivalled measure of peaceful and voluntary dilution of national sovereignty in practice and in theory, not least in the context of outer space and space activities, the subject of regional European space law and its various contributions *ipso facto* to space law in the broadest sense of the word should be of broader interest than for those only interested in Europe as such.

And indeed, in more recent years efforts at international integration of groups of sovereign states in other parts of the world are increasingly looking to such European examples of international, sometimes almost supranational, cooperation in space activities, trying to take home the successful elements thereof whilst avoiding the pitfalls. This takes place on the one hand in a context of – so far abortive and rather academic – efforts to establish regional space organizations, such as an Asian space agency,[4] an ASEAN space organization,[5] a Latin American space agency[6] or an African space agency.[7] Only the Asia-Pacific Space Cooperation Organization (APSCO) and the Asia-Pacific Regional Space Agency Forum (APRSAF) have at least to some extent materialized as such.[8]

On the other hand, with the increasing commercialization of certain space sectors, general regional economic integration organizations – in North America NAFTA (North American Free Trade Agreement),[9] in Latin-America the Mercosur/Mercosul,[10] in Asia amongst others the

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[4] See e.g. D.H. Kim, The Possibility of Establishing an Asian Space Development Agency, 2 *Japanese Journal for the Social System* (2001), 45–56.

[5] See e.g. C. Noichim, *The Asean Space Organization* (2008).

[6] See e.g. R. Gonzalez, 10 *Journal of Space Law* (1982), 218–9.

[7] See e.g. P. Martinez, Is There a Need for an African Space Agency? 28 *Space Policy* (2012), 142–5.

[8] See e.g. F. Tronchetti, *Fundamentals of Space Law and Policy* (2013), 43; E. Sadeh, *Space Strategy in the 21st Century: Theory and Policy* (2013), 288–91; J.C. Moltz, *Asia's Space Race: National Motivations, Regional Rivalries, and International Risks* (2013), 184–5.

[9] North American Free Trade Agreement, San Antonio, done 17 December 1992, entered into force 1 January 1994; 32 ILM 289 (1993); see further http://en.wikipedia.org/wiki/North_American_Free_Trade_Agreement; last accessed 19 November 2013.

[10] Treaty Establishing a Common Market between the Argentine Republic, the Federal Republic of Brazil, the Republic of Paraguay and the Eastern Republic of Uruguay, Asunción, done 26 March 1991, entered into force 29 November 1991; 30 ILM 1042 (1991); see further http://en.wikipedia.org/wiki/Mercosur; last accessed 19 November 2013.

ASEAN Free Trade Area (AFTA),[11] in Africa the COMESA (Common Market for Eastern and Central Southern Africa)[12] and the SADC (Southern African Development Community),[13] and in the Middle East the Gulf Cooperation Council (GCC)[14] – have also become interested in potentially extending the scope of their activities into the space realm.

4.2 OPERATIONAL INTEGRATION OF SPACE ACTIVITIES: THE EUROPEAN SPACE ORGANIZATIONS

4.2.1 The Beginnings: ESRO, ELDO and the European Space Conference

Following some initial attempts of in particular the United Kingdom (in cooperation with the United States) and France to undertake national space activities within a few years after Sputnik-1's flight, it soon became clear that Europe's leading nations, still recovering from the Second World War at that, were essentially a size too small to develop a comprehensive and successful space program on their own.[15]

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[11] Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area, Singapore, done 28 January 1992, entered into force 28 January 1992; 31 ILM 506 (1992); see further http://en.wikipedia.org/wiki/ASEAN_Free_Trade_Area; last accessed 19 November 2013.

[12] Agreement Establishing the Common Market for Eastern and Southern Africa (COMESA), Kampala, done 5 November 1993, entered into force 8 December 1994; 33 ILM 1067 (1994); see further http://en.wikipedia.org/wiki/Common_Market_for_Eastern_and_Southern_Africa; last accessed 19 November 2013.

[13] Treaty of the Southern African Development Community, Windhoek, done 17 August 1992, entered into force 30 September 1993; 32 ILM 116 (1993); see further http://en.wikipedia.org/wiki/Southern_African_Development_Community; last accessed 19 November 2013.

[14] Charter establishing the Cooperation Council for the Arab States of the Gulf, Abu Dhabi, done 25 May 1981, entered into force 11 November 1981; 26 ILM 1131 (1987); see further http://en.wikipedia.org/wiki/Cooperation_Council_for_the_Arab_States_of_the_Gulf; last accessed 19 November 2013.

[15] See e.g. F. Lyall, *Law and Space Telecommunications* (1989), 245 ff.; K. Madders, *A New Force at a New Frontier* (2000), 3–37; G. Lafferranderie, *European Space Agency* (2005), 17–22; *cf.* also P. Malanczuk, Actors: States, International Organisations, Private Entities, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 24 ff.; J.L. van de Wouwer & F. Lambert, *European trajectories in space law* (2008), 47–9.

Thus, in 1962 two separate organizations were established to develop what were considered to be the two main areas of space activities where Europe should develop some level of know-how and technological expertise, at least partially independently from the United States: the European Space Research Organisation (ESRO)[16] for space research and the European Launcher Development Organisation (ELDO)[17] for the development of European launch capabilities.

The establishment of these two organizations immediately resulted in a first novel contribution to international space law or even international law as such: the provisional implementation of an international agreement providing for major joint operations prior to its formal entry into force.[18] The latter was to take some two more years in both cases, as was fairly normal with complex international treaties, yet the member states did not want to wait until such formal entry into force of all relevant rules, rights and obligations before they would actually start undertaking space activities. In the spirit of cooperation in this challenging and novel area of outer space activities, in both cases the member states agreed to act, from the signature of the treaties onwards, as if they were formally applicable in all respects – essentially banking on the assumption that no major legal disputes would arise, the solution of which would have been considerably complicated with the relevant treaty not being in force.

As for ESRO, its original member states were ten in number: Belgium, Denmark, France, Italy, the Netherlands, Spain, Sweden, Switzerland, the

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16 Convention for the Establishment of a European Space Research Organisation (hereafter ESRO Convention), Paris, done 14 June 1962, entered into force 20 March 1964, expired 30 October 1980; 158 UNTS 35: UKTS 1964 No. 56; Cmnd. 2489.

17 Convention for the Establishment of a European Organisation for the Development and Construction of Space Vehicle Launchers (hereafter ELDO Convention), London, done 29 March 1962, entered into force 29 February 1964, expired 30 October 1980; 507 UNTS 177; UKTS 1964 No. 30; Cmnd. 2391; ATS 1964 No. 6.

18 See on this phenomenon in general e.g. R. Lefeber, Treaties, Provisional Application, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. X (2012), 1–5; R.E. Dalton, Provisional Application of Treaties, in *The Oxford Guide to Treaties* (Ed. D.B. Hollis) (2012), 220–47; also Art. 25, Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969); with respect to ELDO and ESRO specifically Madders, *supra* n. 15, 41–3. The example would be followed later e.g. by INTELSAT and INMARSAT (see on those organizations further *infra*, §§ 5.4.1, 5.5.1), and the ISS arrangements (see further *infra*, § 11.2).

United Kingdom and West Germany.[19] It should be immediately clear that there was no formal relation with the then-existing EEC[20] – of those ten member states, only Belgium, France, Italy, the Netherlands, and West Germany at the time were members of the EEC whereas Luxembourg, the sixth then-EEC member state, was not a member of ESRO. Vice versa, of course Switzerland even today is not an EU member.

ESRO's mission was to develop a scientific space research programme financed by member states on the basis of respective Gross National Product (GNP). The ESRO Convention actually introduced a further legal innovation which would be more formally institutionalized in the later ESA legal framework: the separation of mandatory programmes where such financing was indeed on a GNP basis and optional programmes which allowed for *à la carte* contributions from the member states.[21]

As the hoped-for development of fully-fledged European launch capabilities did not take place soon enough, ESRO concluded Memoranda of Understanding with the US space agency NASA on the launch of ESRO satellites, the first of which took place in 1967.[22] As NASA occasionally had to serve other priorities, notably of the US government, resulting in delays for ESRO,[23] this dependence on the United States for its actual space research activities became an increasing nuisance, and a major factor in moving the European institutional space structure beyond ESRO and ELDO.[24]

ELDO started out on the basis of a UK proposal to use its Blue Streak rocket as the first stage for a European launch vehicle, with the French

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19 See further on ESRO, Madders, *supra* n. 15, e.g. 55–61, 66–75; Lafferranderie, *supra* n. 15, 18; Lyall, *supra* n. 15, 246–8; J. Krige & A. Russo, *A History of the European Space Agency 1958–1987, Vol. I, The Story of ESRO and ELDO 1958–1973* (2000), SP-1235, 42 ff., 122 ff.

20 The gradual realization of informal, then more formal, relations between the European space organizations and what was ultimately to become the European Union only took off decades later – and has still not resulted in an institutional integration: contrary to what especially outside Europe is often perceived to be the case, ESA and the European Union are essentially still two distinct – and hugely different – entities, formally independent of each other.

21 *Cf.* e.g. Lyall, *supra* n. 15, 248; Madders, *supra* n. 15, 56, 189–91; Krige & Russo, *supra* n. 19, 312, 320–30. See further on this *infra*, §§ 4.2.3.1 and 4.2.3.2, on mandatory and optional programmes.

22 See Madders, *supra* n. 15, 70; Lafferranderie, *supra* n. 15, 18.

23 See e.g. Krige & Russo, *supra* n. 19, 75–9; E. Sadeh, *Space Politics and Policy: An Evolutionary Perspective* (2002), 290 ff.

24 See on this Sadeh, *supra* n. 23, 290 ff.; *cf.* also Madders, *supra* n. 15, 140–6.

Coralie missile mounted on top as the second stage. Apart from those two European space powers, Belgium, Italy, the Netherlands and West Germany were members of ELDO (so several other ESRO members did not choose to become a member state of this other space organization), plus the non-European nation of Australia, which was to contribute its launch base at Woomera for ELDO launches.[25]

Because of the resulting divided responsibilities, lack of coordination and even expertise as such, however, most launches ended in failure,[26] and in 1972 the European Space Conference was organized to remedy the various shortcomings in the European space effort.[27] It was agreed to merge the two European space organizations into one, as further spurred on by a US offer to cooperate on Spacelab, and include the options of mandatory and optional programmes, with a preference for using the European launchers to be developed as much as reasonably possible.[28] Consequently, in 1973, by way of an interim arrangement, ELDO was formally integrated into ESRO, and two years later the establishment of the European Space Agency, succeeding the two other organizations, was a fact.

4.2.2 ESA: The 1975 ESA Convention and the General Legal Framework

After the conclusion of the ESA Convention[29] in 1975 it would take another five years for it to formally enter into force, as a consequence of

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[25] See further on ELDO e.g. Madders, *supra* n. 15, e.g. 43–55, 60–1, 75 ff.; Lafferranderie, *supra* n. 15, 19; Lyall, *supra* n. 15, 249–50; Krige & Russo, *supra* n. 19, 81 ff.; International Business Publications, *European Space Policy and Programs Handbook* (2010), 62–9.

[26] *Cf.* Lyall, *supra* n. 15, 249; Madders, *supra* n. 15, 163–4, e.g. also noting the distinct difference in origins: ELDO as primarily politician driven, ESRO as primarily scientist driven (at 55) and programmatic delays and cost overruns (at 114–6).

[27] See e.g. Madders, *supra* n. 15, 124–54; Lafferranderie, *supra* n. 15, 21–4; Lyall, *supra* n. 15, 251–2; N.M. Matte, Outer Space and International Organizations, in *A Handbook on International Organizations* (Ed. R.J. Dupuy) (2nd edn, 1998), 769–70; B. Harvey, *Europe's Space Programme: To Ariane and Beyond* (2003), 49–50.

[28] See Lafferranderie, *supra* n. 15, 22–3; *cf.* also *infra*, § 7.5.3.2.

[29] Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1.

the various complicated national ratification procedures, but following the precedent set by ESRO and ELDO also the ESA Convention was provisionally applied as of 1975.[30]

After starting out with ten member states, as of this writing, ESA has grown to encompass 20 member states.[31] As proof that ESA still is not formally part of the institutional structure of the European Union, two of those member states – Norway and Switzerland – are not EU members. Another often-heard misconception, that Canada would be an ESA member state, should be rectified here as well: Canada is designated 'Cooperating Partner'.[32] Other special partnerships currently exist with Estonia, Hungary and Slovenia under the Plan for European Cooperating States (PECS).[33]

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[30] *Cf.* e.g. G. Lafferranderie, The European Space Agency (ESA) and International Space Law, in *International Organisations and Space Law*, ESA SP-442 (Ed. R.A. Harris) (1999), 20; Lafferranderie, *supra* n. 15, 25–9, also 265, reprinting Resolution ESA/C/XLIII/Res.6(final), of 23 October 1980, addressing the *de jure* entry into force of the Convention in the light of its prior *de facto* application; Madders, *supra* n. 15, 212–3; Lyall, *supra* n. 15, 268–9; further *supra*, text at n. 18.

[31] See e.g. www.esa.int/About_Us/Welcome_to_ESA/What_is_ESA, www.esa.int/About_Us/Welcome_to_ESA/ESA_history/History_of_Europe_in_space, last accessed 19 January 2014; these are Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom.

[32] Though formally under Art. XXII(1), ESA Convention, *supra* n. 29, '*any* state' may accede, further to the references in Art. II to 'European States', 'European space policy' and 'European space programme', and more generally to Europe and the European Space Conference (*cf.* Preamble & Arts. I, XX), only European states qualify for formal membership of ESA; see Lafferranderie, *supra* n. 15, 30–2; Matte, *supra* n. 27, 770. Canada entered into a 1978 standing cooperation agreement with ESA in conformity with Art. XIV(2), ESA Convention, following earlier more *ad hoc* cooperation arrangements; see Madders, *supra* n. 15, 420; Lafferranderie, *supra* n. 15, 30.

[33] See further www.esa.int/About_Us/Plan_for_European_Cooperating_States, last accessed 19 January 2014; these partnerships are essentially to prepare those new EU member states to also become fully fledged ESA members, by stimulating relations with interested European states, expanding the overall European scientific and industrial base, and enriching ESA as a research and development organization. *Cf.* also S. Hobe, M. Hofmannová & J. Wouters, *A Coherent European Procurement Law and Policy for the Space Sector* (2011), 180.

Within the legal structure obviously the Convention is the highest document hierarchically speaking, with five Annexes integrally part of the Convention.[34] The Convention also provides for the two main organs, the Council of member states[35] and (formally) the Director General, who is, however, assisted by staff.[36] ESA as an organization consists of five main establishments,[37] with the launch site in Kourou, French Guyana,

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[34] These concern Annex I: Privileges and immunities, Annex II: Financial provisions (dealing with the general budget), Annex III on optional programmes and dealing with budgeting issues, in particular with cost overruns (see further *infra*, § 4.2.3.2), Annex IV: Internationalisation of national programmes, and Annex V: Industrial policy (see further *infra*, § 4.2.4).

[35] See Art. XI, ESA Convention, *supra* n. 29, for establishment, functions, *modus operandi* and competences of the Council. Its main competences are to decide on and accept programmes proposed to it, to determine the financial structure of the programmes, to monitor progress of the various programmes, to adopt the annual general budget, to authorize transfer outside the territories of member states of ESA-originating technology and products, and to establish subordinate bodies such as the Scientific Programme Committee; *cf.* Art. XI(5), (8). Further e.g. Lafferranderie, *supra* n. 15, 57–61; Madders, *supra* n. 15, 196–9; International Business Publications, *supra* n. 25, 36.

[36] See Art. XII, ESA Convention, *supra* n. 29, for establishment, functions, *modus operandi* and competences of the ESA staff under the supervision of the Director General. See further e.g. the organogram in *ESA Annual Report 2005* (2006), 10, www.esa.int/esapub/annuals/annual05/ar5_organigramme.pdf, for the current organizational structure of the Agency. The main competencies of the Director General are to manage the Agency, to monitor actual execution of ESA programmes and ESA policy, to supervise the ESA establishments, to recommend senior management staff to be appointed and dismissed by the Council, to propose activities and programmes to the Council and to propose other measures considered necessary and adequate to fulfil ESA's aims; *cf.* Art. XII(1.b). Further e.g. Lafferranderie, *supra* n. 15, 64–70; Madders, *supra* n. 15, 203–5; International Business Publications, *supra* n. 25, 129; Sadeh, *supra* n. 23, 392.

[37] To wit: the ESA Headquarters in Paris (where general policy-making takes place, including international relations, international negotiations and international law issues), ESTEC in Noordwijk, the Netherlands (the European Space Research and Technology Centre, with the largest portion of ESA staff building and testing the space instruments), ESOC in Darmstadt (the European Space Operations Centre where ground control of all ESA activities is concentrated), ESRIN in Frascati, Italy (the European Space Research Institute, which started out as the ESA database centre but now also has become the centre for ESA's earth observation activities), and the EAC in Cologne (the European Astronaut Centre where the training of ESA crews is conducted). Further e.g. Lafferranderie, *supra* n. 15, 47–8; Madders, *supra* n. 15, 352–67.

operated in close cooperation with the French space agency CNES,[38] effectively counting as the sixth major ESA establishment.[39]

The aims of ESA are 'to provide for and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems'.[40] The Agency therefore effectively has a threefold mission: (1) to stimulate the development of material and technical resources of the member states through a distinct and innovative framework for international cooperation amongst them; (2) to integrate national space programmes as much as possible at a European level, establishing greater economies of scope and scale and allowing for a certain level of specialization; and (3) to strengthen European space efforts for exclusively peaceful purposes at a global level, aiming for international cooperation with the other space powers whilst establishing and maintaining Europe's own position within the global space arena.

4.2.3 ESA in Operation: The Space Programmes

The main thrust of ESA is the pooling of resources (technological as well as financial, and also political) of the member states in the area of outer space and space activities for the benefit of those member states, as well as the world at large. This thrust is given shape mainly through the actual ESA programmes.

In general, either individual member states 'offer' programmes to ESA for 'Europeanization' thereof, meaning they invite other ESA members through the ESA mechanisms to join such a programme, or the Director

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[38] See on Kourou operations in general e.g. Lafferranderie, *supra* n. 15, 53–5; Madders, *supra* n. 15, 367–71.

[39] In the pre-ESA days, ESRO also used the ESRANGE sounding rocket launch site in Kiruna, Sweden, but that facility has long since been transferred to the Swedish Space Corporation (SSC); see e.g. Madders, *supra* n. 15, 67, 74–5.

[40] Art. II, ESA Convention, *supra* n. 29. See further in detail Lafferranderie, *supra* n. 15, 39–46; Madders, *supra* n. 15, 180 ff.; Matte, *supra* n. 27, 770. Consequently, ESA is *not* an international organization endowed with 'supranational' regulatory competences other than the ones narrowly specified by the Convention and other internal legal documents; *cf.* Madders, *supra* n. 15, 392–3; more in general e.g. H.G. Schermers, The Legal Basis of International Organization Action, in *A Handbook on International Organizations* (Ed. R.J. Dupuy) (2nd edn, 1998), 404–11.

General as supported by his staff can propose programmes to be adopted as such by the Council.[41] Such programmes can be of three generic types.

4.2.3.1 Mandatory activities

Following the approach already adopted in the pre-ESA phase of European space integration, the first major category of ESA programmes concerns the 'mandatory activities'.[42] Mandatory activities are generally those of a scientific or R&D nature, such as desktop and laboratory studies of future projects, technological research work, and the elaboration and execution of *scientific* programmes, undertaken by satellites and other space systems.

The ESA Council may approve programmes by simple majority (each state having one vote,[43] regardless of size or input into a particular programme), then determines with unanimity the total level of resources to be made available for that programme.[44] Once these decisions have been made, all member states will contribute their share as per a pre-set scale, based on a rolling average of the last three years' GNP.[45]

Notable examples of mandatory activities undertaken by ESA are the Smart mission to the moon, Mars Express, the Huygens module, which is travelling to Titan on board NASA's Cassini-spacecraft, the XMM-Newton spacecraft targeted to detect X-ray sources in outer space, the ISO (Infrared Space Observatory) researching the 'dusty' areas of the universe, the Integral mission to study explosions, radiation and black holes (launched on a Russian Soyuz vehicle) and the SOHO mission to the sun (launched on the private US launcher Atlas).[46]

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[41] As per Annexes IV, and III respectively, ESA Convention, *supra* n. 29. See further e.g. Madders, *supra* n. 15, 191–2; on the former also Lafferranderie, *supra* n. 15, 93 ff.

[42] See Art. V(1.a), ESA Convention, *supra* n. 29. Further e.g. Lyall, *supra* n. 15, 255; Madders, *supra* n. 15, 189; Lafferranderie, *supra* n. 15, 74–8; International Business Publications, *supra* n. 25, 35; National Research Council and European Science Foundation, *U.S.–European Collaboration in Space Science* (1998), 35; Sadeh, *supra* n. 23, 325.

[43] *Cf.* Art. XI(6.a), ESA Convention, *supra* n. 29; also Lafferranderie, *supra* n. 15, 70–2; Madders, *supra* n. 15, 198.

[44] See Art. XI(5.a), ESA Convention, *supra* n. 29.

[45] See Art. XIII(1), ESA Convention, *supra* n. 29. *Cf.* also e.g. Lafferranderie, *supra* n. 15, 95–6.

[46] See further e.g. Lafferranderie, *supra* n. 15, 74–6; Madders, *supra* n. 15, 223–33.

4.2.3.2 Optional activities

The logical opposite to 'mandatory activities' are the 'optional activities', a mechanism also adopted from its predecessors (notably ESRO), then elaborated, by ESA.[47] Optional activities are generally of a much more practical/operational nature than mandatory ones: they concern the actual design, development, construction, launching and placing into orbit of spacecraft, as well as further operations of the satellites and other space systems thus launched. Here, a major portion of the actual work (in particular for the earth-based design, development and construction stages) is contracted out to the industries of (mainly) the member states.[48] Moreover, the focus of most optional programmes is on space activities with non-scientific experimental applications, beyond science and R&D strictly speaking. Because of the huge costs of actually going into outer space, optional programmes over the years average over 80 per cent of ESA's total budget.[49]

Once again, the ESA Council may accept programmes by simple majority.[50] This time, however, firstly there is an opportunity for member states to opt out altogether,[51] secondly the level of contributions of the individual member states that did not choose to opt out in the last resort is determined by each state for itself, and hence subject to individual states' interests in that particular programme.[52]

Though phrased the other way around – unless a state declares it does not wish to join, it is in, and unless states decide otherwise (which is what in fact happens normally), the standard proportional distribution of financial commitments is applied – this amounts to a system of *à la carte* participation. It indeed allows states to pursue, within the overall ESA framework, their particular interests in certain areas of space activities. For example, manned spaceflight has always been staunchly promoted by

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[47] See Art. V(1.b), ESA Convention, *supra* n. 29. Further e.g. Lyall, *supra* n. 15, 255–7; Madders, *supra* n. 15, 189–95; Lafferranderie, *supra* n. 15, 78–89; Sadeh, *supra* n. 23, 325.

[48] See further *infra*, § 4.2.4, on the discussion on industrial policy and 'fair return'.

[49] *Cf.* e.g. Madders, *supra* n. 15, 189, in 1997 estimating the share at over 85 per cent; Lafferranderie, *supra* n. 15, 80, in 2005 arriving at 'some 80 per cent'.

[50] See Art. XI(5.c), ESA Convention, *supra* n. 29.

[51] *Cf.* Art. V(1), ESA Convention, *supra* n. 29; also Lafferranderie, *supra* n. 15, 79; S.C. Wang, *Transatlantic Space Politics: Competition and Cooperation Above the Clouds* (2013), 51.

[52] *Cf.* Art. XIII(2), ESA Convention, *supra* n. 29; also e.g. Lafferranderie, *supra* n. 15, 79.

France, whereas the United Kingdom, by contrast, was rather lukewarm for comparative cost reasons – whilst for instance Germany likewise could pursue its particular interests in earth observation applications.[53]

The usual deviation from the standard GNP-based distribution of costs and the individual discretion of member states to propose any level of contribution they individually feel appropriate obviously raises some profound management issues. To handle those as effectively and transparently as possible, once a programme has been initially agreed upon the activities are structured, with various milestones giving rise to potential re-evaluation of earlier decisions and the possibility of restructuring the programme to accommodate new developments.

Programmes are thus at the outset subdivided into phases (0: identification programme; 1: establishment programme; 2: establishment legal framework), with an 'Enabling Resolution' and Declaration then setting out the financial framework following relevant discussions in Council as well as detailing the operational phase (usually subdivided into A through E).[54]

The financial framework declaration sets out the key financial parameters, notably also including the individual commitments of member states to contribute funds to the programme. The default scenario is that once the total amount of committed member state contributions reaches 80 per cent of the total programme costs, the programme activities are allowed to take off.[55] The assumption is that, seeing the programme become a reality, other states may then join the fray after all; as a fall-back, the member states already committed would have to share any unaccounted parts of the budget in proportion to their originally committed share.[56] Participating states also accept up front that cost overruns up

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53 Thus, France promised in 1987 a contribution to the Hermes programme, developing a European space shuttle, of 43.5 per cent of the total estimated budget plus 13.8 per cent for the Columbus module for the ISS, whereas the United Kingdom was to contribute 5.5 per cent to Columbus only and nothing to Hermes at all. Germany was the largest contributor to Columbus with 38 per cent, as a platform intended for major space research and science. Germany was also, for example, the largest contributor to the major phase of the European Earth Remote Sensing Programme when established in 1984, with 27.29 per cent. See Madders, *supra* n. 15, 308, and 288 at n. 151. Generally, the footnotes to Madders' chs. 12 and 13 with the accompanying text provide much information on promised contributions to various programmes. *Cf.* further Lafferranderie, *supra* n. 15, 97–8, on the financing of optional programmes.

54 See Lafferranderie, *supra* n. 15, 80–1; also Madders, *supra* n. 15, 192–3.

55 See Lafferranderie, *supra* n. 15, 82–3; Madders, *supra* n. 15, 193.

56 *Cf.* Lafferranderie, *supra* n. 15, 82–3; Madders, *supra* n. 15, 193.

to 20 per cent would be likewise shared between them; only once cost overruns start to exceed 20 per cent would states be allowed to withdraw from the programme altogether.[57] There are, however, possibilities to deviate from this default process, in recognition of the special characteristics which individual programmes may turn out to have.[58]

Major examples of optional programmes concern the development of the Ariane launch vehicle,[59] the cooperation on Spacelab with the United States, the experimental telecommunication satellites OTS (for land-based communications) and MARECS (for maritime communications),[60] meteorology satellites Meteosat-1 and Metop,[61] the unsuccessful and half-way aborted effort to develop a European space shuttle Hermes,[62] the Olympus satellite dedicated to distance learning,[63] Envisat for environmental monitoring[64] and the two European flagship projects Galileo and Global Monitoring for Environment and Security (GMES)/ Copernicus, as far as ESA participation in those projects was concerned.[65]

The combination of mandatory and optional programmes within one international intergovernmental institution makes for a uniquely flexible

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[57] This is called the '120 per cent rule'; see Lafferranderie, *supra* n. 15, 83–5; Madders, *supra* n. 15, 193.

[58] *Cf.* e.g. the cases of Spacelab and Envisat as addressed by Lafferranderie, *supra* n. 15, 84–5; Madders, *supra* n. 15, 194, mentions 'variations on the 120 per cent clause (e.g. negating it)' as an option to be agreed upon by the Council through the Implementing Regulations.

[59] See further on Ariane and Arianespace *infra*, § 4.2.6.1 and § 7.2.1.2. Also V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001), 135–7; Lafferranderie, *supra* n. 15, 155 ff.; Madders, *supra* n. 15, 235–41.

[60] See further e.g. Madders, *supra* n. 15, 252–6; Lyall, *supra* n. 15, 269–70. *Cf.* also *infra*, § 4.2.6.2 and § 5.6 on EUTELSAT.

[61] See further e.g. Madders, *supra* n. 15, 266–70. Also *infra*, § 4.2.6.3.

[62] See e.g. Madders, *supra* n. 15, 294–342.

[63] See e.g. Madders, *supra* n. 15, 256–8.

[64] See e.g. Lafferranderie, *supra* n. 15, 87.

[65] See further *infra*, § 4.4.4. *Cf.* also Lafferranderie, *supra* n. 15, 149–51, on Galileo; 152–3, on GMES; S. Hobe *et al.*, Ten Years of Cooperation between ESA and EU: Current Issues, 58 *Zeitschrift für Luft- und Weltraumrecht* (2009), 49–73; G. Brachet, From Initial Ideas to a European Plan: GMES as an Exemplar of European Space Strategy, 20 *Space Policy* (2004), 7–15.

framework accommodating the interests of individual states while maintaining a coherent and efficient manageable programme, in short balancing the sovereign discretion of member states to spend resources on space programmes and the fundamental need to cooperate in that respect.[66]

4.2.3.3 Operational activities

In addition, a third generic type of space activities undertaken by ESA concerns the 'operational activities'.[67] Under this heading, ESA provides operational services on behalf of others (notably placing ESA facilities at the disposal of a 'customer', ensuring the launch, placing in orbit and/or control of operational satellites on its behalf, or carrying out any other activities requested by it), at cost price.[68]

Notable examples of operational activities concern the ongoing Telemetry, Tracking, and Command (TT&C) support for EUMETSAT satellites by the European Space Operations Centre (ESOC) in Darmstadt,[69] ongoing TT&C support for Arianespace from Kourou and ESOC,[70] consultancy on the Second Spacelab with NASA,[71] and consulting activities for the European Commission and playing the role of 'procurement agency' on behalf of the EU for the later stages of the Galileo programme.[72]

4.2.4 ESA and Industrial (Space) Policy

4.2.4.1 General aspects of ESA industrial policy

As one of the main rationales and justifications for ESA and its framework of mandatory and optional programmes is to serve the

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[66] It may be reiterated, that certainly for the early decades of space activities, the costs and risks associated therewith were generally considered too substantial for most states to handle on their own, meaning that without international cooperation, such as given shape by ESA, many states would be unable to directly benefit from space activities at all.

[67] See Art. V(2), ESA Convention, *supra* n. 29.

[68] *Cf.* Art. V(2), ESA Convention, *supra* n. 29. Further e.g. Lafferranderie, *supra* n. 15, 90; Madders, *supra* n. 15, 183; G. Lafferranderie, La notion d'activités opérationnelles dans la Convention de l'Agence, 37 *ESA Bulletin* (1984), 68.

[69] See further on EUMETSAT *infra*, § 4.2.6.3. *Cf.* also Lafferranderie, *supra* n. 15, 47, 91; Madders, *supra* n. 15, 359–64, 516–20.

[70] See further on Arianespace *infra*, § 4.2.6.1, § 7.2.1.2. *Cf.* also Lafferranderie, *supra* n. 15, 91; Madders, *supra* n. 15, 520–6.

[71] *Cf.* Madders, *supra* n. 15, 454.

[72] See further *infra*, § 4.4.4.1.

scientific, technological and economic interests of its member states, the industrial policy behind these programmes – that is, how to organize the involvement of the space industries of the various member states in a fair, effective, coherent and comprehensive manner in these programmes – is a key feature also of the legal framework established through ESA. The general principles of ESA's industrial policy[73] are listed as being

> designed in particular to
>
> (a) meet the requirements of the European space programme and the coordinated national space programmes in a cost-effective manner;
> (b) improve the world-wide competitiveness of European industry by maintaining and developing space technology and by encouraging the rationalisation and development of an industrial structure appropriate to market requirements, making use in the first place of the existing industrial potential of all Member States;
> (c) ensure that all Member States participate in an equitable manner, having regard to their financial contribution, in implementing the European space programme and in the associated development of space technology; in particular the Agency shall, for the execution of its programmes, grant preference to the fullest extent possible to industry in all Member States, which shall be given the maximum opportunity to participate in the work of technological interest undertaken for the Agency;
> (d) exploit the advantages of free competitive bidding in all cases, except where this would be incompatible with other defined objectives of industrial policy.[74]

As is likely to happen with general principles, their actual application may lead to conflicting approaches. Whilst, for example, principles (b) and (d) might call for stimulating and promoting competition within Europe amongst the space industry to steel European companies for global competition with their US, Russian, Chinese, Japanese and other

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[73] For precision's sake it should be noted that 'ESA industrial policy' is actually shorthand for the combination of its member states' interests in pursuing certain industrial space policies and the result of those interests being discussed and negotiated in the framework of ESA, notably the ESA Council, where applicable then giving rise to particular ESA space programmes or less concrete ESA actions such as Resolutions – as opposed to national space programmes and policy actions, where member states were either not interested in having other ESA members join or failed to generate sufficient interest amongst them to join such programmes. See also further *infra*, §§ 4.4.2, 4.4.3, on EU involvement in this context.

[74] Art. VII(1), ESA Convention, *supra* n. 29, further to Art. II(d). The Council may unanimously add other objectives to the list.

counterparts, principle (c) (as well as the reference to 'existing industrial potential') might call for the opposite – not inciting competition for ESA contracts, but designating contractual partners through different mechanisms. The key clause in this respect is the last sentence quoted, where the most pro-competition-oriented principle is caveated as being in the end subordinate to the others.

This is then also the general approach taken, both in the further elaboration of ESA industrial policy in Annex V to the ESA Convention and in practice when it comes to relevant decisions in the Council.[75]

4.2.4.2 Preference for European industry

Firstly, '[i]n the placing of all contracts, the Agency shall give preference to industry and organisations of the Member States. However, within each optional programme covered by Article V.1(b) of the Convention, particular preference shall be given to industry and organisations in the participating States.'[76] Only the Council can decide whether and to what extent ESA can deviate from this preference – a 'buy European' policy which strictly speaking is not legally binding upon ESA, but in practice plays a considerable role in ensuring ESA will comply in particular with the last sentence of principle (b) of Article VII of the ESA Convention as quoted above.[77]

Technically, the 'allocation' of particular companies to a member state for this purpose takes place 'in the light of the following criteria: location of the enterprise's registered office, decision-making centres and research centres, and territory on which the work is to be carried out',[78] which

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[75] See further e.g. Hobe, Hofmannová & Wouters, *supra* n. 33, 52–63; Lafferranderie, *supra* n. 15, 107 ff.; Madders, *supra* n. 15, 383–98; R. Hansen & J. Wouters, Towards an EU Industrial Policy for the Space Sector – Lessons from Galileo, 28 *Space Policy* (2012), 94–101; K. Suzuki, *Policy Logics and Institutions of European Space Collaboration* (2003), 87–93.

[76] Art. II(1), Annex V, ESA Convention, *supra* n. 29.

[77] See Art. II(2), Annex V, ESA Convention, *supra* n. 29. See further G.V. D'Angelo, *Aerospace Business Law* (1994), 37–41; *cf.* also Lafferranderie, *supra* n. 15, 155 ff.; Madders, *supra* n. 15, 526; not even the recent European Guaranteed Access to Space (EGAS) policy developed in conjunction with the European Commission results in a fully fledged obligation to buy European; *cf.* Lafferranderie, *supra* n. 15, 172–3; also *infra*, § 7.5.3.2.

[78] Art. II(3), Annex V, ESA Convention, *supra* n. 29; especially the first criterion reflects the general public international law approach of determining the nationality of a legal person with reference to its headquarters and legal registration; see J. Crawford, *Brownlie's Principles of Public International Law* (8th edn, 2012), 527–30; P. Okowa, Issues of Admissibility and the Law on

would allow, for example, a US company carrying out work in Germany to qualify as a 'German' enterprise for the purposes of the 'buy European' policy determination.

4.2.4.3 'Geographical distribution' and 'fair return'

Secondly, and even more importantly, in the distribution of contracts for ESA programmes amongst the companies of the various member states, respectively the various member states participating in that programme, the concepts of 'geographical distribution' and 'fair return' are applied.[79]

Under these principles, ideally any ESA member state should see 100 per cent of its committed financial contribution to an ESA programme returned to its industry in the form of contracts.[80] While some 'weighing' of specific contributions is possible, allowing for some flexibility and discretion on the ESA side to accommodate the interests of the programme as such, also a 'minimum acceptable' return coefficient was agreed upon, of (originally) 0.8.[81]

Post-1975 (as this scheme was immediately adopted), for the first two decades or so the system of 'fair return' was regularly tightened, following the general growth of financial activities which had caused the original 20 per cent 'maximum loss' to become ever larger in absolute terms, whilst also several member states turned out to be chronically 'underserved' in terms of ESA contracts.[82] The minimum acceptable return coefficient was raised to 0.9 in 1985, to 0.95 in 1987, to 0.96 in 1992 and to 0.98 in 1997; moreover, as of 1987 the concept was applied not just across the board as far as the totality of ESA programmes was concerned, but within each programme.[83] Then, however, partly due to

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International Responsibility, in *International Law* (Ed. M.D. Evans) (2003), 483–5; incl. *Case Concerning the Barcelona Traction Light and Power Company, Limited* (Second Phase) (Belgium v. Spain), International Court of Justice, 5 February 1970, I.C.J. Rep. 1970, 4, para. 44. Further Madders, *supra* n. 15, 388–9.

[79] See in general e.g. Hobe, Hofmannová & Wouters, *supra* n. 33, 70–8; B. Schmidt-Tedd, The Geographical Return Principle and its Future within the European Space Policy, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 87–9; Lafferranderie, *supra* n. 15, 108–15; Madders, *supra* n. 15, 384–8.

[80] *Cf.* Art. IV(1), (3), Annex V, ESA Convention, *supra* n. 29; see also further *infra*, § 4.4.5.

[81] See Art. IV(2), (6), Annex V, ESA Convention, *supra* n. 29.

[82] See on this Madders, *supra* n. 15, 297, *cf.* also 384–5; Lafferranderie, *supra* n. 15, 108.

[83] See e.g. Hobe, Hofmannová & Wouters, *supra* n. 33, 73, incl. at n. 379; Madders, *supra* n. 15, 384–5; Lafferranderie, *supra* n. 15, 108–10.

the increasing involvement of the European Community, then European Union, in the field,[84] in 1997 a new system was introduced and the strict and rigorous application of 'fair return' was considerably diluted, although it continues to play a key role in allocating ESA contracts.[85]

4.2.5 ESA and Space Law

As per the above survey, ESA presents a rather unique and interesting case of integration of national space activities and policies of individual states into a larger, international framework even as the individual sovereignty of member states to conduct their own space programmes remains. Not only can they participate *à la carte* in optional programmes, but they maintain their freedom to continue or establish new national space programmes and also to conclude international cooperation agreements, even with other ESA member states, yet disregarding the ESA framework.[86]

With a view to ESA's role specifically in the context of space law beyond the institutional structures and mechanisms surveyed above, the baseline is that ESA has no legislative authority as such – its impact on space law and the development thereof consequently largely runs along a few more indirect lines.

4.2.5.1 Partisanship to the UN space treaties

Firstly, as one of the few – and arguably the most important amongst them – international organizations, ESA has made use of the possibilities

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[84] See further on this e.g. *infra*, § 4.4.5.

[85] *Cf.* e.g. Madders, *supra* n. 15, 393–8; further Hobe, Hofmannová & Wouters, *supra* n. 33, 76–9; Lafferranderie, *supra* n. 15, 109; *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2013), 31–2.

[86] Examples of the latter concern the French SPOT programme, where France accepted (limited) participation at various times by Belgium, Italy and Sweden outside the ESA framework; see F.G. von der Dunk, *Private Enterprise and Public Interest in the European 'Spacescape'* (1998), 215–7; A. Kerrest de Rozavel & F.G. von der Dunk, Liability and Insurance in the Context of National Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 153; and the French-Italian Helios satellite; see Madders, *supra* n. 15, 485, 497. *Cf.* also more in general Madders, *supra* n. 15, 180–4; Lafferranderie, *supra* n. 15, 93, *i.a.* mentioning single-state space projects that were not 'Europeanized'.

under the Rescue Agreement,[87] the Liability Convention[88] and the Registration Convention[89] to become a 'party' for all practical purposes to those treaties, and therefore qualifies as 'launching authority' and 'launching State' respectively in their contexts. As only three ESA member states (Austria, Belgium and the Netherlands) are parties to the Moon Agreement, by contrast ESA could not fulfil one of the preconditions of becoming such a 'party' to that treaty, had it been interested in doing so.[90] In this regard, therefore, ESA certainly plays a rather exemplary role in promoting the adherence to these UN space treaties, albeit by definition limited in its possibilities to do so by the sovereign

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[87] As per Art. 6, Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968); and Declaration of 31 December 1975; *International Organisations and Space Law* (1999), 25. *Cf.* further Lafferranderie, *supra* n. 30, 20–3; also *supra*, § 2.3.2.2.

[88] As per Art. XXII, Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971); and Declaration of 23 September 1976; *International Organisations and Space Law* (1999), 33; *Space Law – Basic Legal Documents*, A.III.2, at 1. *Cf.* further Lafferranderie, *supra* n. 30, 20–2; Madders, *supra* n. 15, 424–7; Lafferranderie, *supra* n. 15, 135; also *supra*, § 2.3.3.8. The Resolution on the Agency's Legal Liability, ESA/C/XXII/Res. 3, adopted Paris, 13 December 1977; *International Organisations and Space Law* (1999), at 35, spelled out in further detail how international liability claims against ESA would then be handled within the Agency, notably by proportional sharing as between the member states.

[89] As per Art. VII, Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975); and Declaration of 2 January 1979; *International Organisations and Space Law* (1999), 27. *Cf.* further Lafferranderie, *supra* n. 30, 20–3; Madders, *supra* n. 15, 424–5; also *supra*, § 2.3.4.3.

[90] *Cf.* Art. 16, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979); requiring *i.a.* a majority of member states to be parties to the Moon Agreement.

member states ultimately in control of the extent to which such adherence is even possible – in accordance with the treaties themselves, of course.

4.2.5.2 Role in the formation of customary international law

Secondly, as ESA includes several major space powers – France, Germany, the United Kingdom, Italy and Spain – in a number of respects its decisions, policies and internal rule-making could reflect an important 'conglomerate' *opinio juris* of those member states regarding certain international space law developments.[91] Interesting examples are its interpretation of the 'peaceful purposes' provisions in space law,[92] its leading role in developing tentative customary law on debris mitigation through its co-initiation of the Inter-Agency Space Debris Consultative Committee (IADC),[93] the application of the 'fair return' concept in

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[91] See on the key issues and role in international law of *opinio juris* generally e.g. B.D. Lepard, *Customary International Law: A New Theory with Practical Applications* (2010); specifically on the role of intergovernmental organizations in this context, S.R. Freeland, The Role of 'Soft Law' in Public International Law and its Relevance to the International Regulation of Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 10–1; F.G. von der Dunk, International Organisations as Creators of Space Law – A Few General Remarks, in *International Organisations and Space Law* ESA SP-442 (Ed. R.A. Harris) (1999), 335–43; on the role of customary law in space law e.g. B.D. Lepard, The Legal Status of the 1996 Declaration on Space Benefits: Are Its Norms Now Part of Customary International Law?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), esp. 291–4; I. Marboe, The Importance of Guidelines and Codes of Conduct for Liability of States and Private Actors, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 137–43; V.S. Vereshchetin & G.M. Danilenko, Custom as a Source of International Law of Outer Space, 13 *Journal of Space Law* (1985), 22–35.

[92] *Cf.* e.g. Arts. III, IV, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967); also *infra*, §§ 6.3, 5.9.2.3. It may be noted that ESA is by its Convention required to undertake its activities for 'exclusively peaceful purposes'; Art. II, ESA Convention, *supra* n. 29. For many years this has meant ESA had to stay away from any potentially military space activities in Europe, although this strictness is increasingly being mitigated in the post-Cold War era. *Cf.* further e.g. Madders, *supra* n. 15, 184–7; Lafferranderie, *supra* n. 15, 44–5; more broadly also von der Dunk, *supra* n. 3, 75–8, 90–2, 98–9.

[93] See further *infra*, § 13.3.2.2, also § 13.3.2.1. *Cf.* further e.g. K.U. Schrogl, Space and its Sustainable Uses, in *Outer Space in Society, Politics and Law* (Eds.

cooperative space projects engaging private industry[94] and its role in, and handling of, jurisdictional issues on the International Space Station (ISS).[95]

4.2.5.3 A particular IPR regime

Thirdly, noting the involvement of private industry in many major ESA projects and the interests of the former in intellectual property rights (IPR) as a means to protect investments and generate revenue, the ESA regime on handling such IPR has evolved into an interesting legal framework as well.[96] The baseline provisions of the ESA Convention require that member states and ESA itself should facilitate the exchange of scientific and technical information except when security-sensitive or in conflict with international obligations, should aim at a wide dissemination of scientific results of ESA projects whilst relevant data would remain the property of ESA, allow ESA to secure those rights necessary for protecting its interests, those of the member states and those of their entities in terms of access and disclosure rights, and in the end should make ESA intellectual property freely available to the member states – whose taxpayers after all ultimately funded those ESA projects.[97]

C. Brünner & A. Soucek) (2011), 605–7; F. Tronchetti, Soft Law, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 629–32; C. Wiedemann, Space Debris Mitigation, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 317 ff.; F.G. von der Dunk, *Contradictio in terminis* or Realpolitik?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 54–5.

[94] See discussion *supra*, § 4.2.4.3; also *infra*, § 4.4.5.

[95] *Cf.* Arts. 3(b), 4, 5(1), 6(2); on intellectual property, Art. 21; on criminal liability, Art. 22, Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station, Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4; *cf.* further *infra*, § 11.3.2. Also e.g. A. Farand, Jurisdiction and Liability Issues in Carrying out Commercial Activities in the International Space Station (ISS) Programme, in *The International Space Station* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 87–95; Madders, *supra* n. 15, 455–69; Lafferranderie, *supra* n. 15, 127–31.

[96] See A.M. Balsano & J. Wheeler, The IGA and ESA: Protecting Intellectual Property Rights in the Context of ISS Activities, in *The International Space Station* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 67 ff.; Lafferranderie, *supra* n. 15, 183–92; Madders, *supra* n. 15, 407–15; in general on IPR *infra*, Chapter 18.

[97] See Art. III, ESA Convention, *supra* n. 29.

These provisions were first worked out in the 1989 Rules concerning Information and Data,[98] which, however, only referred to patent protection and with their clear focus on public interests and wide dissemination of ESA-funded information and data, including free access for member states and their nationals, did not do much for the interests and competitiveness of the European industry.[99] Consequently, the 2001 Rules on Information, Data and Intellectual Property[100] broadened the ESA policy to all IPR, and created a required balance between the need of commercialization for a certain measure of non-disclosure and data protection and the need of effective R&D for information sharing and wide dissemination. Now, the ownership of raw and calibrated data and exclusivity of access, use and/or right to disseminate such data may remain with the industry if deemed necessary by ESA, whilst *ad hoc* agreements remain possible for specific cases.[101]

4.2.5.4 Creating daughter entities for practical space applications

A final set of important contributions made by or through the ESA framework to international space law concerns the practice of disengaging in certain space activities when they can no longer be considered R&D even from a broad perspective, and are being carefully handed off to other entities – sometimes newly created, alternatively making use of the EU's institutional structure allowing for specific new bodies to be established – whilst maintaining mutually beneficial relationships through its entitlement to undertake operational activities.

As to the first option, of creating new entities, ESA has so far spawned three 'daughter' entities in the realms where its activities were no longer

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[98] Rules concerning Information and Data, ESA/C(89)95, rev. 1, of 14 December 1989; see Lafferranderie, *supra* n. 15, 183 ff.; Madders, *supra* n. 15, 408–10.

[99] *Cf.* e.g. Balsano & Wheeler, *supra* n. 96, 76 ff.; also Madders, *supra* n. 15, 414–5; L.B. Malagar & M.A. Magdoza-Malagar, International Law of Outer Space and the Protection of Intellectual Property Rights, 17 *Boston University International Law Journal* (1999), 311–66.

[100] Rules on Information, Data and Intellectual Property, ESA/C(2002)3, of 19 December 2001.

[101] See Art. 8(1), ESA Implementing Rules for the ISS Exploitation Programmes, ESA/C(2002)175; see Balsano & Wheeler, *supra* n. 96, 78; also Lafferranderie, *supra* n. 15, 187.

considered to be R&D or experimental, and could actually be immediately or soon properly commercialized: launching, satellite communications and satellite remote sensing for meteorological purposes.[102] Later on, the same transformation from experimental space activities to application-oriented structural operations took place in two further areas, namely satellite navigation and satellite remote sensing for security and environmental purposes, but as these developments fundamentally involved the European Union, they will be addressed further below.[103]

4.2.6 The 'Daughters' of ESA

4.2.6.1 Launching and Arianespace

France, in particular, had always been keen on developing an autonomous European launch capability, and even during the formal demise of ELDO initiated within the soon-to-be-created ESA structure the optional Ariane programme in 1973.[104] With the resulting Ariane-1 vehicle launched successfully for the first time in 1979, it was quickly decided to spin off future routine, even commercial, operations to a prospective new private company Arianespace, which took effect in 1980.[105]

Arianespace, due to the leading role of France and the CNES, was established as a French company, headquartered in Evry and operating from Kourou in French Guyana, but with shareholders coming from all other ESA member states that had chosen to participate in the Ariane programme.[106] Its main mission was to take the blueprint of the tested Ariane-1 vehicle, build more of those, and market launching services

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[102] *Cf.* Art. II, ESA Convention, *supra* n. 29; another major element in such considerations concerned the inappropriateness for ESA to run 'routine' operations possibly in competition with member state and/or private entities, which, in particular in satellite communications, would have become almost inevitable.

[103] See *infra*, § 4.4.4.

[104] See on ESA optional programmes *supra*, § 4.2.3.2. Further on the Ariane programme e.g. M.G. Bourély, La Production du Lanceur Ariane, 6 *Annals of Air and Space Law* (1981), 280 ff.; R. Oosterlinck, Private Law Concepts in Space Law, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 45; Madders, *supra* n. 15, 235–41; Lafferranderie, *supra* n. 15, 155 ff.

[105] See e.g. Madders, *supra* n. 15, 520–6; A.J. Butrica, *Single Stage to Orbit: Politics, Space Technology, and the Quest for Reusable Rocketry* (2004), 1985–6; Kayser, *supra* n. 59, 137–47.

[106] *Statuts de la Société Arianespace*, of 26 March 1980. Arianespace currently has 24 shareholders from 10 (European) states, including as its largest shareholder the French space agency CNES, as well as all main companies

using them, and then to develop as appropriate further launch vehicles and services.[107]

Following its first commercial launches in 1984, Arianespace quickly became a success and captured a large share of the global open commercial market for launch services.[108] In 1996 it teamed up with Aerospatiale, the Russian Space Agency and the Samara Space Centre (also in Russia) in the Starsem joint venture to broaden its portfolio with Soyuz-plus-Ikar and Fregat launches from Plesetsk and Bajkonur.[109] With the registration and headquarters also in France, Starsem is a French company; France and Russia have concluded an agreement which *inter alia* provides for derogation of international third-party liability claims by Russia to France.[110] Following the first Starsem flight in 1999, so far more than 20 successful flights have taken place. Later still, Arianespace added another, smaller launcher (similar to the Ariane family developed by ESA) to its portfolio,[111] as well as starting to launch Soyuz vehicles from Kourou. ESA, in alignment with the European Commission, provides further support for Arianespace through its EGAS (European Guaranteed Access to Space) programme.[112]

Because of the intricate involvement of ESA as a research and development organization, France as the host country and country of

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involved in producing the Ariane-5 launch vehicle; see http://en.wikipedia.org/wiki/Arianespace, last accessed 18 January 2014; further e.g. Kayser, *supra* n. 59, 137.

[107] *Cf.* also Madders, *supra* n. 15, 521–4. For later Ariane vehicles a similar approach was adhered to; *cf.* Lafferranderie, *supra* n. 15, 167–71.

[108] See further K. Iserland, Ten years of Arianespace, 6 *Space Policy* (1990), 341–3; Madders, *supra* n. 15, 520–4; H.P. van Fenema, *The International Trade in Launch Services* (1999), 8, 20, 353–7; also *infra*, § 7.2.1.2.

[109] EADS meanwhile having inherited the 35% share of Aerospatiale, Rosaviacosmos and the Samara Space Centre each hold 25% with Arianespace itself holding the remaining 15%; see http://en.wikipedia.org/wiki/Starsem, last accessed 18 January 2014. Further also e.g. von der Dunk, *supra* n. 86, 179–81; B. Harvey, *The Rebirth of the Russian Space Program: 50 Years After Sputnik, New Frontiers* (2007), 15–6; Harvey, *supra* n. 27, 83.

[110] See e.g. von der Dunk, *supra* n. 86, 180.

[111] The Vega launcher; see e.g. Lafferranderie, *supra* n. 15, 168.

[112] See Council Resolution on a European space strategy, of 16 November 2000; OJ C 371/2 (2000); this meant that essentially the EGAS programme was sanctioned by the European Union. The aim was to ensure independent access to space for Europe by guaranteeing the competitiveness of the Ariane launcher, notably by providing Arianespace with a guarantee of at least six launches per year; see e.g. Lafferranderie, *supra* n. 15, 172–3; *Space 2030: Exploring the Future of Space Applications* (2004), OECD, 51.

nationality of the company and its (main) launch base, and the other European member states of ESA as having committed major resources to the Ariane programme as well, France, ESA and the participating ESA member states could all be held internationally responsible and/or liable for Arianespace's operations.[113] Consequently, a complex legal construction ruled the operations of Arianespace until the 2008 French Law on Space Operations[114] provided the French authorities with a licensing regime to apply to the company.[115] That legal construction, in the European context now largely a matter of history but possibly still of interest to other regions, depended upon a triad of documents.

Firstly, the Arianespace Declaration, adopted in its original version in 1980,[116] and renewed every ten years, is underwritten by the ESA member states involved in Arianespace directly or indirectly (that is through national industry) as shareholders. The Declaration provided for a principled commitment of support for Arianespace by those member states, meaning preferential treatment of Arianespace in case of national launches as well as international programmes in which such member states were participating.[117] ESA was, at least in principle, obliged to use the services of Arianespace for its launches.[118] Such services were to be offered only in conformity with the ESA Convention and the Outer Space

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113 *Cf.* Arts. VI, VII, Outer Space Treaty, *supra* n. 92; see *supra*, § 2.3.1.1. While the French space agency CNES would actually take care of the registration of Ariane launches, ESA, having also complied with the requirements of Art. VII, Registration Convention, *supra* n. 89 for becoming a 'party' to that Convention, could also perform that task.

114 Law on Space Operations (Loi relative aux opérations spatiales; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453.

115 See further *supra*, § 3.3.3.1.

116 Declaration by Certain European Governments Relating to the Ariane Launcher Production Phase (hereafter Arianespace Declaration), entered into force 14 April 1980; 6 *Annals of Air and Space Law* (1981), at 723; www.jaxa.jp/library/space_law/chapter_3/3-2-2-3/index_e.html, last accessed 13 April 2014. See further e.g. Oosterlinck, *supra* n. 104, 45–6; Kerrest de Rozavel & von der Dunk, *supra* n. 86, 151–2; von der Dunk, *supra* n. 86, 155 ff.; Kayser, *supra* n. 59, 137, Lafferranderie, *supra* n. 15, 155.

117 See Art. 1(4)(b) & (c), Arianespace Declaration, *supra* n. 116.

118 *Cf.* Art. 1(4)(a), Arianespace Declaration, *supra* n. 116. For the member states and their private space operators, however, this was already at best a *politically* binding preference; see Lafferranderie, *supra* n. 15, 155–65; see further *infra*, § 7.5.3.2.

Treaty; in particular the provision from the former that space activities could only be conducted for peaceful purposes was reiterated.[119]

As for the international third-party liability possibly resulting from Ariane launches by the company, France would answer such claims, as necessary reimbursing ESA and/or any of its member states if those were obliged under the Liability Convention to pay such claims.[120] Arianespace in turn was required to reimburse France for up to originally FF400 million per launch, which was later converted into €60 million, and to be insured up to that level.[121]

Also, the Arianespace Declaration included a provision ascertaining that IPR issues would not get in the way of developing Ariane launchers and their operations: 'Participants undertake to make available to Arianespace, when required for the purposes of the production or launch of Ariane … free of charge, the intellectual property rights belonging to them and deriving from the development and promotion phases of the Ariane programme' and likewise 'Participants invite the Agency to make available to Arianespace, to the extent necessary for the production or launch of Ariane … free of charge, the intellectual property rights deriving from the development and promotion phases of the Ariane programme'.[122]

Secondly, an Arianespace Convention was signed in 1992 between ESA and Arianespace to give effect to the provisions of the Arianespace Declaration as between ESA and the company – in the event of a conflict between the two, the latter takes precedence.[123] Most notably, the Convention effectively imposed liability on Arianespace for damage to

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[119] See Arts. 1(2)(a), 3(1), Arianespace Declaration, *supra* n. 116. *Cf.* also Art. II, ESA Convention, *supra* n. 29.

[120] See Art. 4(1), Arianespace Declaration, *supra* n. 116. On the Liability Convention, *supra* n. 88, see further *supra*, § 2.3.2.

[121] *Cf.* Art. 3(8), Arianespace Declaration, *supra* n. 116. As under Art. XII, Liability Convention, *supra* n. 88, international third-party liability was in principle without limit, this meant any claim going over the amount indicated would have to be borne by France. See further e.g. Kayser, *supra* n. 59, 142; Kerrest de Rozavel & von der Dunk, *supra* n. 86, 152–3, 160.

[122] Arts. 1(7) & 2(2), Arianespace Declaration, *supra* n. 116.

[123] See Art. 1. Convention between the European Space Agency and Arianespace on the Ariane Launcher Production Phase (hereafter Arianespace Convention), signed 24 September 1992; excerpts at www.oosa.unvienna.org/oosa/SpaceLaw/multi_bi/esa_ariane_001.html. See further e.g. Oosterlinck, *supra* n. 104, 45–6; Kerrest de Rozavel & von der Dunk, *supra* n. 86, 152; von der Dunk, *supra* n. 86, 156 ff.; Kayser, *supra* n. 59, 139; Madders, *supra* n. 15, 522–3.

property to the agency or the participant states, whilst itself waiving any liability claims against ESA.[124]

Thirdly, there was the CSG Agreement, effectively a series of protocols concluded between France and ESA concerning the use of the Centre Spatial Guyanais (CSG), the space centre at Kourou.[125] Under the CSG Agreement France reiterates its undertaking to carry any international third-party liability claims resulting from Arianespace launches, representing a reversal of the arrangements regarding the Ariane development programme when this was undertaken by ESA.[126] In turn, ESA waives all claims for inter-party liability against France for operations at the CSG, except in cases of gross negligence, wilful acts or deliberate omissions.[127]

The net effect of these documents, focusing on the activities which Arianespace was allowed to undertake, the level of support and control on the public side (in this case not only France as its state of nationality but also ESA as a consequence of its involvement through the Ariane programme) and key liability issues, was fulfilling a role that national space laws and licensing regimes would normally fulfil in a single-state context.[128] Only the establishment of the French Law on Space Operations could take over the role of these documents (at least in a number of respects), although at the same time elements pertaining to the roles, rights and responsibilities of ESA and its participating member states other than France would continue to be governed by these documents.[129]

4.2.6.2 Satellite communications and EUTELSAT

Following the general success of the Orbital Test Satellite OTS-2 in 1978, a follow-on more extended optional programme ECS (European Communication Satellite) kicked off in 1979, giving rise to the launches of ECS-1 (1983), ECS-2 (1984), ECS-3 (an abortive launch in 1985), ECS-4 (1987) and ECS-5 (1988).[130] At the same time, preparing for the follow-on activities of operating these satellites for practical telecom

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[124] *Cf.* Art. 22, Arianespace Convention, *supra* n. 123.

[125] *Cf.* e.g. Agreement between the French government and the European Space Agency with respect to the Centre Spatial Guyanais (CSG) (hereafter CSG Agreement), of 1993; excerpts of French version at 80 *ESA Bulletin* (Nov. 1994), at 67. Further Kayser, *supra* n. 59, 141; Kerrest de Rozavel & von der Dunk, *supra* n. 86, 152–3; von der Dunk, *supra* n. 86, 156 ff.

[126] See Art. 11(3) & (1), CSG Agreement, *supra* n. 125.

[127] *Cf.* Art. 13(1), (2), CSG Agreement, *supra* n. 125.

[128] See further on this von der Dunk, *supra* n. 86, 155–61.

[129] See e.g. Kerrest de Rozavel & von der Dunk, *supra* n. 86, 150 ff.; also Kayser, *supra* n. 59, 134–5.

[130] See e.g. Madders, *supra* n. 15, 253–5; further Lyall, *supra* n. 15, 269–70.

applications on a daily and quasi-commercial basis, in 1977 Interim EUTELSAT was created to ensure the establishment, operation and maintenance of the space segment of a European satellite communication system, and to conclude the necessary agreements, including with ESA.[131]

Interim EUTELSAT evolved into the European Telecommunication Satellite Organization EUTELSAT,[132] an intergovernmental organization headquartered in Paris with an interesting hybrid character as a public consortium much akin to INTELSAT and INMARSAT,[133] in 1982 (with formal effect as of 1985, following the now common practice of temporary application as per the Interim Arrangements prior to such formal effect[134]).

Due to the burgeoning satellite communications environment, EUTELSAT soon was able to stand on its own feet, no longer requiring ESA to develop new satellites for it, and the organization grew until at present it

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[131] Agreement on the Constitution of a Provisional European Telecommunications Satellite Organization 'INTERIM EUTELSAT', Paris, done 13 May 1977, entered into force 30 June 1977; ESA, *Basic Texts*, Vol. III, Doc. K6. See further e.g. Lyall, *supra* n. 15, 269–73; Madders, *supra* n. 15, 504–14; C. Roisse, The Evolution of EUTELSAT: A Challenge Successfully Met, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 120–2; Matte, *supra* n. 27, 772; S. White, S. Bate & T. Johnson, *Satellite Communications in Europe: Law and Regulation* (2nd edn, 1996), 105 ff.

[132] EUTELSAT was established by means of the Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9069; *Space Law – Basic Legal Documents*, C.II.1; and the Operating Agreement Relating to the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Operating Agreement), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9154; *Space Law – Basic Legal Documents*, C.II.2. Following a major restructuring, in the early 2000s the intergovernmental organization was essentially privatized; see further *infra*, § 5.6.2.

[133] Like INTELSAT and INMARSAT, EUTELSAT was a two-tier organization, with member states represented in the highest bodies but the actual telecom operators together running the satellite system; see further *infra*, § 5.6.1. *Cf.* also on the structure and organs of EUTELSAT Arts. VI–XIII, EUTELSAT Convention, *supra* n. 132; further e.g. Lyall, *supra* n. 15, 280–6.

[134] *Cf.* Lyall, *supra* n. 15, 275; Madders, *supra* n. 15, 504–5; Matte, *supra* n. 27, 772.

encompasses 49 member states,[135] that is almost all European countries – and considerably more states than either ESA or the European Union.

EUTELSAT's main objectives were the design, development, construction, establishment, operation and maintenance of a space segment and ground control segment for European satellite communication operations, where the transmitting and receiving ground stations and the communication services themselves offered by way of those were the responsibility of the individual member states and their telecommunication operators (essentially public agencies at the time).[136]

The operation of EUTELSAT's space infrastructure was to take place on a sound economic and financial basis and under accepted commercial principles.[137] This *inter alia* resulted in a financial structure whereby the contributions of the individual signatories to the organization's activities were matched with the actual usage and, if applicable, the revenues generated in that context.[138] In general, the order of priority of usage of the EUTELSAT system was (1) international public telecommunication activities; (2) domestic public telecommunication activities of the member states; and (3) specialized telecommunications.[139]

EUTELSAT's main focus was on the provision of one-way point-to-multipoint telecommunications; overall some 75 per cent of its activities concerned direct broadcasting by satellite.[140] This turned out to be important also in the legal realm. As all states establishing EUTELSAT were also member states of INTELSAT, its establishment had to comply with the requirement in the latter context that no satellite system could be established by its member states if that would give rise to 'significant

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135 See www.eutelsatigo.int/en/eutelsat.php?menu=3, last accessed 7 September 2013.

136 See Art. III, EUTELSAT Convention, *supra* n. 132; *cf.* e.g. Roisse, *supra* n. 131, 124–6; Lyall, *supra* n. 15, 277–8; Matte, *supra* n. 27, 773.

137 See Art. V, EUTELSAT Convention, *supra* n. 132.

138 *Cf.* Arts. 8–10, EUTELSAT Operating Agreement, *supra* n. 132. See further e.g. Roisse, *supra* n. 131, 125; Madders, *supra* n. 15, 506–7; Lyall, *supra* n. 15, 287–9.

139 See Art. III, EUTELSAT Convention, *supra* n. 132; also Lyall, *supra* n. 15, 278–80, 287–9.

140 See e.g. Madders, *supra* n. 15, 509–14; S. Courteix, EUTELSAT: Europe's Satellite Telecommunications, 5 *Michigan Yearbook of International Legal Studies* (1984), 85–102; C. Morrow, Developments in European Telecommunications Law and Policy, 24 *Columbia Journal of Transnational Law* (1985–1986), 165–70; *cf.* also Roisse, *supra* n. 131, 127–8.

economic harm' to – read seriously compete with – INTELSAT operations.[141] As INTELSAT, by contrast, was largely focused on two-way point-to-point non-broadcast telecommunications, that risk was deemed insignificant enough to allow the establishment of EUTELSAT to go ahead.

On intellectual property rights, EUTELSAT was to acquire only the rights necessary for it to operate properly; the contractor developing any relevant IPR got to retain it.[142] EUTELSAT, however, reserved its right to royalty-free use of such IPR, which also included EUTELSAT member states and signatories, including as necessary earth stations.[143]

On contractual liability, a general cross-waiver was applied:

> Neither EUTELSAT, nor any Signatory … shall be liable to any Party or to any Signatory or to EUTELSAT, because of any interruption, delay or malfunctioning of telecommunications services provided or to be provided under the Convention or the Operating Agreement, nor shall any actions for damages be brought against them because of such interruption, delay or malfunctioning.[144]

As for third-party liability, in case of international liability claims for example under the Liability Convention:

> No Party shall be individually liable for the acts and obligations of EUTELSAT, except where such liability results from a treaty to which that Party and a State claiming compensation are parties. In that case, EUTELSAT shall indemnify the Party concerned in respect of any such liability, unless the latter has expressly undertaken to assume exclusively such liability.[145]

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141 *Cf.* Art. XIV(d), Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 21; TIAS 7532; 23 UST 3813; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 909 (1971); also Lyall, *supra* n. 15, 277–8; 289–90; Roisse, *supra* n. 131, 125; further *infra*, § 5.4.1.

142 See Art. 18(b), EUTELSAT Operating Agreement, *supra* n. 132.

143 *Cf.* Art. 18(c), EUTELSAT Operating Agreement, *supra* n. 132.

144 Art. 19(a), EUTELSAT Operating Agreement, *supra* n. 132; see further e.g. Roisse, *supra* n. 131, 126.

145 Art. XXIV, EUTELSAT Convention, *supra* n. 132.

It should be noted that EUTELSAT had indeed deposited a declaration of acceptance of rights and obligations of the Liability Convention in conformity with the latter's provisions.[146]

Essentially, the above construction and legal role, position and competencies of EUTELSAT were fundamentally changed by a series of developments in the 1990s ultimately giving rise to its privatization, as further discussed below.[147]

4.2.6.3 Satellite remote sensing for meteorological purposes and EUMETSAT

ESA started to engage itself in satellite remote sensing for meteorological purposes with the optional programme Meteosat in 1975, giving rise to the launch of the Meteosat-1 satellite in 1977.[148] Following the success of its operations, in 1983 EUMETSAT was formed.[149]

Henceforth, EUMETSAT provides an international infrastructure of satellite remote sensing satellites and attendant services for meteorology for Europe, by developing, procuring, launching and operating satellites generating relevant weather data.[150] In this case, the national meteorological services of the member states are the users.[151]

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[146] As per 30 November 1987. See United Nations treaties and principles on outer space and related General Assembly resolutions, Addendum, Status of international agreements relating to activities in outer space as at 1 January 2009; ST/SPACE/11/Rev.2/Add.2, at 16; also e.g. N. Jasentuliyana, The Future of International Telecommunications Law, in *Legal Visions of the 21st Century* (Eds. A. Anghie & G. Sturgess) (1998), 399 at n. 26. See further Art. XXII(1), Liability Convention, *supra* n. 88.

[147] See *infra*, § 5.6.1.

[148] See e.g. Madders, *supra* n. 15, 266–70, 516–20.

[149] As per the Convention for the Establishment of a European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) (hereafter EUMETSAT Convention), Geneva, done 24 May 1983, entered into force 19 June 1986; as amended 14 July 1994, entered into force 27 July 1994; UKTS 1999 No. 32; Cm. 1067; Cmnd. 9483; 44 ZLW 68 (1995).

[150] *Cf.* Art. 2(1), EUMETSAT Convention, *supra* n. 149; also e.g. Madders, *supra* n. 15, 516–7. More in general on EUMETSAT see further F.G. von der Dunk, European Satellite Earth Observation: Law, Regulations, Policies, Projects, and Programmes, 42 *Creighton Law Review* (2009), 403–6; M.G. Bourély, EUMETSAT – A New European Space Organization for Cooperation in the Field of Meteorology, in *Proceedings of the Twenty-Sixth Colloquium on the Law of Outer Space* (1984), 195 ff.; W. Balogh & P. Valabrega, EUMETSAT International Cooperation Activities, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 189 ff.

[151] See Art. 8(2), EUMETSAT Convention, *supra* n. 149.

EUMETSAT from the start, contrary to EUTELSAT, was a 'traditional' intergovernmental organization; thus, the national meteorological services were not independently represented within its institutional structure.[152] Currently, the organization counts 29 member states, with two more states as 'cooperating states' paying 50 per cent of full membership fees.[153] The organization is headquartered in Darmstadt, Germany – next door to the ESOC run by ESA.

EUMETSAT continued the Meteosat programme, taking over relevant direct responsibilities from ESA, and also was made responsible for developing new programmes and next-generation satellite systems as appropriate.[154] Part of that responsibility also concerned the generation of valuable weather data, to be protected through copyright or related IPR tools such as the later Database Directive adopted by the European Union.[155]

The organization accepted liability for damage caused by its satellites, in line with the Liability Convention and if necessary reimbursing member states, but not for damage resulting from use of meteorological data.[156] As between EUMETSAT itself and its member states, a cross-waiver of liability was established.[157]

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[152] The Council of Member States is the supreme organ of the organization making all the highest-level decisions on the status, role, competences and operations of EUMETSAT; see Arts. 4, 5, EUMETSAT Convention, *supra* n. 149. The Director-General and his staff are responsible for the implementation and execution of EUMETSAT programmes; see Art. 6. *Cf.* however Art. 4(1), requiring that these services should be represented on the member states' delegations to the EUMETSAT Council. See further e.g. Hobe, Hofmannová & Wouters, *supra* n. 33, 233.

[153] See http://en.wikipedia.org/wiki/EUMETSAT, last accessed 14 April 2014; the full member states include all 20 ESA member states (see *supra*, at n. 31), non-ESA EU members Croatia, Estonia, Hungary, Latvia, Lithuania, Slovakia and Slovenia, plus Iceland and Turkey. The two cooperating states are Bulgaria and Serbia. *Cf.* also Art. 5(2)(a) *sub* (vii), EUMETSAT Convention, *supra* n. 149, on the legal basis for such cooperation.

[154] *Cf.* e.g. Art. 2(1), (2), (6), (7), EUMETSAT Convention, *supra* n. 149.

[155] See e.g. P. Hulsroj, Space Community, Space Law, Law, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 72–3; for the Database Directive, *infra* n. 210, see further *infra*, § 4.3.2.3.

[156] *Cf.* Art. 9(3) and (1) respectively, EUMETSAT Convention, *supra* n. 149. EUMETSAT declared its acceptance of the rights and obligations under the Liability Convention, *supra* n. 88, in July 2005; see UN COPUOS/LEGAL/T.734, of 4 April 2006, 13.

[157] See Art. 9(2), EUMETSAT Convention, *supra* n. 149.

Further to growing activities of the organization, such as the start of the Meteosat Second Generation (MSG) programme in 1994 and the taking over of operational responsibilities for the Meteosat satellite from ESOC in 1995,[158] EUMETSAT amended its Convention in 2000.[159] Henceforth, the material scope of EUMETSAT activities would formally extend to operational monitoring of the climate and detection of global climate changes.[160] More strictly legally speaking, the organization introduced the concept of 'optional programmes'. The (now) mandatory programmes, including Meteosat and other basic satellite programmes continued to be financed (like the general budget) in accordance with GNP ratios.[161] Optional programmes would concern all other programmes within the objectives of the organization, where the respective contributions were now to be determined per programme, as is the case with ESA optional programmes.[162]

In terms of its procurement policy, however, EUMETSAT only partially followed the ESA example: while both open competition and existing European expertise were leading principles to determine the granting of contracts, formally there was no geographical distribution or application of a 'fair return' principle: contracts were to be awarded essentially on a 'best value for money' basis.[163]

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[158] *Cf.* V. Thiem, Recent Developments in Eumetsat, in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (1996), 175–8; also e.g. already Madders, *supra* n. 15, 518–20.

[159] Convention for the Establishment of a European Organization for the Exploitation of Meteorological Satellites 'EUMETSAT' as amended (hereafter EUMETSAT Convention as amended); Paris, done 24 May 1983, entered into force 19 June 1986, amended version entered into force 19 November 2000; *Space Law – Basic Legal Documents*, C.III.1.

[160] See Art. 2(1), 2nd sent., EUMETSAT Convention as amended, *supra* n. 159; further R. Harris & R. Browning, *Global Monitoring: The Challenges of Access to Data* (2013), 130–1; A. Woods, *Medium-Range Weather Prediction: The European Approach* (2006), 159–60.

[161] See Arts. 2(7), 3, 5(2)(c), 10(3), EUMETSAT Convention as amended, *supra* n. 159.

[162] See Arts. 2(8), 3, 5(2)(d) & (3), 10(4), EUMETSAT Convention as amended, *supra* n. 159; further *supra*, § 4.2.3.2.

[163] *Cf.* Art. 2(3), EUMETSAT Convention, *supra* n. 149. To the extent, however, that ESA was involved in financing satellites, the 'fair return' principle *was* applied; *cf.* Hobe, Hofmannová & Wouters, *supra* n. 33, 235.

4.3 REGULATORY INTEGRATION OF SPACE ACTIVITIES: THE EUROPEAN COMMUNITY/UNION

4.3.1 The Legal Foundations for European Community/Union Involvement in Space

4.3.1.1 The founding treaties and the establishment of a European legal order

The involvement in space and space policy issues of the European Union, as the successor at a political, if not completely at the legal level, of the European Community, stems from a completely different background compared with that of ESA. The Community, then Union, became involved in European space activities and related policy issues primarily as a regulator, and has only recently become a player in its own right, even a policy-maker – but this remains a secondary role.[164]

Following the original establishment of three different European Communities in the 1950s[165] and a number of later treaties fundamentally amending these founding treaties,[166] a distinct and partly supranational

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[164] *Cf.* e.g. L. Mantl, The European Union, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 406 ff.; Madders, *supra* n. 15, 566–86; also Lafferranderie, *supra* n. 15, 139–48; more in general as part of the Community's R&D regime R. Barents & P.J. Slot, Sectoral Policies, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn, 2008), 1259–64.

[165] The European Coal and Steel Community (ECSC), as per the Treaty establishing the European Coal and Steel Community (hereafter ECSC Treaty), Paris, done 18 April 1951, entered into force 23 July 1952, expired 23 July 2002; 126 UNTS 140; the European Atomic Energy Community (EAEC or Euratom), as per the Treaty establishing the European Atomic Energy Community (hereafter EAEC Treaty), Rome, done 25 March 1957, entered into force 1 January 1958; 298 UNTS 167; and the European Economic Community, the most important one, as per the Treaty of Rome, or Treaty establishing the European Economic Community (hereafter EEC Treaty), Rome, done 25 March 1957, entered into force 1 January 1958; 298 UNTS 11. See also e.g. Timmermans, *supra* n. 1, 6–16; Arnull *et al.*, *supra* n. 1, 4–10; Folsom, *supra* n. 1, 4–10, 3–8.

[166] The most important of these concerned the Treaty Establishing a Single Council and a Single Commission of the European Communities, Brussels, done 8 April 1965, entered into force 1 July 1967; OJ L 152/2 (1967), effectively merging the three Communities; the Single European Act, Luxembourg/The Hague, done 17/28 February 1986, entered into force 1 July 1987; UKTS 1988 No. 31; Cm. 372; OJ L 169/1 (1987); 25 ILM 506 (1986), which triggered the

legal order has by now emerged amongst the (at present) 28 member states.[167] This means that in many instances the Union can in law override the interests, policies and even legislation of individual member states – although in the last resort such competences are still based on these treaties between sovereign member states.

Together these treaties form a body of primary EU law, *inter alia* creating the main Union organs, officially referred to as: the Council (of Ministers),[168] the European Commission,[169] the European Parliament,[170] and the Court of Justice of the EU;[171] since 1992 formally augmented by a European Council comprised of heads of state and government entitled to develop policies – but based on consensus, and without being formally entitled to guide follow-on legislative measures.[172] The treaties also

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Community's involvement in outer space; the Treaty on European Union, Maastricht, done 7 February 1992, entered into force 1 November 1993; 31 ILM 247 (1992); OJ C 191/1 (1992), which established the European Union; and the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 306/1 (2007), which offered the Union its first comprehensive measure of 'space competence' (see further *infra*, § 4.4.3). See also e.g. Timmermans, *supra* n. 1, 28–44; Arnull *et al.*, *supra* n. 1, 10–1, 16–24; Folsom, *supra* n. 1, 8, 19–29.

[167] These are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

[168] See Arts. 227–243, Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter Treaty on the Functioning of the European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/47 (2009). Further e.g. R.H. Lauwaars, Institutional Structure, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn, 2008), 180–8; Arnull *et al.*, *supra* n. 1, 32–7; Folsom, *supra* n. 1, 41 ff.

[169] See Arts. 244–250, Treaty on the Functioning of the European Union, *supra* n. 168. Further e.g. Lauwaars, *supra* n. 168, 188–99; Arnull *et al.*, *supra* n. 1, 37–44; Folsom, *supra* n. 1, 54–8.

[170] See Arts. 223–234, Treaty on the Functioning of the European Union, *supra* n. 168. Further e.g. Lauwaars, *supra* n. 168, 199–215; Arnull *et al.*, *supra* n. 1, 44–51; Folsom, *supra* n. 1, 35–9.

[171] See Arts. 251–281, Treaty on the Functioning of the European Union, *supra* n. 168. Further e.g. Lauwaars, *supra* n. 168, 213–52; Arnull *et al.*, *supra* n. 1, 387 ff.; Folsom, *supra* n. 1, 75 ff.

[172] *Cf.* Arts. 235–236, Treaty on the Functioning of the European Union, *supra* n. 168; also Arts. 13(1), 15, Treaty on European Union as amended by the

provided these organs with extensive legal competences, which they then used to jointly expand the scope of European law immensely – by drafting and enunciating what is called 'secondary EU law'. Secondary EU law is composed of Regulations, Directives, and Decisions.[173]

4.3.1.2 The relationship between the European legal order and national member state law

The essential elements of the European legal order thus summarized present today's European Union with its own set of competences and a distinct measure of autonomous jurisdiction.[174] Depending upon certain circumstances and legal preconditions, these can be directly applied not only to the member states themselves, but also to private persons and entities (otherwise directly) resorting under the domestic jurisdictions of these member states.[175] In addition, in a number of cases the rights and obligations directly applicable to individual citizens and legal entities can

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Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter Consolidated version of the Treaty on European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/1 (2009). Further e.g. Lauwaars, *supra* n. 168, 176–80; Arnull *et al.*, *supra* n. 1, 30–2; Folsom, *supra* n. 1, 42.

[173] See Art. 288, Treaty on the Functioning of the European Union, *supra* n. 168. Regulations are essentially laws on a European level: they are phrased in general terms and apply comprehensively, at least as far as indicated or expressly provided for by the Regulations themselves. The same qualification as law applies to Directives to some extent, namely as far as the required end result is concerned: each state is free, however, to reach that end result in whatever way it sees fit, prior to a given deadline. Finally, Decisions also provide binding law, but only upon those entities to which they are explicitly or implicitly directed. In each case, they would override, wherever applicable, national law or regulation to the contrary. Further e.g. B. de Witte, A. Geelhoed & J. Inghelram, Legal Instruments, Decision-Making and EU Finances, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn, 2008), 280–8; Folsom, *supra* n. 1, 33–4.

[174] *Cf.* also e.g. Mantl, *supra* n. 164, 406–9; also Madders, *supra* n. 15, 566–7; Arnull *et al.*, *supra* n. 1, 81 ff.

[175] Most importantly for outer space and space activities, this concerns the competition ('anti-trust') regime of the Treaty on the Functioning of the European Union, *supra* n. 168; see also further *infra*, §§ 4.3.2, 4.4.3, 4.4.5. See in great detail e.g. Arnull *et al.*, *supra* n. 1, 965–1191; Folsom, *supra* n. 1, 292–370; R. Barents, The Competition Policy of the EC, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn, 2008), 785–879.

also be claimed directly by those entities. Bypassing domestic jurisdictions of member states, the Court of Justice can be called upon in a number of instances by those concerned to judge upon the legality of EU as well as national actions.[176] The existence of this body central to the EU legal order represents an essential measure of supranational adjudication.

However, at the same time this does not automatically allow the Union and its legal framework to affect outer space and space activities. In this respect, the underlying sovereignty of its member states still remains the most fundamental legal basis for that EU-law framework: the aforementioned competences and jurisdictions are applied to concrete issues only if explicitly made to do so by primary EU law or (much more commonly) secondary EU law, or if from existing EU law no other conclusion can be drawn other than that such applicability was implied.[177]

Primary EU law, obviously, is to be directly established by the EU member states agreeing to a new EU treaty or an amendment to an existing one. Also on secondary law, however, the competences of the organs applicable there cannot be exercised without regard for existing legal bases in the current treaty framework, and can only be extended in compliance with the fundamental principles of 'conferral', 'subsidiarity' and 'proportionality'.[178] Taken together, these principles mean that unless the competence to legislate on a certain issue has unequivocally, even if

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[176] *Cf.* Arts. 258–260, 263–267, 269–272, Treaty on the Functioning of the European Union, *supra* n. 168.

[177] See e.g. for application of the doctrine of 'implied powers' in the EU context, Art. 352, Treaty on the Functioning of the European Union, *supra* n. 168.

[178] *Cf.* Arts. 5, 12, Consolidated version of the Treaty on European Union, *supra* n. 172; Arts. 7, 352(2), Treaty on the Functioning of the European Union, *supra* n. 168; Protocol (No 2) on the Application of the Principles of Subsidiarity and Proportionality. 'Conferral' is defined as meaning that 'the Union shall act only within the limits of the competences conferred upon it by the Member States in the Treaties to attain the objectives set out therein', thus '[c]ompetences not conferred upon the Union in the Treaties remain with the Member States' (Art. 5(2), Consolidated version of the Treaty on European Union). 'Subsidiarity' is defined as requiring that 'in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level' (Art. 5(3), Consolidated version of the Treaty on European Union). 'Proportionality' is defined as ensuring that 'the content and form of Union action shall not exceed

only implicitly, been transferred to the Union's organs the relevant power should still be deemed to rest with the national governmental authorities. If doubt arises whether an issue could be regulated more effectively and logically at the European level or at the national level, the presumption under these principles is that the national level should prevail.

As for a possible role of the European Community/Union in outer space, as a consequence of this complex relationship between EU organs' legislative powers and sovereign member state discretion any competence to legislate can be exercised by EU organs only to the extent that space(-related) activities are covered more or less unequivocally and in accordance with subsidiarity and proportionality by provisions in primary or secondary EU law. This then brings analysis to the substantive focus of the European legal order, and how it would relate or could relate to outer space and space activities.

4.3.1.3 The substantive focus of the European legal order and outer space

In terms of substance, EC law originally addressed almost exclusively issues of cross-border trade and free and fair competition among the member states, more particularly their industries and enterprises, so as to create a 'Common Market'.[179] Import and export tariffs and quotas and other obstructions to such a common market were to be phased out as much as possible as regards goods, services and capital, backed up by an anti-trust regime and limitations to state aid and the free movement of persons for, essentially, economic reasons.[180] Special regimes were developed at the same time for agriculture and – at least potentially relevant for the space sector – transport.[181]

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what is necessary to achieve the objectives of the Treaties' (Art. 5(4), Consolidated version of the Treaty on European Union). See further e.g. C.W.A. Timmermans, The Basic Principles, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al*.) (4th edn, 2008), 138–47; also Folsom, *supra* n. 1, 30–3; Arnull *et al*., *supra* n. 1, 97–112.

[179] Not accidentally, the European Economic Community itself was often labelled the 'Common Market'; the EEC Treaty was by far the most important among the three founding treaties, with the ECSC and EAEC Treaties essentially addressing two special, narrow but highly-strategic economic sectors.

[180] *Cf.* currently, Arts. 28–37, 56–62, 63–66, 101–106, 107–109 & 45–55 respectively, Treaty on the Functioning of the European Union, *supra* n. 168; also Arts. 26–27.

[181] *Cf.* currently Arts. 38–44 and 90–100 respectively, Treaty on the Functioning of the European Union, *supra* n. 168.

Over time, the competences of the European organs were gradually extended to include the broader economic law environment (involving, for instance, taxation, harmonization of national economic legislation and a common customs tariff[182]), then the comprehensive economic environment (from economic policies to a common currency[183]), and finally the even broader societal environment (from environmental pollution, education and culture to social issues such as public health, employment and support for poor regions, and even tentatively to foreign policy and security-related issues[184]).

Nevertheless, the original core of private sector economics summarized above continues to remain at the heart of the EU legal order. This meant essentially that, as long as space activities, at least within Europe, were almost exclusively undertaken by states and public intergovernmental organizations,[185] there was neither rationale nor interest for the member states to consider, let alone allow, substantial involvement of the EU organs in space issues, and the latter also would not consider such involvement to be high on the European list of priorities.[186] If there is no private involvement in space activities other than a limited industrial sector being engaged for scientific and strategic reasons by government establishments in the context of a rather idiosyncratic, non-economic framework, application, for example, of competition and free market principles basically remains a non-issue.

4.3.2 The Involvement of the European Community/Union in Space Activities

4.3.2.1 The 1986 Single European Act and space research and development

Following the above, virtually until 1985 the only European inter-state fora where legal aspects of space activities and applications were

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[182] *Cf.* currently, Arts. 110–113, 114–118 & 31 respectively, Treaty on the Functioning of the European Union, *supra* n. 168.

[183] *Cf.* currently Arts. 119–133 & 136–138 respectively, Treaty on the Functioning of the European Union, *supra* n. 168.

[184] *Cf.* currently, Arts. 191–193, 165–166, 167, 168, 151–161 & 300 respectively (as well as individual clauses spread throughout the Treaty), Treaty on the Functioning of the European Union, *supra* n. 168; Arts. 21–46 respectively, Consolidated version of the Treaty on European Union, *supra* n. 172.

[185] *Cf.* on this also *supra*, §§ 2.1, 2.2.2.3.

[186] *Cf.* also Madders, *supra* n. 15, 566–8; G. Delanty & C. Rumford, *Rethinking Europe: Social Theory and the Implications of Europeanization* (2013), 120–2; M. Sheehan, *The International Politics of Space* (2007), 87–8.

discussed were ESA and its intergovernmental daughter entities EUTELSAT and EUMETSAT. Legally relevant references to 'outer space', 'space activities' or 'space applications' could be found nowhere in primary or secondary EC law.[187]

Only with the adoption of the Single European Act in 1986[188] giving the EC organs a first level of competence in the space realm did that change; tellingly, however, that competence was part of the broader competences now provided to the Commission to take as necessary auxiliary legislative initiatives in the general realm of science and technological development. 'Outer space' was considered part of a realm where important science was being conducted, also requiring immense high research and development budgets, which most private enterprises could not, or could hardly be expected, to provide.

Thus, the Single European Act provided for a set of clauses[189] whereby the EC organs were charged with building and financing R&D framework programmes endowed with large funds, and developing other, partly legislative instruments to enhance research and development. References to research and development were widely accepted to include space as a relevant area, showing great potential for more down-to-earth technological, then also economic and societal spin-offs.

Concurrently with the adoption of the Single European Act and following *inter alia* a report from a European Parliamentary working group chaired by Mr. Toksvig for the first time addressing the potential relevance of space for the broader issues of European integration,[190] the Community also started building relationships with ESA, clearly still considered by all as the leading European organization involved in space research and related activities and also recognized as such by the Community's organs.[191]

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[187] *Cf.* also Madders, *supra* n. 15, 569, recounting the European Commission's observer role at the 1970 European Space Conference as the formal starting point for European Community involvement with the space sector; however, not until the Single European Act were actual regulatory competences obtained by the Community's organs; further e.g. Mantl, *supra* n. 164, 410.

[188] Single European Act, *supra* n. 166; also e.g. Madders, *supra* n. 15, 568; Lafferranderie, *supra* n. 15, 140.

[189] Art. 24, Single European Act, *supra* n. 166, effectively added Arts. 130f–130q to the then-EEC Treaty, *supra* n. 165.

[190] Toksvig Report on European space activities, Doc. B 2 565/86, of 6 July 1986; see e.g. Madders, *supra* n. 15, 570; Van de Wouwer & Lambert, *supra* n. 15, 104–6.

[191] *Cf.* Madders, *supra* n 14, 570–7; Lafferranderie, *supra* n. 15, 140; Van de Wouwer & Lambert, *supra* n. 15, 107–9.

4.3.2.2 Satellite communications: Two Green Papers, the Satellite Directive and beyond

More fundamentally, the increasing commercialization and correlated privatization of international telecommunications including satellite communications in the late 1980s[192] opened the door for the European Commission to address this sector from a Community perspective, first as a matter of policy, then in more properly legal terms.

A 1987 Green Paper on liberalization and privatization also within Europe in the general telecom sector,[193] a high-level policy document setting the scene for proper EC legislation, constituted the starting point. Though the Green Paper included satellite communications within the scope of its overall assessment of the telecommunications landscape within Europe, it also recognized that as a special sub-sector requiring special attention (among other things in view of the existence of three international satellite organizations with major EU member state participation) the proper way of handling liberalization and privatization in that context would require specific further attention.[194]

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[192] See for a rather comprehensive analysis of that changing environment e.g. P.K. McCormick, Neo-Liberalism: A Contextual Framework for Assessing the Privatisation of Intergovernmental Satellite Organisations, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 1–34; specifically on the European environment e.g. Roisse, *supra* n. 131, 128–32.

[193] Towards a Dynamic European Economy – Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, Communication from the Commission (hereafter 1987 Green Paper), COM(87) 290 final, of 30 June 1987; OJ C 257/1 (1987); as per Council Resolution on the development of the common market for telecommunications services and equipment up to 1992, of 30 June 1988, OJ C 257/1 (1988). A 'Green Paper' in the context of the European Community/Union constitutes an overarching policy analysis coming up with more or less general proposals for both policy and, as appropriate, attendant legal measures, to be then realized to the extent generally found acceptable by the EU member states and (to the extent applicable) other stakeholders.

[194] See 1987 Green Paper, *supra* n. 193, esp. pp. 37–9, 83–7, 172–3, 175, 178–9, 190–1. *Cf.* further in general on the 1987 Green Paper S. Mosteshar, *European Community Telecommunications Regulation* (1993), esp. 4–5, 50 ff.; C.D. Ehlermann, The Contribution of EC Competition Policy to the Single Market, 29 *Common Market Law Review* (1992), 258–60; A. Metraux, *European Telecommunications Policy and the Regional Bell Operating Companies* (1991), 38–40; White, Bate & Johnson, *supra* n. 131, 161–4; F.G. von der Dunk, Satellite Communications in the European Community: The Tide is Changing

The 1987 Green Paper rapidly resulted in three key Directives implementing its general principles, largely leaving satellite communications outside of their scope: a Directive liberalizing the telecommunication equipment market,[195] a Directive liberalizing the telecommunication service market to the extent of establishing open network access[196] (effectively also relevant for satellite communications to the extent these would ultimately connect to open networks), and a Directive applying the Community's competition regime to telecommunication services.[197]

After a 1990 Green Paper[198] as a follow-up to the 1987 Green Paper slightly adapting the latter's main principles applied them to the satellite communication sector, in 1994 the first piece of EU law resulted: the Satellite Directive.[199] The Satellite Directive provided the framework for

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Wave by Wave, in *Issues in International Air and Space Law, and in Commercial Law* (1994), 335–7.

[195] Commission Directive on competition in the markets in telecommunications terminal equipment (hereafter Directive on Terminal Equipment), 88/301/EEC, of 16 May 1988; OJ L 131/73 (1988). The Directive did include receive-only satellite stations not reconnected to the public networks, but no other satellite-related terminal equipment; see Art. 1. See further e.g. White, Bate & Johnson, *supra* n. 131, 164–5; Folsom, *supra* n. 1, 220–1.

[196] Council Directive on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (hereafter Directive on Open Network Provision), 90/387/EEC, of 28 June 1990; OJ L 192/1 (1990). See further e.g. White, Bate & Johnson, *supra* n. 131, 173–6; Folsom, *supra* n. 1, 219–20.

[197] Commission Directive on the competition in the markets of telecommunications services (hereafter Directive on Competition in Telecommunications Services), 90/388/EEC, of 28 June 1990; OJ L 192/10 (1990). This Directive expressly excluded satellite communications from its scope; *cf.* Art. 1(2); see further e.g. White, Bate & Johnson, *supra* n. 131, 165–73; Folsom, *supra* n. 1, 217–19.

[198] Towards Europe-wide systems and services – Green Paper on a common approach in the field of satellite communications in the European Community, Communication from the Commission, COM(90) 490 final, of 20 November 1990. See for general comments Mosteshar, *supra* n. 194, 14–8, 51–6, 65–6; White, Bate & Johnson, *supra* n. 131, 180–2; Roisse, *supra* n. 131, 129–31; von der Dunk, Satellite Communications in the European Community, *supra* n. 194, 337–42.

[199] Commission Directive amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications (hereafter Satellite Directive), 94/46/EC, of 13 October 1994; OJ L 268/15 (1994). See further e.g. S. LeGoueff, Satellite Services: The European Regulatory Framework, 2–5 *Computer & Telecommunications Law Review* (Oct. 1996), 186–8;

implementation of internal market principles into the satellite communications sector throughout the Union, by applying the Directive on Terminal Equipment and the Directive on Competition in Telecommunications Services to the satellite sector, thus for example imposing such principles as separation of regulatory and operational functions, the prohibition of concerted anti-competitive practices and the prohibition of abuse of dominant and monopoly positions in that market.[200]

Many Directives and Regulations followed elaborating that regime, for example addressing specific areas such as personal mobile communications, including satellite communications, or the licensing of service providers across the Union.[201] In addition, the Commission asserted through various Decisions on perceived market-distorting practices by satellite communication service providers that these laws were also complied with.[202] Also, the privatization of the three major international

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White, Bate & Johnson, *supra* n. 131, 166; von der Dunk, *supra* n. 86, 268 ff.; C.D. Long, *Telecommunications Law and Practice* (2nd edn, 1995), 223 ff., esp. 253–4.

[200] See Arts. 1–3, Satellite Directive, *supra* n. 199; for greater detail e.g. Long, *supra* n. 199, 224 ff.; also F. Cugia di Sant'Orsola, European Union Regulatory Policies on Satellite Communications, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 420–2; M. Thatcher, *The Politics of Telecommunications: National Institutions, Convergence, and Change in Britain and France* (1999), 83–4; C. Koenig & A. Bartosch, *EC Competition and Telecommunications Law* (2009), 81–2.

[201] *Cf.* e.g. Commission Directive amending Directive 90/387/EEC with regard to personal and mobile communications, 96/2/EC, of 16 January 1996; OJ L 20/59 (1996); Commission Directive amending Directive 90/388/EEC with regard to the implementation of full competition in telecommunications markets, 96/19/EC, of 13 March 1996; OJ L 74/13 (1996); and Decision of the European Parliament and of the Council on a coordinated authorization approach in the field of satellite personal communications systems in the Community, No. 710/97/EC, of 24 March 1997; OJ L 105/4 (1997).

[202] Some early examples of decisions enforcing competition policy in the area of satellite communications are: Commission Decision declaring a concentration to be incompatible with the common market and the functioning of the EEA Agreement (IV/M.490 – Nordic Satellite Distribution), No. 96/177/EC, of 19 July 1995; OJ L 53/20 (1996); Commission Decision relating to a proceeding under Article 85 of the EC Treaty and Article 53 of the EEA Agreement (IV/35.518 – Iridium), No. 97/39/EC, of 18 December 1996; OJ L 16/87 (1997); and Commission Decision declaring a concentration to be compatible with the common market and the EEA Agreement (COMP/M.4403 – Thales/Finmeccanica/Alcatel Alenia Space & Telespazio), of 4 April 2007; OJ C 034/5 (2009).

satellite operators INTELSAT, INMARSAT and EUTELSAT was partially the result of these legislative developments.[203]

Whilst in many respects the internal market for satellite communications has yet to be finalized, through such an adoption of Directives, Regulations and Decisions the EU institutions have exercised a large measure of jurisdictional competence in this major area of the human space endeavour.[204] Not technically speaking in space perhaps, but certainly with respect to, and having a great impact upon, relevant activities in outer space.

4.3.2.3 Satellite remote sensing: The Database Directive

A third legal realm relevant to space activities which the Community moved into concerned satellite remote sensing. After initial considerations were given to development of a fully fledged EC satellite system for environmental purposes ('Green Eye in the Sky'),[205] the Community settled for an instrument on a SPOT-4 satellite,[206] and thus started out as a customer of data – not in any legislative or regulatory role.

When, however, in the 1990s satellite remote sensing seemed to be on the verge of allowing for commercial applications and operations, the legal instrument of copyrights to protect the investments in remote sensing systems by protecting the data generated, *prima facie* a useful tool, was found wanting. In particular in jurisdictions where entitlement to copyright protection required some level of creativity or originality, the use of often fully automated satellite remote sensing equipment and the electronic and/or digital environment in which data generation, enhancement and distribution occurred caused problems with using copyright for such purposes.[207]

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203 Art. 3, Satellite Directive, *supra* n. 199, in conjunction with the other articles of the Directive and the 1990 Green Paper effectively called for abolishment of the various anti-competitive elements in the legal structures of these three organizations; see further on the latter e.g. *infra*, §§ 5.4.2, 5.5.2 and 5.6.2.

204 See e.g. Van de Wouwer & Lambert, *supra* n. 15, 205–7.

205 Following the Rovsing Report, PE 146, 210 Corr., of 15 October 1991; see furthermore S. Cheli & P.H. Tuinder, European Space Policy, Institutional Developments, 21 *Air & Space Law* (1996), 55.

206 See Cheli & Tuinder, *supra* n. 205, 57; P.H. Tuinder, Issues of Protection of Remote Sensing Data – EC Developments, in *Recent Developments in the Field of Protection and Distribution of Remote Sensing Data* (Eds. F.G. von der Dunk & V. Kayser) (1994), 23; also Mantl, *supra* n. 164, 413; von der Dunk, *supra* n. 150, 428–9.

207 See further in general also *infra*, § 18.2.

Following an ESA initiative to address this issue[208] the Commission then led an effort to develop such a legal tool, making certain that space-derived data would explicitly be encompassed in, and appropriately dealt with in the context of, the broader concept of databases.[209]

These developments gave rise to the adoption of Directive 96/9,[210] also known as the Database Directive. The Directive addressed electronic databases including specifically those containing remote sensing data, and provided them with *sui generis* protection wherever copyright would not suffice for such purposes.[211] Following the Directive, those rights essentially applied to both nationals of EU member states and databases generated on EU member states' territories.[212] Individual accessibility to data and substantial investment were required for applicability of the *sui generis* right,[213] but once it applied the database creator alternatively owner could exclusively decide on whom to allow the rights of extraction and re-utilization of such data respectively, the two key rights offered by the Directive.[214]

Once again this very targeted legislative effort by the Union perhaps did not amount to jurisdiction in or over outer space, but it certainly amounted to a competence to co-determine the potential for satellite remote sensing activities in outer space to be successfully undertaken by commercial private operators.

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208 Following its central role in remote sensing to start with (*cf.* also Art. III(3), ESA Convention, *supra* n. 29, on the baseline policy of ESA on IPR), a study was undertaken in 1990–1, drawing the interest of the Commission before it was effectively concluded; see e.g. Tuinder, *supra* n. 206, 28–9.

209 This study, giving rise to the so-called Gaudrat Report presented April 1993, concluded that the best way to effectuate protection of remote sensing data would be to bring them under the heading of databases, rather than for instance copyright; see Tuinder, *supra* n. 206, 29–35; A.M. Balsano, Intellectual Property Rights: Practical Experience and Importance of the Legal Environment – The Experience of the European Space Agency, in *Intellectual Property Rights and Space Activities*, ESA SP-378 (Ed. G. Lafferranderie) (1995), 118–9; von der Dunk, *supra* n. 150, 429–30.

210 Directive of the European Parliament and of the Council on the legal protection of databases, 96/9/EC (hereafter Database Directive), of 11 March 1996; OJ L 77/20 (1996); see further *infra*, § 18.2.1. Also R. Bond, Database Law and the Information Society, 4 *Telecommunications & Space Journal* (1997), esp. 183–4; Tuinder, *supra* n. 206, 31–5; von der Dunk, *supra* n. 150, 430–2.

211 *Cf.* Art. 3(2), Database Directive, *supra* n. 210.

212 Art. 11(1), (2), Database Directive, *supra* n. 210.

213 See Art. 1(2), Database Directive, *supra* n. 210.

214 See Art. 7, Database Directive, *supra* n. 210.

4.4 THE CONVERGENCE OF THE EUROPEAN SPACE AGENCY AND EUROPEAN UNION

4.4.1 Increasing Cooperation of the European Community/Union with ESA

Whilst the Community, then Union, had thus by the time the new millennium started entered the area of law and regulation of space-related activities in at least three particular realms – and had even more prominently itself become active in leading two European flagship projects in outer space, with equally profound legal repercussions[215] – at the same time that entry was piecemeal and almost ad hoc.

This was very much reflected in the fact that the Commission had no single division or unit dealing with space or space policy: for example, launch activities fell within the competence of the Directorate-General on External Affairs, now the Directorate-General on Trade; satellite communications within that of the Directorate-General 'Information Society and Media'; satellite earth observation within the Directorate-General 'Research and Innovation'; and satellite navigation within the Directorate-General on Mobility and Transport.[216]

As outer space and space activities also in the European context increasingly became a key area for technological development and research and development, as well as for strategic geopolitical positioning, the European Union became more and more concerned that clear space policies and a clear overarching legal framework for *all* space activities were necessary, and should be realized at least partially at a European, read EU level.

The increasing cooperation and coordination between the Commission and ESA was not considered sufficient from this perspective. Since 1993 a Space Advisory Group had operated to institutionalize such cooperation and coordination between ESA and the Commission in matters of outer

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[215] This concerned Galileo and GMES/Copernicus; see further *infra*, §§ 4.4.4.1 and 4.4.4.2 respectively.

[216] See G. Sabathil, K. Joos & B. Kessler, *The European Commission: An Essential Guide to the Institution, the Procedures and the Policies* (2008), 44–5; A. Staab, *The European Union Explained, Second Edition: Institutions, Actors, Global Impact* (2011), 47–53; also H.S. Harris, *Competition Laws Outside the United States* (2001), 178; H. Wallace, M.A. Pollack & A.R. Young, *Policy-Making in the European Union* (2010), 390; *cf.* also Folsom, *supra* n. 1, 56–7.

space.[217] This cooperation gave rise to a 2000 European Space Strategy, as part of a first joint meeting of the ESA Council and the EU Council of Ministers (the two highest organs of the respective organizations[218]), which spelled out the perceived respective roles of the two – with the Union leading all efforts which should allow Europe to reap the benefits from space activities for society and markets, as opposed to scientific and research and development-oriented policies programmes, and projects.[219]

By 2003, the Commission had produced – on its own – its White Paper 'Space: a new European frontier for an expanding Union – An action plan for implementing the European Space Policy'.[220] The call was expressly made for, *inter alia*, space infrastructures and applications to serve the needs of EU political objectives and to update the institutional structure to provide the Union with new powers to drive, fund and coordinate activities within this European Space Policy.[221]

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[217] *Cf.* e.g. Preamble, § (5), Council Resolution on the involvement of Europe in a new generation of satellite navigation services – Galileo-Definition phase, of 19 July 1999; OJ C 221/01 (1999).

[218] *Cf.* Art. XI, ESA Convention, *supra* n. 29, and Art. 16, Consolidated version of the Treaty on European Union, *supra* n. 171 respectively; also Madders, *supra* n. 15, 576; Lafferranderie, *supra* n. 15, 140.

[219] See Council Resolution on developing a coherent European space strategy, of 2 December 1999; OJ C 375/1 (1999); and Council Resolution on a European space strategy, of 16 November 2000; OJ C 371/2 (2000). Under a 'division of labour', or responsibilities, ESA would be the primary agent of Europe in strengthening the foundations of space activities, notably including launch capabilities, and enhancing scientific knowledge such as through the ISS, whereas the Commission was to take the lead in ensuring society and markets in Europe would reap the benefits of space activities, for example through such flagship projects as Galileo and GMES/Copernicus (see further *infra*, § 4.4.4). See e.g. Sadeh, *supra* n. 8, 10; Suzuki, *supra* n. 75, 197–9; also Lafferranderie, *supra* n. 15, 141–2; Van de Wouwer & Lambert, *supra* n. 15, 108.

[220] White Paper – Space: a new European frontier for an expanding Union – An action plan for implementing the European Space policy, COM(2003) 673 final, of 11 November 2003. See e.g. Sánchez Aranzamendi, 'Towards a Space Strategy for the EU that Benefits Its Citizens': The EU's Declaration of Intents for Space, in *Yearbook on Space Policy 2010/2011* (Eds. P. Hulsroj, S. Pagkratis & B. Baranes) (2013), 142–4; I. Marboe, National Space Legislation: The European Perspective, in *Nationales Weltraumrecht – National Space Law* (Eds. C. Brünner & E. Walter) (2008), 34–6; also Lafferranderie, *supra* n. 15, 143–4; Van de Wouwer & Lambert, *supra* n. 15, 117–23.

[221] See esp. §§ 2, 3, White Paper – Space: a new European frontier for an expanding Union, *supra* n. 220. The roles of the Union and ESA were to

4.4.2 The EU-ESA Framework Agreement of 2003

Even the Framework Agreement which the two international organizations concluded in 2003[222] however did not provide the Union with the level of control and leadership over Europe's destiny in outer space aspired to, as it essentially allowed the two parties to continue promoting Europe's interests as they each saw fit.

The Framework Agreement provided for an *à la carte* list of cooperation options as between the Commission and ESA, without in any way prejudicing the right of either to apply the one or the other.[223] Cooperation efforts could address any field of space activities – science, technology, earth observation, navigation, satellite communications, human space flight and micro-gravity, launchers and spectrum policy issues related to space – and joint initiatives could be structured in various manners – ESA managing a project for the Union, the Union participating in ESA optional programmes, by way of jointly coordinated and funded activities or even by the creation of joint subsidiary bodies.[224] For each cooperative initiative thus ad hoc arrangements were required.[225]

A Space Council was furthermore formally established to coordinate and facilitate such cooperative activities.[226] The Space Council, with both the Commission and ESA on board, adopted a – new – European Space

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'federate demand for space activities' and 'federate the supply thereof' respectively; *cf.* also § 5.1, White Paper. See further e.g. Hobe, Hofmannová & Wouters, *supra* n. 33, 19–21; Lafferranderie, *supra* n. 15, 144.

[222] Framework Agreement Between the European Community and the European Space Agency (hereafter Framework Agreement), Brussels, done 25 November 2003, entered into force 28 May 2004; OJ L 261/64 (2004); 53 *ZLW* 89 (2004). See in general Mantl, *supra* n. 164, 417–8; Hobe, Hofmannová & Wouters, *supra* n. 33, 21–7; B. Schmidt-Tedd, The Relationship between the EU and ESA within the Framework of European Space Policy and its Consequences for Space Industry Contracts, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 26; Lafferranderie, *supra* n. 15, 144–5; Van de Wouwer & Lambert, *supra* n. 15, 110–1.

[223] *Cf.* Arts. 2, 4, 5(3), Framework Agreement, *supra* n. 222.

[224] See Arts. 3 & 5(1) respectively, Framework Agreement, *supra* n. 222. An example of creation of a joint subsidiary body was the Galileo Joint Undertaking for the European satellite navigation programme; whereas at the current stage of the Galileo project the first option, of ESA managing the project on behalf of the Union, has now been applied; see further *infra*, § 4.4.4.1.

[225] See Art. 5(2), Framework Agreement, *supra* n. 222.

[226] See Art. 8(1), Framework Agreement, *supra* n. 222; also e.g. Lafferranderie, *supra* n. 15, 145.

Policy in 2007, whereby the cooperation was extended to security- and defence-related areas, the realm of Space Situational Awareness, industrial policy and international relations, the preferred model being that ESA acts as technical expert, manager of EU space activities and procurement agency for the Union applying EU law principles – but once again, the self-financed ESA programmes were not touched upon.[227]

Thus, when in the same timeframe that the Framework Agreement was set into operation the ambitious exercise to draft a Constitutional Treaty for Europe kicked off, the latter presented a vehicle for those contemplating true integration of the European space efforts – beyond and above, and ultimately controlling, the more practical and project-oriented approach ESA had represented ever since the 1970s.[228]

Since within the ESA framework the Director General could also himself propose European space programmes,[229] ESA had often been seen as not merely a platform for member states to integrate their national space policies, but also as itself developing a European space policy – even though, with regard to any such proposals, it was still the member states which had to agree by two-thirds majority before they would be implemented.[230]

To the extent that the totality of ESA's programmes thus agreed upon and executed could be deemed to constitute a proper 'space policy', however, it certainly was not one that the proponents of EU competence in space considered particularly coherent, logical and/or helpful. The ingrained inability of ESA to overcome key individual member state policy divergences, the 'geographical distribution' principle as the main focus of the 'industrial policy' 'of' ESA,[231] and the principled absence of competence for ESA to regulate any activities within the European 'spacescape' in any legal sense of the word all conspired to point at the

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[227] See European Space Policy, Communication from the Commission to the Council and the European Parliament, COM(2007) 212 final, of 26 April 2007; Resolution on the European Space Policy, ESA BR 269, of 22 May 2007; Council of the European Union, Doc. 10037/07, of 25 May 2007.

[228] *Cf.* early on Madders, *supra* n. 15, 570 ff.; further also e.g. Lafferranderie, *supra* n. 15, 148. See in general on the Constitutional Treaty e.g. Timmermans, *supra* n. 1, 39–42; Folsom, *supra* n. 1, 26–8; also Arnull *et al.*, *supra* n. 1, 23–4.

[229] See Art. XII(1)(b), ESA Convention, *supra* n. 29; also *supra*, § 4.2.3.

[230] *Cf.* Art. XI(5)(a) & (c), ESA Convention, *supra* n. 29.

[231] See Art. VII & (in particular) Arts. II, IV, V, Annex V, ESA Convention, *supra* n. 29; also *supra*, § 4.2.4.3.

apparent timeliness of handing over the lead in the European space effort to the Union.[232]

4.4.3 From Constitutional Treaty to Treaty of Lisbon

4.4.3.1 The EU 'space competence'

The aforementioned effort to arrive at a Constitutional Treaty, which tried to move the process of European integration forward considerably in many fields and on many issues, now seemed the perfect carrier for fully taking over the reins on the European space effort. Indeed, the Constitutional Treaty provided for the clauses which, once the Treaty itself came to fail and a much dressed-down follow-on drafting exercise resulted in the Treaty of Lisbon, survived that failure and were included in the latter.[233]

There was one major exception however. The Treaty of Lisbon ultimately provided:

1. To promote scientific and technical progress, industrial competitiveness, and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development, and coordinate the efforts needed for the exploration and exploitation of space.
2. To contribute to attaining the objectives referred to in paragraph 1, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the Member States.
3. The Union shall establish any appropriate relations with the European Space Agency.
4. This Article shall be without prejudice to the other provisions of this Title.[234]

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[232] *Cf.* further e.g. Madders, *supra* n. 15, 570–84.

[233] See on the Treaty of Lisbon in general e.g. C. Tomuschat, Lisbon Treaty, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VI (2012), 889–94; Timmermans, *supra* n. 1, 42–4; extensively J.C. Piris, *The Lisbon Treaty: A Legal and Political Analysis* (2010); M. Trybus & L. Rubini, *The Treaty of Lisbon and the Future of European Law and Policy* (2012); D. Phinnemore, *The Treaty of Lisbon: Origins and Negotiation* (2013).

[234] Art. 189, Treaty on the Functioning of the European Union, *supra* n. 168. The 'ordinary legislative procedure' was spelled out in Art. 289(1) as consisting 'in the joint adoption by the European Parliament and the Council of a regulation, directive or decision on a proposal from the Commission'.

Whilst Article 189(2) of the Treaty on the Functioning of the European Union had essentially copied Article III-254 of the draft Constitutional Treaty with respect to the EU competence henceforth to 'establish the necessary measures, which may take the form of a European space programme', the Treaty of Lisbon had crucially added the phrase 'excluding any harmonisation of the laws and regulations of the Member States'.[235]

Various estimations of the importance of this new clause exist, but it should be recognized that the references to 'space policy' and 'space programme' are more policy- than legally-oriented novelties, whereas the exclusion of harmonization of national laws and regulations leaves the discretion with the individual member states to, *inter alia*, continue to opt for national as well as ESA-focused space policies and space programmes, including the use of the legal ESA mechanisms to do so.[236]

4.4.3.2 The 'space competence' put in perspective

In the context of the Union, in a sense legal competences had constituted its core business ever since its beginnings. Such competences, originally all operating on a national level, could become 'elevated' to a European level by the inherently still-sovereign member states, and would normally be so 'elevated' in accordance with the principles of 'conferral', 'subsidiarity' and 'proportionality'.[237] Further to this approach, basically three scenarios are possible with respect to any particular subject matter: one of exclusive competence at the EU level to be created in accordance with conferral, subsidiarity and proportionality, one of shared competence at the EU level to be equally so created – or one of no competence at the EU level at all.

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[235] See further e.g. Mantl, *supra* n. 164, 415–6; Schmidt-Tedd, *supra* n. 222, 28–30; S. Hobe *et al.*, A New Chapter for Europe in Space, 54 *Zeitschrift für Luft- und Weltraumrecht* (2005), 336–56; I. Marboe & F. Hafner, Latest Trends in the National Authorisation and Regulation of Space Activities in Europe, in *Yearbook on Space Policy 2008/2009* (Eds. K.U. Schrogl *et al.*) (2010), 246–7; Schmidt-Tedd, *supra* n. 222, 29–30.

[236] See for a more detailed assessment and argumentation F.G. von der Dunk, The EU Space Competence as per the Treaty of Lisbon: Sea Change or Empty Shell?, in *Proceedings of the International Institute of Space Law 2011* (2012), 382–92; also e.g. M. Sánchez Aranzamendi, Space and Lisbon. A New Type of Competence to Shape the Regulatory Framework for Commercial Space Activities, in *New Perspectives on Space Law* (Eds. M.J. Sundahl & V. Gopalakrishnan) (2011), 154–9.

[237] See *supra*, § 4.3.1.2.

Under the first scenario, 'only the Union may legislate and adopt legally binding acts, the Member States being able to do so themselves only if so empowered by the Union or for the implementation of Union acts'.[238] Under the second scenario, 'the Union and the Member States may legislate and adopt legally binding acts in that area. The Member States shall exercise their competence to the extent that the Union has not exercised its competence. The Member States shall again exercise their competence to the extent that the Union has decided to cease exercising its competence.'[239] In that case, following 'subsidiarity' and 'proportionality' again, the Union is to act only if action at EU level is required to achieve the objective at issue.

Following the Treaty of Lisbon, the Treaty on the Functioning of the European Union included 'space' in the shared competence, where 'the Union shall have competence to carry out activities, in particular to define and implement programmes', yet it also added that 'the exercise of that competence shall not result in Member States being prevented from exercising theirs'.[240] This led some observers to conclude that this was not so much a shared competence but a 'parallel competence' – individual member states would retain sovereign discretion as such to draft and implement their own national policies and legislation in this area.[241]

So the main contribution of this new clause on the space competence is perhaps that, henceforth, the competence that the EU institutions could exercise with respect to space would no longer be completely dependent on sector-specific characteristics related to commercial markets and requiring application of the free market and competition principles relatively narrowly focused on a free and level playing field for commercial enterprise throughout the Union – as had happened, most elaborately, in the satellite communications sector.[242]

Under the Constitutional Treaty's provisions the Commission for the first time would have had the competence to address 'space' and 'space activities' in their full measure, not only as commercial activities but also as a new area where scientific, commercial, societal and strategic interests would *all* have to be accommodated by more fundamental legislation and regulation. However, the final phrase of Article 189(2) of the Treaty on the Functioning of the European Union then by and large

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[238] Art. 2(1), Treaty on the Functioning of the European Union, *supra* n. 168.

[239] Art. 2(2), Treaty on the Functioning of the European Union, *supra* n. 168.

[240] Art. 4(3), Treaty on the Functioning of the European Union, *supra* n. 168.

[241] So e.g. Hobe *et al.*, *supra* n. 235, 346–7.

[242] See *supra*, § 4.3.2.2.

limits such competence in legal terms to the adoption of secondary EU law establishing space projects or space programmes and taking care of their financing through EU budgets and applying the freedom of movement and the competition regimes to the space sector (as remaining key aspects of the internal market not covered by the post-Lisbon version of the clause). This competence is then further limited to the extent EU member states have *not* already established and are interested in establishing national space law dealing with these aspects of space sector activities.[243]

4.4.4 The collaborative European space flagship projects

The regulatory approach of the European Union vis-à-vis outer space and space activities, amounting to efforts to bring the space sector and ESA's role in that context into the broader legal environment of EU law and competences as prominently reflected by the Framework Agreement and the efforts to establish an EU space competence through Constitutional Treaty and Treaty of Lisbon, met with considerable resistance from various quarters – and sometimes gave rise to downright political friction. All in all, ESA would retain its own status as an intergovernmental organization formally independent from the Union as per the Framework Agreement, whereas the individual member states ultimately ensured their primacy in space policy matters by way of the adapted version of the clause on the space competence.

At the same time and in the same vein, the story of convergence of ESA's and the Union's roles in the European 'spacescape' was not only a matter of opposition, friction and fights for competences – recognizing the special role and value of ESA, the Union also engaged in increasing practical and operational cooperation. Most notably, this took the form of two European 'flagship projects',[244] which so far are on the way to realization, as well as more pragmatic general accommodation of ESA and EU institutional/regulatory structures in the context of space and industrial policies.

4.4.4.1 Flagship No. 1: EGNOS and Galileo

The area where EU involvement in space activities, in close conjunction with ESA, was first achieved on a comprehensive scale, not just comprising policy and legal activities, but also the proper development of

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243 See for an analysis in greater detail von der Dunk, *supra* n. 236, 386–9.
244 As explicitly so labelled in European Space Policy, *supra* n. 227, 3.

a major space infrastructure and assorted ground infrastructure, concerned satellite navigation. After initial ideas to arrive at a global 'GNSS-2' system somehow embracing the existing US-operated GPS and Russian-operated GLONASS systems had failed,[245] the Commission took the lead in developing an autonomous European satellite navigation system, as the first European flagship programme in outer space.

The first step was the establishment of EGNOS, the European Geostationary Navigation Overlay System, designed to augment (in particular) the GPS signals to make them useful for (especially) aviation in Europe.[246] In line with this approach, the development of the system was undertaken under the aegis of the European Tripartite Group (ETG), comprising apart from the European Union (as political driving force and competent on developing an appropriate legal environment for the system and its usage within Europe) and ESA (as the technical and operational entity responsible for realizing the system itself), Eurocontrol, the organization created to enhance technical and operational safety in European aviation.[247]

The Tripartite Agreement[248] underlying this cooperation between three European international organizations effectively represents the first properly legislative document concerning the European satellite navigation

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[245] *Cf.* Council Resolution on the European Contribution to the Development of a Global Navigation Satellite System (GNSS), of 19 December 1994; OJ C 379/2 (1994).

[246] See further *infra*, § 10.2.6.2; on GNSS usage in the air transport sector in particular § 10.6. *Cf.* also e.g. Mantl, *supra* n. 164, 419–20; E.M.O. Abu-Taieh, A. El Sheikh & M. Jafari, *Technology Engineering and Management in Aviation: Advancements and Discoveries* (2011), 290–3; also H.J. Kramer, *Observation of the Earth and Its Environment: Survey of Missions and Sensors* (2002), 766.

[247] Eurocontrol was established by way of the Convention Relating to Co-operation for the Safety of Air Navigation, Brussels, done 13 December 1960, entered into force 1 March 1963; 523 UNTS 117; UKTS 1963 No. 39; Cmnd. 2114; substantially amended by a Protocol Amending the Eurocontrol International Convention Relating to Co-operation for the Safety of Air Navigation of 13 December 1960, Brussels, done 12 February 1981, entered into force 1 January 1986; 430 UNTS 279; Cmnd. 8662; and a Protocol consolidating the Eurocontrol International Convention Relating to Co-operation for the Safety of Air Navigation of 13 December 1960, as variously amended, Brussels, done 27 June 1997, not yet entered into force (but applied on a provisional basis); Eurocontrol Revised Convention, Sept. 1997 edition at Eurocontrol.

[248] Agreement between the European Community, the European Space Agency and the European Organisation for the Safety of Air Navigation on a European Contribution to the development of a global navigation satellite system

flagship cooperation. EGNOS was duly developed with the Union gradually taking over control of its governance structure, the system now being operated by a multinational European Satellite Services Provider (ESSP).[249]

However, EGNOS crucially depends on input from GPS,[250] and by 2002 the Union was ready to take the next step, the establishment of a Galileo Joint Undertaking (GJU) as the new agency to guide the process of developing a fully fledged autonomous second-generation (as compared to GPS and GLONASS) European satellite navigation system.[251]

Part of the approach was not to focus on aviation applications only, but to make Galileo offer timing, positioning and navigation signals and services to all transport and several non-transport sectors.[252] Galileo should thus provide, apart from an Open Service similar to GPS and GLONASS Open Services, three types of enhanced service for which users one way or another would have to pay, the Public Regulated Service (PRS), the Commercial Service (CS) and the Safety-of-Life Service (SOL),[253] plus search and rescue services additional to the existing COSPAS-SARSAT Programme.[254]

Throughout the process of realizing Galileo several major changes occurred, necessitating new legal documents. A 2004 Regulation strengthened the institutional control of the Commission over the process by replacing the GJU with a European GNSS Supervisory Authority (GSA).[255]

(GNSS) (hereafter Tripartite Agreement), Luxembourg, done 18 June 1998, entered into force 18 June 1998; OJ L 194/16 (1998).

[249] See further www.essp-sas.eu, last accessed 29 December 2013.

[250] *Cf.* further *infra*, §§ 10.2.6.2 *juncto* 10.2.2.1.

[251] See Council Regulation setting up the Galileo Joint Undertaking, No. 876/2002/EC, of 21 May 2002; OJ L 138/1 (2002). See further e.g. Van de Wouwer & Lambert, *supra* n. 15, 141–4.

[252] This meant *i.a.* that Eurocontrol was no longer principally involved; the 'Joint' Undertaking was of the Commission with ESA only, as per Art. 187, Treaty on the Functioning of the European Union, *supra* n. 168.

[253] See e.g. F.G. von der Dunk, Liability for Global Navigation Satellite Services: A Comparative Analysis of GPS and Galileo, 30 *Journal of Space Law* (2004), 148–52; also *infra*, § 10.2.2.3.

[254] See International COSPAS-SARSAT Programme Agreement, Paris, done 1 July 1988, entered into force 30 August 1988; *Space Law – Basic Legal Documents*, D.II.6.

[255] See Council Regulation on the establishment of structures for the management of the European satellite radio-navigation programmes, No. 1321/2004/EC, of 12 July 2004; further e.g. F.G. von der Dunk, Towards Monitoring

More importantly, the originally envisaged Public–Private Partnership (PPP) approach to financing, building, and operating the system had to be reconstructed, ultimately discarded, as the EU Council of Ministers by means of a Resolution of 8 June 2007 had unequivocally concluded in this regard 'that the current concession negotiations have failed and should be ended'.[256] To replace the private investments, which now were no longer expected in the short run, with public investments the transferral of unused Common Agricultural Funds was agreed upon.[257] This new approach was formalized by a 2008 Regulation on the further implementation of EGNOS and Galileo, itself amended two years later.[258]

Most recently, the security issues involved in Galileo, specifically with respect to the PRS, noting international cooperation agreements on Galileo *inter alia* with China,[259] necessitated further refinement and definition of the rules of access to that particular service, which was achieved by way of a 2011 Decision.[260]

Galileo: the European GNSS Supervisory Authority *in statu nascendi*, 55 *Zeitschrift für Luft- und Weltraumrecht* (2006), 100–17; Van de Wouwer & Lambert, *supra* n. 15, 145–8.

[256] Item 2, Council Resolution on GALILEO, 2805th Transport, Telecommunications, and Energy Council Meeting, Luxembourg, 6–8 June 2007.

[257] Items 4–7, Council Resolution on GALILEO, *supra* n. 256; respectively Council of the European Union, 2828th Council Meeting, Economic, and Financial Affairs, Brussels, 13 November 2007, 14534/07 (Presse 251), at 18.

[258] Regulation of the European Parliament and of the Council on the further implementation of the European satellite navigation programmes (EGNOS and Galileo), No. 683/2008/EC, of 9 July 2008; OJ L 196/1 (2008); and Regulation of the European Parliament and of the Council setting up the European GNSS Agency, repealing Council Regulation (EC) No 1321/2004 on the establishment of structures for the management of the European satellite radio navigation programmes and amending Regulation (EC) No 683/2008 of the European Parliament and of the Council, No. 912/2010/EU, of 22 September 2010; OJ L 276/11 (2010) respectively.

[259] *Cf.* Cooperation Agreement on a Civil Global Navigation Satellite System (GNSS) – Galileo between the European Community and its Member States and the People's Republic of China, of 30 October 2003; Council of the European Union, Doc. 13324/03.

[260] Decision of the European Parliament and of the Council on the rules for access to the public regulated service provided by the global navigation satellite system established under the Galileo programme, No. 1104/2011/EU, of 25 October 2011; OJ L 287/1 (2011). See further more generally for the security-related dimensions e.g. von der Dunk, *supra* n. 3, esp. 89–92; J.

The most important strictly legal issue beyond the above-mentioned institutional ones concerns that of liability, where on the one hand the Liability Convention is generally perceived to apply only to direct damage caused by navigation satellites[261] whilst on the other hand Galileo as a commercial second-generation GNSS may accept third-party liability also for damage caused by absent or erroneous GNSS signals.[262]

At the point of writing the first Galileo satellites have been launched and declared operational; the first services are expected to start being offered as of 2015 with completion of the full 30-satellite system aimed for by 2019.[263] This likely means that only by the latter date will the comprehensive legal framework for Galileo activities, taking care *inter alia* of the proper handling of security and liability issues and (perhaps) again drawing private interests into the operational and governance structure, have been established.

4.4.4.2 Flagship No. 2: GMES/Copernicus

As the European Commission and ESA were making progress with Galileo, especially the former started also pushing for a GMES project, which should ultimately result in a Copernicus satellite system providing Europe with its independent comprehensive and permanent earth observation capacity, realizing integrated use of terrestrial, airborne and space data notably combining existent satellite earth observation systems such

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Lembke, *Competition for Technological Leadership: EU Policy for High Technology* (2002), 119–28; P. Finocchio, R. Prasad & M. Ruggieri, *Aerospace Technologies and Applications for Dual Use* (2008), 238–41.

[261] *Cf. supra* § 2.3.3.2, as well as Art. I(a), Liability Convention, *supra* n. 88, on the definition of damage, usually seen as excluding damage caused by absent or erroneous GNSS signals, but see *contra* B.D.K. Henaku, *The Law on Global Air Navigation by Satellite: An Analysis of Legal Aspects of the ICAO CNS/ATM System* 1998), 221. Further on liability *cf.* e.g. von der Dunk, *supra* n. 253, 129–68; P. Manzini & A. Masutti, International Civil Liability Regime for the Galileo Services: A Proposal, 33 *Air and Space Law* (2008), 114–31; D. Bensoussan, *GNSS and GALILEO Liability Aspects* (2003).

[262] *Cf.* e.g. von der Dunk, *supra* n. 253, 129–67; F.G. von der Dunk, Hosting Galileo Ground Stations – Liability and Responsibility Issues under Space Law, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 358–68; also further *infra* §§ 10.4, 10.5.

[263] See http://en.wikipedia.org/wiki/Galileo_(satellite_navigation), last accessed 21 January 2014.

as those of ESA and EUMETSAT with, where appropriate, new instruments and satellite systems to fill any gaps detected.[264] GMES/Copernicus would also allow Europe to contribute to the Global Earth Observation System of Systems (GEOSS).[265]

Beyond that, while the contours of GMES/Copernicus may be gradually emerging, many key aspects of the institutional and operational structure are not yet defined.[266] A Council Resolution of November 2001 merely provided for the underlying general policy as the point of departure for all further action.[267] GMES/Copernicus is tasked to support a range of EU policies, and the 2005 Communication refers to specific, concrete examples like the Union's involvement in agriculture, environmental and fisheries monitoring, external relations such as disaster and emergency response action, and development policies.[268] The 2005

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[264] See e.g. Marboe, *supra* n. 220, 39–40; M. Ferrazzani, The Status of Satellite Remote Sensing in International Treaties, in *Project 2001 – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 196–7.

[265] See on this further http://en.wikipedia.org/wiki/Global_Earth_Observation_System_of_Systems, last accessed 13 April 2014.

[266] See for an early appraisal e.g. von der Dunk, *supra* n. 150, 438–40; also – on the security aspects in particular – von der Dunk, *supra* n. 3, 92; F.G. von der Dunk, The 'S' of 'Security': Europe on the Road to GMES, 4–2 *Soochow Law Journal* (2007), 1–27; more in general on GMES/Copernicus legal aspects e.g. L. Mantl, The Commission Proposal for a Regulation on the European Earth Observation Programme (GMES) and its Initial Operations (2011–2013), 58 *Zeitschrift für Luft- und Weltraumrecht* (2009), 404–22; briefly G. Cho, Privacy and EO: An Overview of Legal Issues, in *Evidence from Earth Observation Satellites* (Eds. R. Purdy & D. Leung) (2012), 291–2.

[267] Council Resolution on the launch of the initial period of global monitoring for environment and security (GMES), of 13 November 2001; OJ C 350/4 (2001). Further Communications essentially developed that policy further, but did not constitute legislative or regulatory measures either; *cf.* Communication from the Commission to the European Parliament and the Council – Global Monitoring for Environment and Security (GMES): Establishing a GMES capacity by 2008, COM(2004) 65 final, of 3 February 2004; Communication from the Commission to the Council and the European Parliament – Global Monitoring for Environment and Security (GMES): From Concept to Reality, COM(2005) 565 final, of 10 November 2005.

[268] See Communication from the Commission to the Council and the European Parliament – Global Monitoring for Environment and Security (GMES): From Concept to Reality, *supra* n. 267, 6–7.

Communication further paves the way forward by defining the concepts of pilot operational services and fast-track introduction.[269]

Only in 2010 did the first formal EU-level legislation on GMES emerge.[270] In legal terms progress has been obstructed for several years as a consequence of major problems encountered by the Commission regarding its original plans to fund major parts of GMES/Copernicus through the Union budgets, although these now seem to have been solved.[271] Consequently, a second piece of EU law was recently enunciated addressing, in particular, the desired 'full and open access to information produced by the GMES services and of data collected through the GMES dedicated infrastructure', and provided further details on conditions for various aspects of such open use, including specifically the absence of 'any express or implied warranty, including as regards quality and suitability for any purpose'.[272]

As of this writing, the first geospatial information services of Copernicus under the land, ocean and emergency response themes and two additional ones addressing the atmosphere and security themes are to be fully operational in 2014, with atmosphere, security and climate change services to follow in the next few years. That same year is to see the first actual satellite contributions to these services, by way of the first Sentinel missions.[273]

Obviously, only once those satellites go up will the more properly space-oriented laws (international, European and national) and regulations become applicable; also, considerable work remains to be done at

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[269] See Communication from the Commission to the Council and the European Parliament – Global Monitoring for Environment and Security (GMES): From Concept to Reality, *supra* n. 267, 7–8.

[270] Regulation of the European Parliament and of the Council on the European Earth monitoring programme (GMES) and its initial operations (2011 to 2013), No. 911/2010/EU, of 22 September 2010; OJ L 276/1 (2010).

[271] *Cf.* e.g. EU Parliament Supports GMES within Financial Framework, 17 February 2012, www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/EU_Parliament_supports_GMES_within_financial_framework, last accessed 13 April 2014.

[272] Arts. 1(a) & 9 respectively, Commission Delegated Regulation supplementing Regulation (EU) No 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES) by establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information, No. 1159/2013/EU, of 12 July 2013; OJ L 309/1 (2013).

[273] See http://en.wikipedia.org/wiki/Copernicus_Programme, last accessed 21 January 2014.

this stage on the governance – and hence the responsibility and liability issues, the latter at least as far as beyond the 'standard' applicability of the Liability Convention.[274]

4.4.5 Solving the 'Fair Return' Conundrum

Strictly legally speaking, the thorniest issue in the EU–ESA relationship concerned the principle of 'fair return' as the most specific elaboration of 'geographical return'.[275] Indeed, following ESA's overarching aims it provided a strong rationale for an individual member state to commit financial resources to a particular programme, especially if it had national industries that could contribute to that programme, and thus stimulated specialization within the various space industries as well as allowing smaller ESA member states and their industries to also benefit from huge and complex space programmes.

However, the result in practice could well be that a particular contractor was not chosen for offering the best value for money but because of his nationality and the need to comply with the 'fair return' principle vis-à-vis 'his' member state. In other words, the principle of fair competition would be sacrificed to that extent.

Once the Community, then Union, became fundamentally involved in the regulatory side of space activities, this could, at least in principle, trigger the application of the EU competition regime.[276] Strictly speaking, this would not apply directly to ESA itself, as an intergovernmental organization with not even congruent membership as compared to the Union not subject to the latter's legal order and jurisdiction.[277] However,

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274 Note again that under the prevailing interpretation of the Liability Convention, *supra* n. 88, 'damage' does not include any indirect and/or downstream damage caused by absent or erroneous data.

275 See for the basic analysis of these principles *supra*, § 4.2.4.3.

276 See for the EU competition regime in general *supra*, (text at) n. 180; also again Arnull *et al.*, *supra* n. 1, 965–1191; Folsom, *supra* n. 1, 292–370; Barents, *supra* n. 175.

277 Though technically speaking ESA could be viewed as an 'undertaking' subject to the prohibition of the competition regime on abuse of a dominant position applicable to such undertakings for not applying 'normal' commercial principles in contracting out (*cf.* Art. 102, Treaty on the Functioning of the European Union, *supra* n. 168), alternatively as a 'cartel' of undertakings distorting normal operation of the market (*cf.* Art. 103, Treaty on the Functioning of the European Union), its composition of sovereign member states – including non-EU members Norway and Switzerland – principally excluded EU jurisdiction over such practices at that level.

the 'fair return' rule could be viewed as an indirect form of 'state aid' by individual member states of both the Union and ESA, in that the proposed contributions by such states to particular ESA programmes were directly related to the expected and likely contracting for such amounts to their national industry, and would thus distort an otherwise fair competition for specific contracts and subcontracts.[278]

Whilst the application of 'fair return' did therefore give rise to some discussion, the Commission soon realized that there were sound justifications in play for applying such a potentially or even inherently anti-competitive mechanism. There could be little doubt about the special character of the space industry: highly technical, highly risky, highly cost-intensive and very much of a long-term and strategic nature. As a consequence, in many respects, there might be no real competition possible within Europe anyway; in which case enforcing it would often be rather artificial – and worse, could result in weakening the European space industry vis-à-vis major US and Japanese consortia and the new Russian, Ukrainian and Chinese industrial complexes by precluding concentration and the realization of economies of scale. As a consequence, the continued application of 'fair return' in the ESA context has so far been *de facto* justified by overriding European interests, and was accepted by the European authorities for the time being.

What is more, even the EU competition regime itself acknowledges the possibility for exceptions to and exemptions from otherwise applicable competition principles and rules for such reasons. For example the provisions of the so-called 'anti-cartel' provisions of the EU regime could be 'declared inapplicable' if the activities or practices concerned contributed 'to promoting technical or economic progress'.[279] The European space industry in particular within the ESA context was clearly designed to promote technical progress due to its focus on research and development, and once it became evident that in order to compete globally European companies should be supported rather than played off against

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[278] See for the principled prohibition of state aid under EU law Art. 107(1), Treaty on the Functioning of the European Union, *supra* n. 168. *Cf.* further e.g. F.G. von der Dunk, ESA and EC: Two Captains on One Spaceship?, in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 427–9; F.G. von der Dunk, Perspectives for a Harmonised Industrial Policy of ESA and the European Union, in *'Project 2001 Plus' – Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2006), 181–6.

[279] Art. 101(3), Treaty on the Functioning of the European Union, *supra* n. 168.

each other by artificial application of competition principles, economic progress in Europe also came to be seen as (partially) dependent upon the ESA system. Similar options offered themselves in the case of the so-called 'anti-monopoly' clauses of the EU regime.[280]

In line with these provisions targeted at individual companies, moreover, and more directly applicable, as regards state aid:

> The following may be considered to be compatible with the internal market:
>
> …
>
> (b) aid to promote the execution of an *important project of common European interest* or to remedy a serious disturbance in the economy of a Member State;
>
> (c) aid to *facilitate the development of certain economic activities* or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest;
>
> …
>
> (e) such other categories of aid as may be specified by decision of the Council on a proposal from the Commission.[281]

Clearly, the major space projects, or even the space sector as a whole in view of its technological, economic and strategic importance, qualify as 'important projects of common European interest' and 'facilitate the development of certain economic activities' of common European interest, and in case of doubt the possibilities exist also to specifically carve out (certain) space projects or sectors by way of future legislation.

4.5 CONCLUDING REMARKS

The European legal 'spacescape' presents a rather complex and constantly evolving picture, but at this point ESA and the European Union are still to be seen – and will likely for the foreseeable future continue to be seen – as the two primary flag-bearers of Europe in outer space. As their relationship, overlaying in many respects that of their member states who are to a large extent – but not completely – identical, continues to evolve, a body of law has resulted and will continue to evolve trying to

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[280] Further to Arts. 102 & 103, Treaty on the Functioning of the European Union, *supra* n. 168, this notably concerned Regulation (EEC) 17/62, of 6 February 1962, OJ 13/204 (1962), as regularly updated and amended later on.

[281] Art. 107(3), Treaty on the Functioning of the European Union, *supra* n. 168 (emphasis added).

match the individual interests of still-sovereign states with the higher-level common interests of these same states on the global scene.

The latest development is a(nother) report from the European Commission trying to gradually further align the respective roles of the European Union and ESA beyond the *à la carte* approach of the Framework Agreement.[282] The report briefly analyses four principled options for further collaboration of the two bodies, ranging from 'no change' to ESA becoming an EU agency while preserving some of its intergovernmental features.[283] As of now, however, the two 'middle' options are the most likely ones to be further investigated, and possibly be chosen from: improved cooperation under the status quo (meaning ESA will remain formally independent from the European Union, yet increasingly be tasked by the latter, effectively to that extent taking over from the combined member states as it were) or creating an 'EU pillar' within ESA exclusively working for the Union, under its guidance and in accordance with its legal principles such as fair competition.[284] Whichever option is finally chosen, another chapter in European space legal development will almost certainly result.

Particularly interesting features of European space law as it has come into being so far, for other regions of the world seeking more intra-regional cooperation and integration in the space realm and a stronger voice in global space policy and economics, are the two joint flagship projects of Galileo and Copernicus; but also earlier institutional developments such as the creation of Arianespace, EUTELSAT and EUMETSAT and legislative developments such as the creation of an EU internal market for satellite communications and a specific Database Directive may present interesting examples of legal/institutional integration.

Finally, and perhaps most importantly from the present perspective, these developments have shown that such intra-regional integration need not be at the expense of global space law and mankind's space endeavour, but may in many respects actually contribute to and enhance the application and effectiveness of that body of (public) international law, such as for instance by ESA's official partisanship to three UN space treaties.

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[282] Progress report on establishing appropriate relations between the European Union and the European Space Agency, Report from the Commission, of 6 February 2014, COM(2014) 56 final.

[283] See Progress report on establishing appropriate relations between the European Union and the European Space Agency, *supra* n. 282, 5–6.

[284] *Cf.* Progress report on establishing appropriate relations between the European Union and the European Space Agency, *supra* n. 282, 6–9.

5. International organizations in space law

Frans von der Dunk

5.1 INTRODUCTION: INTERGOVERNMENTAL ORGANIZATIONS AND OUTER SPACE

Since the Second World War the global community has seen an enormous rise in international intergovernmental organizations in virtually all areas of international cooperation, trade and other interaction.[1] 'Intergovernmental organizations' (IGOs) should be distinguished from other, essentially 'non-governmental' organizations (NGOs), even if these in many cases also operate internationally; the former fundamentally concern organizations comprised of sovereign member states and hence are, in and of themselves, of a public legal character.[2]

As a consequence of such membership and the essentially public character of their tasks, responsibilities and activities, IGOs have constitutive documents providing *inter alia* for an institutionalized system for participation of member state representatives,[3] may be granted

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[1] See e.g. J. Crawford, *Brownlie's Principles of Public International Law* (8th edn., 2012), 166 ff.; R.L. Bindschedler, International Organizations, General Aspects, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. II (1995), 1292–3; P. Malanczuk, *Akehurst's Modern Introduction to International Law* (7th edn., 1997), 30–1; A. Cassese, *International Law* (2001), 35 ff., also 72; R.M.M. Wallace, *International Law* (3rd edn., 1997), 68.

[2] See e.g. I. Brownlie, *Principles of Public International Law* (7th edn., 2008), 675–99, esp. 687–9; Malanczuk, *supra* n. 1, 92–3; Cassese, *supra* n. 1, 69–71; Wallace, *supra* n. 1, 68–9; U.M. Bohlmann & G. Süss, The Status of International Intergovernmental Organisations under the UN Outer Space Treaty System, 10-1 *Space Law – Newsletter of the International Bar Association Legal Practice Division* (Oct. 2009), 8.

[3] Usually such member state participation is enshrined by means of their representation in key organs of the organization labelled 'General Assembly', 'Assembly of Parties', 'Plenary Meeting', 'Council' and such like. See further e.g. I. Seidl-Hohenveldern, Les organes des organisations internationales, in *A Handbook on International Organizations* (Ed. R.J. Dupuy) (2nd edn., 1998), 89–109; H.G. Schermers, International Organizations, Membership, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. II (1995), 1320 ff.;

secondary competences to conclude international agreements of a treaty-like nature,[4] and enjoy certain functional immunities and privileges loosely based on those of sovereign states and their diplomatic representations.[5] In all cases, those constitutive documents provide for the fundamentals of the legal relationship between the organizations, their competences, tasks and responsibilities, and those of the totality of member states.

This, of course, is no different for IGOs involved in outer space and space activities, which may raise the issue of whether such general 'IGO law' should indeed be included within the broad concept of space law. Nevertheless, in at least one major respect outer space does present a very special case from the perspective of IGOs and international law.

Almost all intergovernmental organizations operating in the other realms subject to (general) public international law essentially qualify as 'regulatory' organizations; they represent efforts of the respective collectivities of member states to establish international fora for discussion of and cooperation on international political and legal issues, common representation of interests vis-à-vis non-member states, and to that end draft guidelines, rules of the road, recommendations and binding regulations at least for internal purposes, within the competences allotted to the organizations by their member states through the constitutive documents. In this respect, outer space and space law are not unique, although

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P.C. Szasz, International Organizations, Privileges and Immunities, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. II (1995), esp. 1329; Crawford, *supra* n. 1, esp. 178–9, 188–91; Malanczuk, *supra* n. 1, 95–6.

[4] *Cf.* also the Vienna Convention on the law of treaties between states and international organizations or between international organizations, Vienna, done 21 March 1986, not yet entered into force; Cm. 244; 25 ILM 543 (1986). Further e.g. K. Zemanek, International Organizations, Treaty-Making Power, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. II (1995), 1343–6; Crawford, *supra* n. 1, 191–5.

[5] See e.g. R. Zacklin & C.F. Amerasinghe, The Ways and Means of International Organizations, in *A Handbook on International Organizations* (Ed. R.J. Dupuy) (2nd edn., 1998), 293–313, 349–65; Crawford, *supra* n. 1, 171–6; Szasz, *supra* n. 3, 1328–31. *Cf.* e.g. the so-called Headquarters Agreements between IGOs and their host states, spelling out such immunities and privileges in detail (for the United Nations, e.g. the Agreement between the United Nations and the United States of America regarding the Headquarters of the United Nations, Lake Success, done 26 June 1947, entered into force 21 November 1947; 11 UNTS 11; 554 UNTS 308 (1966); 687 UNTS 408 (1969); and the general Convention on the Privileges and Immunities of the United Nations, London, done 13 February 1946, entered into force 17 September 1946; 1 UNTS 15; UKTS 10 (1950) Cmd. 7891; ATS 1949 No. 3).

their specific characteristics may occasionally also determine the precise roles and competences of such IGOs.

However, in addition, space law knows of a number of intergovernmental organizations not so much pooling regulatory or less formal cooperative yet still 'paper-based' resources, but pooling financial, technical and scientific resources to actually undertake activities in the extremely alien, risky and costly realm of outer space and space activities. Whilst at the heart being construed similar to regulatory IGOs, these operational IGOs also have to properly accommodate, by way of their internal governance structures, the extent of, for instance, joint finances and joint operations involved – and, even more interestingly from the perspective of public international law, by their activities may come to constitute a special kind of state practice contributing to the development of customary international law.

5.2 REGULATORY INTERGOVERNMENTAL ORGANIZATIONS AND OUTER SPACE: A SURVEY

5.2.1 Regulatory IGOs and International Space Law

Regulatory IGOs play a major role also in the establishment and further development of international space law, even if those organizations almost without exception were already existing prior to mankind's entry into outer space in 1957, and merely at some point extended the scope of their activities to outer space and space activities – sometimes expressly so, sometimes less expressly so.

To the extent such organizations play an important role in the development of space law, they and their respective substantive impact and role are almost automatically addressed in respective chapters elsewhere in this book, so rather than reiterating the various analyses undertaken in these, more focused, chapters and paragraphs, at this point a succinct survey of the most important of these regulatory IGOs and their role in the broader context of space law should suffice.

Intergovernmental organizations are not mentioned in the classical summary enumeration of sources of public international law as per the Statute of the International Court of Justice,[6] although later analyses

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[6] Art. 38(1), Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1 lists those sources as, at the primary level, comprising 'a. international conventions, whether general or

often include them – or more precisely legislative developments within their context – among such sources.[7] At the abstract level, their contributions would thus by and large fall into one of four categories.

Firstly, IGOs present an often-used platform for the member states to conclude further substantive treaties on the subject matter the IGO is established for, which then of course as treaty law squarely form part of public international law. This may and indeed does also happen in the context of outer space and space law.[8] A special subcategory here concerns treaties to which IGOs effectively become parties.[9]

Secondly, whilst competences to impose binding law regarding substantive issues on member states against their individual opposition are usually absent with IGOs,[10] most of them have extended competences to adopt guidelines, recommendations, rules of the road and other non-formally binding texts. Many of those documents after their adoption turn out to gradually transform into customary international law, as the

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particular, establishing rules expressly recognized by the contesting states; b. international custom, as evidence of a general practice accepted as law; [and] c. the general principles of law recognized by civilized nations'. See *supra*, § 2.1.1, esp. at n. 2; further on the role of this clause in providing the sources of public international law, in particular in the context of space law e.g. S.R. Freeland, The Role of 'Soft Law' in Public International Law and its Relevance to the International Regulation of Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 12–9; also e.g. P. Malanczuk, Actors: States, International Organisations, Private Entities, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 27, 30–1; Cassese, *supra* n. 1, 117–62; Wallace, *supra* n. 1, 7–34.

[7] See further on the role of IGOs in the formation of international law e.g. Crawford, *supra* n. 1, 179 ff., esp. 192–6; J. Verhoeven & C. Dominicé, Les activités normatives et quasi normatives des organisations internationales, *A Handbook on International Organizations* (Ed. R.J. Dupuy) (2nd edn., 1998), 413–61; Wallace, *supra* n. 1, 28–31; Cassese, *supra* n. 1, 153–5; Malanczuk, *supra* n. 1, 52–4.

[8] Prominent examples are the five space treaties developed in UN COPUOS (see *supra*, § 2.3) or the GATS agreement on liberalizing trade in satellite communication services (see *infra*, §§ 15.4.2–15.4.4).

[9] A few examples notably exist in the European context, with the European Union adhering to *i.a.* the WTO Agreement and the GATS (see *infra*, §§ 15.2.1.2, 15.2.2.4) and concluding international treaty-like agreements with ESA on satellite navigation (see *supra*, § 4.4.4.1).

[10] The single exception here is the European Union – which therefore merits special treatment in this context, as per Chapter 4 *supra.*

member states start to appreciate their legal relevance and authority more and more, specifically in the context of IGO-based cooperation.[11]

Thirdly, whilst internal binding regulations adopted within a particular IGO usually remain confined to procedural and organizational rather than substantive matters, the boundaries between the two cannot always be easily drawn and such regulations may sometimes develop their own momentum and impact, which may occasionally have an effect upon the creation of binding international law (whether treaty or customary) even beyond the member states themselves.[12]

Finally, most of the major regulatory IGOs possess some dispute settlement system comprising mixed forms of judicial and non-judicial mechanisms, often prominently involving arbitration. Those dispute settlement mechanisms may not only use general public international law in the context of solution of particular disputes but in doing so may also contribute to further interpretation and understanding of these rules.[13]

5.2.2 The United Nations (UN)

The primary pre-existing IGO relevant for space activities and space law is of course the United Nations.[14] Established in 1945 to try and maintain or restore international peace and security, that focus gradually widened to encompass such areas as decolonization, global economics and their consequences and a whole range of social, medical, ecological and other important societal issues of global scope.[15]

When in 1957 Sputnik-1 for the first time raised the spectre of concrete active military use of space, it was only logical for the United Nations to be accosted by the two then-superpowers to present the primary forum for ensuring the worst would not come about in that

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[11] A prime example concerns the UN Remote Sensing Principles (see *infra*, § 9.4.1.2).

[12] Examples are the role of the European Union in liberalizing and privatizing the satellite communication sector, where the EU-internal regulation of the sector, together with national US policies and legislation, presented the major driving factor behind the regulatory developments in the WTO/GATS context (see *infra*, § 15.4).

[13] Beyond the obvious leading instance of the International Court of Justice major examples include the ITU and WTO/GATS dispute settlement systems; see *infra*, § 19.2.2 and § 15.2.1.3 respectively; also in general further Chapter 19.

[14] See more in detail *supra*, §§ 1.1–1.3, 2.1.3, 2.2, 2.3.

[15] See e.g. Cassese, *supra* n. 1, 35–45, esp. 275 ff.; J.A. Frowein, United Nations, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. IV (2000), 1029 ff.; Malanczuk, *supra* n. 1, 26–30, *cf.* also 385 ff.

context. The UN General Assembly quickly established a Committee on the Peaceful Uses of Outer Space (COPUOS) serving as the main source for resolutions and treaties on outer space and space activities – although in later years its importance was rather hampered, then diminished, by the need for consensus between the sovereign member states.[16] Nevertheless, an embryonic legal framework for all human activity in outer space has arisen within the context of COPUOS, which to this day presents the core of all space law.

The other main (quasi-)legislative organ of the United Nations is the Security Council. Whilst COPUOS was a subsidiary body of the General Assembly, which by definition is unable to enunciate binding international law, the Security Council does have the competence to issue legally binding decisions, albeit limited to the area of maintaining international peace and security in a rather narrowly circumscribed sense.[17]

This competence in principle would certainly also extend to outer space – witness the Outer Space Treaty's clause stating:

> States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.[18]

So far, these Security Council competences have never been called upon in the context of outer space – which not only obviously is a good thing, but may also testify to both the commitment of the space powers to keep outer space outside of the Cold War as much as possible, and the validity and viability of the Outer Space Treaty in keeping the peace – but unfortunately, there is no inherent reason why this could not change at some future date.

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[16] See further *supra*, § 2.2.1; also more broadly §§ 1.1, 1.2.

[17] *Cf.* Arts. 39–42, Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1.

[18] Art. III, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

The third major UN organ, the International Court of Justice, so far has never been seized of a case concerning space activities, and the possibility under the Statute, for example, to establish a special chamber for such disputes so far has never been actively pursued, let alone implemented.[19]

5.2.3 The International Telecommunication Union (ITU)

As analysed in greater detail below,[20] once Sputnik-1 demonstrated at least the theoretical possibility to use space infrastructure as part of telecommunication networks, the International Telecommunication Union (ITU), which had already taken care of the international aspects of terrestrial telecommunications since the late nineteenth century, also included the frequency coordination of (international) space frequencies and their usage within its main tasks. The ITU thereby, next to the United Nations, became an organization fundamental to almost all space activities.

The most interesting example of the inherently natural impact of the ITU's regime on space activities concerns the system for allocation, allotment and assignment of frequency resources. The ITU notably now shall '*effect allocation* of bands of the radio-frequency spectrum, the *allotment* of radio frequencies and the *registration of* radio-frequency assignments and, for space services, *of* any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits'.[21]

This almost amounts to a 'competence creep'. Outer space is not subject to national appropriation,[22] and originally the international community of states through the ITU Constitution as quoted had strictly speaking charged the ITU with allocating, allotting and registering frequencies only, but due to the inevitable relationship between orbital positions and the risk of interference tied to certain frequencies, this effectively meant those orbital positions also came to be allocated, allotted and assigned through the same mechanism. This 'competence

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[19] See further *infra*, §§ 19.1.1, 19.1.3.

[20] See *infra*, §§ 8.2.1, 8.2.4.1.

[21] Art. 1(2)(a), Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1 (emphasis added). *Cf.* also Art. 44(2).

[22] *Cf.* Art. II, Outer Space Treaty (*supra* n. 18), further *supra*, § 2.3.1.2.

creep' having taken place more or less unchallenged, it can now be said to have become public international law per se.

5.2.4 The World Trade Organization (WTO)

As analysed in much greater detail further below,[23] the actual or expected liberalization and privatization of various space sectors since the 1980s has given rise to increasing involvement of the WTO in the satellite communications sector.

The resulting application of the GATS to this sector has caused classical international trade concepts such as National Treatment and Most-Favoured Nation to become relevant for satellite communications law. While so far the various individual schedules of commitment show a considerable variation of the measure of trade liberalization actually realized with respect to various countries, and a large variety of instruments to maintain some form of national control over the sector, the process undeniably has a converging effect – and most of the limitations in the mid-1990s introduced in these schedules are of a temporary nature.[24] Once, moreover, the WTO dispute settlement system – as appropriately, perhaps, backed up by or alternating with the new PCA Rules on Outer Space Disputes[25] – is increasingly called upon to solve disputes, almost inevitably also in this multi-billion dollar commercial context the proper interpretation and application of such key concepts might cause them to become part and parcel of international space law more broadly.

5.2.5 The World Intellectual Property Organization (WIPO)

A further IGO of interest from the perspective of space activities is the World Intellectual Property Organization (WIPO), established to work towards harmonization of national intellectual property rights regimes and mutual recognition of nationally granted intellectual property rights.[26] Such an approach had already been developed from the second

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[23] See *infra*, §§ 15.3–15.5.

[24] *Cf. infra*, § 15.4.3.

[25] See further *infra*, § 19.3.

[26] See Arts. 3, 4, Convention Establishing the World Intellectual Property Organization (WIPO) (WIPO Convention), Stockholm, done 14 July 1967, entered into force 26 April 1970; 828 UNTS 3; TIAS 6932; 21 UST 1749; UKTS 1970 No. 52; Cmnd. 3422; ATS 1972 No. 15; 6 ILM 782 (1967). See further *infra*, Chapter 18.

half of the nineteenth century onwards by way of, originally largely unrelated, international treaties,[27] but with the establishment of WIPO the development of an international regime on IPR gained considerable momentum – *inter alia* by enunciating more treaties still.

It was basically those treaties which started to be discussed also in the context of space, in particular patent law, to protect inventions specifically developed in outer space (the International Space Station[28]) and space-related manufacturing, and copyright, for example when it came to space-based remote sensing data.[29] This was especially relevant in view of the increasing commercialization and privatization of space activities, which called for precise legal instruments to protect the huge investments made in space further to general (possible or actual) applicability of patents, copyrights and other IPR regimes. In the context of the European Union, this also gave rise to such finely tuned legal instruments as the Database Directive *inter alia* protecting remote sensing databases.[30]

5.2.6 Transport-Specific IGOs: ICAO and the IMO

One of the terrestrial realms most amenable to and interested in downstream satellite applications concerns transport, where in particular satellite navigation[31] and mobile satellite communications[32] could provide huge benefits. As a consequence, existing regimes in the transport sector – national as well as international – became of importance as well for relevant categories of space activities, as part of the legal environment ultimately co-defining the sector and, in a commercial context, the marketplace.

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[27] Most famous among those were the Convention for the Protection of Industrial Property as Modified by Additional Act of 14 December 1900 and Final Protocol (Paris Convention), Paris, done 20 March 1883, entered into force 6 July 1884; 828 UNTS 305; USTS 379; UKTS 1907 No. 21; ATS 1907 No. 6; on patents; and the Berne Convention for the Protection of Literary and Artistic Works (Berne Convention), Berne, done 9 September 1886, entered into force 5 December 1887; 828 UNTS 221; 331 UNTS 217; ATS 1901 No. 126; on copyrights.

[28] See further *infra*, §§ 11.3.2.15, 18.3.4.

[29] See further *infra*, § 18.2.2.

[30] Directive of the European Parliament and of the Council on the legal protection of databases (Database Directive), 96/9/EC, of 11 March 1996; OJ L 77/20 (1996). See further *infra*, § 18.2.1, also *supra*, § 4.3.2.3.

[31] See further *infra*, Chapter 10.

[32] *Cf.* also *infra*, Chapter 8.

Although this could apply to all transport sectors, aviation and maritime transport, because of their inherent overriding international character and well-developed international legal regimes, stand out as the two transport sectors most relevant from this perspective for space law[33] since in both cases, major intergovernmental organizations of global scope and membership have existed for many decades, which have been tasked to represent and further the interests of the sectors by way of international regulation – ICAO and the IMO respectively.

5.2.6.1 The International Civil Aviation Organization (ICAO)

The International Civil Aviation Organization (ICAO) was established in 1944 by way of the Chicago Convention[34] in order to, most notably, '[i]nsure the safe and orderly growth of international civil aviation throughout the world'.[35] ICAO's competences to that extent included issues related to air navigation, which in the 1980s would come to encompass satellite navigation as well,[36] and aeronautical communications making use of satellites.[37] More recently, ICAO also became

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[33] For an example of legal aspects of the involvement of GNSS also in other transport modes see e.g. F.G. von der Dunk, The European Equation: GNSS = Multimodality + Liability, in *Air and Space Law in the 21st Century*, Liber Amicorum Karl-Heinz Böckstiegel (2001), 231–46.

[34] Convention on International Civil Aviation (hereafter Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300; see esp. Pt. II, Arts. 43–66.

[35] Art. 44(a), Chicago Convention, *supra* n. 34.

[36] *Cf.* e.g. Arts. 11, 12, 28, 37(a) and (c), 56–57, Chicago Convention, *supra* n. 34, and Annexes 2, Rules of the Air; 6, Operation of Aircraft; 10, Aeronautical Telecommunications; and 11, Air Traffic Services; also e.g. B.D.K. Henaku, *The Law on Global Air Navigation by Satellite* (1998); F.G. von der Dunk, Navigating Safely through the 21st Century: ICAO and the Use of GNSS in Civil Aviation, 47 *Indian Journal of International Law* (2007), 1–29; P.A. Salin, Regulatory Aspects of Future Satellite Air Navigation Systems (FANS) on ICAO's 50th Birthday, 44 *Zeitschrift für Luft- und Weltraumrecht* (1995), 173–5; J.M. Epstein, Global Positioning System (GPS): Defining the Legal Issues of its Expanding Civil Use, 61 *Journal of Air Law and Commerce* (1995), 248–51.

[37] *Cf.* e.g. Arts. 30, 37(a), Chicago Convention, *supra* n. 34, and Annexes 10, Aeronautical Telecommunications and 15, Aeronautical Information Services; also e.g. T.C. Brisibe, *Aeronautical Public Correspondence by Satellite* (2006), 5 ff.; P.L. Meredith & G.S. Robinson, *Space Law: A Case Study for the Practitioner* (1992), 107–8; K. Heilbronner, International Civil Aviation Organization, in *Encyclopedia of Public International Law* (Ed. R. Bernhardt) Vol. II (1995), 1072; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 353.

engaged in the development of an international regime for securities with respect to both aircraft and space assets (as for space culminating in the UNIDROIT Space Assets Protocol)[38] and discussions on the appropriate international legal framework for sub-orbital spaceflight.[39]

Such discussions in an ICAO context, of aviation applications making use of space infrastructures and assessing whether an essentially hybrid activity should be regulated as part of air law respectively, highlight the complexity of interaction of non-space law with space law *stricto sensu*, in particular when in the former context an effective and well-established organizational structure exists to help further refine and implement such law. This situation often tends to lead to approaches for solving issues ignoring the broader aspects of the involvement of outer space and space activities in the particular area at hand.[40]

5.2.6.2 The International Maritime Organization (IMO)

Although the maritime sector, principally due to the far lesser speeds of the transport vehicles involved, knows a considerably lesser degree of international oversight compared to international aviation, the International Maritime Organization (IMO) has played a central role in that respect for many years.[41]

Thus, the IMO has played a major role in integrating satellite applications into the maritime domain for the benefit of its stakeholders, and thereby, at least at a political level, influenced the regime applicable to such satellite applications and the satellite operations feeding them. Primary examples concern the use of satellite navigation in the maritime context[42] and the development of the INMARSAT satellite system for the

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[38] See further *infra*, § 16.4.

[39] See further *infra*, § 12.3.

[40] *Cf.* also e.g. the discussion on GNSS liability in the context of UNIDROIT, *infra*, §§ 5.2.7, 10.10.

[41] Originally established as the Intergovernmental Maritime Consultative Organization IMCO by the Convention on the Intergovernmental Maritime Consultative Organization IMCO (hereafter IMCO Convention), Geneva, done 6 March 1948, entered into force 17 March 1958; 289 UNTS 48; TIAS 4044; UKTS 1958 No. 54; Cmnd. 589; Cmd. 7412; ATS 1958 No. 5; the title of the Convention was amended to 'Convention on the International Maritime Organization' in 1975 with effect from 22 May 1982.

[42] Thus, IMO has e.g. by way of IMO Resolution A.195(22) on Revised Maritime Policy and Requirements for a Global Navigation Satellite System (GNSS), of 29 November 2011, substantially influenced the development of GNSS operations and services in the maritime domain.

purpose of, first and foremost, enhancing the existing search-and-rescue opportunities available for addressing distress, incidents and accidents at sea.[43]

5.2.7 The International Institute for the Unification of Private Law (UNIDROIT)

The International Institute for the Unification of Private Law (UNIDROIT) presents a more particular example of a regulatory IGO, having recently become involved in space activities and space law.[44] Particular especially in that UNIDROIT is an organization focused on *private* international law, and as considered necessary and appropriate, undertakes efforts to harmonize and/or streamline national legal regimes directly addressing private actors. Thus, its involvement in the space sector also constitutes another illustration of the growing measure of privatization and commercialization of that sector – even as UNIDROIT's activities have so far remained confined to the special realm of space project financing.

The inevitable coherence of *private* space activities and the particular legal regimes applicable to them and international *public* international space law has not only given rise to concerns in the latter context that the Space Assets Protocol might somehow negatively interfere with the UN space treaties,[45] but also to efforts in the former context to address the rather complex issue of liability for GNSS signals and services.[46]

These efforts are somewhat misguided and in the end perhaps doomed to fail precisely because UNIDROIT is an organization working on private international law issues, where the liabilities for GNSS, to the

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[43] This, further to the establishment of the International Convention for Safety of Life at Sea (hereafter SOLAS Convention), London, done 1 November 1974, entered into force 25 May 1980; 1184 UNTS 278, 1300 UNTS 391, 1408 UNTS 339, 1484 UNTS 442 & 1593 UNTS 417; TIAS 9700 & 10626; UKTS 1980 No. 46 & UKTS 1983 No. 42; ATS 1983 No. 22); see further *infra*, § 5.5.1.

[44] See *infra*, § 16.4.

[45] See *infra*, esp. § 16.4.7. This concerned *i.a.* definitional issues of 'space assets' vis-à-vis 'space objects' or the potential interference of rights of holders of security interests in satellites with the liability regime of the Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).

[46] See also *infra*, § 10.10.

extent they could be established, would emanate in the first instance from the public international realm, with such key players as sovereign nations (the United States, Russia and soon China) and the European Union, and in view of the global scope of GNSS activities and the manifold public aspects of its usage – for safety, security and general economic purposes.[47]

Yet, they testify to the apparently natural tendency of new IGO entrants into the field of space law to extend their prospective regulatory and legislative activities beyond the original point of departure in order to preserve the effectiveness of their original contributions stemming from their inherent institutionalized focus.

5.2.8 The European Community/Union

Finally, the European Union presents a rather special case in the context of regulatory IGOs – to the extent even that the applicability of the epithet 'intergovernmental' is becoming increasingly doubtful. The many semi-supranational competences assembled over the last half century at the Community, then Union, level have resulted in a special legal order somewhere between classic public international law and classic domestic law – which meanwhile has also become relevant for space activities, justifying also a special treatment of this European legal order in a separate chapter.[48]

At this point, therefore, suffice it to note that the impact of EU legislative and regulatory developments is indeed profoundly affecting many space sectors, and hence many areas of space law. This ranges from the liberalization of satellite communication services[49] to intricate institutional and substantive cooperation with the European Space Agency,[50] comprises EU-wide legal regimes applicable to satellite earth observation databases[51] or the international trade in dual-use security-sensitive goods,[52] and has given rise to the establishment under its

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47 See further *infra*, § 10.10; *cf.* also in great detail F.G. von der Dunk, Liability for Global Navigation Satellite Services: A Comparative Analysis of GPS and Galileo, 30 *Journal of Space Law* (2004), 129–67.

48 See *supra*, Chapter 4, esp. §§ 4.3, 4.4.

49 See further *supra*, § 4.3.2.2.

50 See further *supra*, § 4.4.

51 See further *supra*, § 4.3.2.3.

52 See further *infra*, § 6.6.4, § 7.5.1.3.

leadership of the European flagship space projects Galileo and Copernicus/GMES.[53]

5.3 OPERATIONAL INTERGOVERNMENTAL ORGANIZATIONS AND OUTER SPACE: AN INTRODUCTION

As arguably outer space constitutes the most alien, risky and costly arena for mankind to undertake activities in, yet those activities at least potentially have a crucial impact on terrestrial security, economics and societies, groups of sovereign states have regularly bundled their scientific, technical, operational and financial resources through the establishment of permanent joint institutional structures charged with conducting space activities on behalf of the collective group of member states – the operational organizations. In doing so, those states handed over distinct sets of sovereign competences in the narrow field of those operations and how they should be conducted to the IGO and its organs itself, even if those and the competences they could assert ultimately also depended on constitutive documents and member state participation in the main organ(s) of the IGO.[54]

One further categorization distinguishes organizations with, in principle, global membership from those with a distinct regional character; another distinguishes organizations principally undertaking the complete range of space activities from those focusing on one type of space activities only.

Starting with the latter sub-categorization, only the European Space Agency (ESA) can currently be deemed to constitute an IGO principally addressing more or less the comprehensive range of mankind's potential activities in outer space, from science to applications. At the same time being the prime regional European organization operating in the complicated European spacescape, however, in particular since over two decades involving the European Union, ESA, its activities, roles and competences have been dealt with above.[55]

Since another regional European organization EUMETSAT, the only operational IGO in the realm of remote sensing (and then for meteorological purposes only) has effectively sprung from ESA and operates as a

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[53] See further *supra*, § 4.4.4, also *infra* §§ 10.2.1.3, 10.4.1 and § 9.4.3.3 respectively.

[54] See also *supra*, § 5.1.

[55] See *supra*, Chapter 4, esp. § 4.2.

classical intergovernmental entity in that same European spacescape, also this IGO has been addressed further above.[56] Whilst the same holds true also for the regional European organization undertaking satellite communications, EUTELSAT,[57] to the extent that EUTELSAT as an IGO was rather similar to INTELSAT and INMARSAT and has meanwhile been transformed into a private operator, it will be dealt with in this chapter.

The other operational IGOs in the space sector are all once more focused on satellite communications: INTELSAT and INMARSAT on a global level, and INTERSPUTNIK[58] and ARABSAT on a regional level (the latter two not having been privatized so far). It is these IGOs that will be dealt with in greater detail presently, whereas the additional focus will be on INTELSAT, INMARSAT and EUTELSAT for reasons of their transition to private operators with 'Residual International Intergovernmental Satellite Organizations', RIISOs, as supervisors.[59]

5.4 INTELSAT

5.4.1 INTELSAT Prior to Privatization

The story of the International Telecommunications Satellite Organization INTELSAT started with the establishment in 1962 of a US corporate entity by law bestowed with a monopoly on federal and (as far as the United States was concerned) international satellite communications: the Comsat Corporation.[60] Within a year, it had an experimental satellite

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[56] See *supra*, § 4.2.6.3.

[57] See *supra*, § 4.2.6.2.

[58] Whilst labelling INTERSPUTNIK as a 'regional' IGO is strictly speaking incorrect, as the organization is fundamentally open to membership from states around the world, its heritage as a Soviet Union-led organization of communist states has so far limited membership to former constituent states of the Soviet Union, former 'satellite' states in Eastern Europe and a handful of other (formerly) communist allies elsewhere; only Germany (following up on former East Germany's membership, hence also a special case) and India clearly do not fall in any of those categories.

[59] For a comprehensive analysis of such RIISOs see esp. M.J. Mechanick, The Role and Function of Residual International Intergovernmental Satellite Organisations Following Privatisation, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 175–221; further *infra*, §§ 5.4.2, 5.5.2, 5.6.2.

[60] Comsat was established by way of the Communications Satellite Act, Public Law 87–624, 87th Congress, H.R. 11040, 31 August 1962; 76 Stat. 419;

Syncom-1 up and running,[61] and within another year the fundamental decision had been made to use Comsat as the core of an international organization offering a satellite system to its member states for telecommunications purposes.

Thus, in 1964 Interim INTELSAT was established,[62] with 11 member states (including of course the United States) and its first satellite Early Bird operating as of 1965, courtesy of Comsat.[63] By 1969 a first full-fledged global satellite communication system consisting of seven satellites in the geostationary orbit had arisen. Quickly, this interim organization evolved into the more independent INTELSAT, established in 1971.[64] The organization was to grow from 80 member states in 1973,

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as amended 1978; *Space Law – Basic Legal Documents*, E.III.2. It was a private, publicly tradable company headquartered in Washington, yet protected against competition, the Communications Satellite Act effectively functioning as a monopolistic licence; *cf.* Secs. 102 (esp. (c)), 103(8) and Title III. See further e.g. F. Lyall, *Law and Space Telecommunications* (1989), 30–73; P.K. McCormick, Intelsat: Pre and Post-Private Equity Ownership, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 83–5; H.M. White, Space Communications Law and the Geostationary Orbit, in 3 *American Enterprise, the Law and the Commercial Use of Space* (1987), 77–8; Lyall & Larsen, *supra* n. 37, 323–5.

[61] See http://en.wikipedia.org/wiki/Syncom, last accessed 25 February 2014; also Lyall, *supra* n. 60, 34.

[62] By way of Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System, and Relative Special Agreement (Interim INTELSAT Agreement), Washington, done 20 August 1964, entered into force 20 August 1964; 514 UNTS 25; 15 UST 1705; TIAS 5646; 1966 UKTS 12; 3 ILM 805 (1964); see also Lyall, *supra* n. 60, 74–85; B. Cheng, *Studies in International Space Law* (1997), 545–8; McCormick, *supra* n. 60, 84–5; Lyall & Larsen, *supra* n. 37, 325–9.

[63] See Cheng, *supra* n. 62, 545; Lyall, *supra* n. 60, 15.

[64] By way of the Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 21; TIAS 7532; 23 UST 3813; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 909 (1971); and the Operating Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Operating Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 149; TIAS 7532; 23 UST 4091; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 946 (1971). See on INTELSAT in general Lyall, *supra* n. 60, 74–208; R.S. Jakhu, International Regulation of Satellite Telecommunications, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 92–4; S. Courteix, International Legal Aspects of Television Broadcasting, in *Legal Aspects of Space*

when the constitutive treaties entered into force, to 143 in 2000, when the privatization process started kicking in.[65] Overall, more than 200 states and autonomous territories made use of its satellite infrastructure, which by then comprised 17 satellites in the geostationary orbit used especially for fixed satellite services (FSS; constituting some 85 per cent of its turnover) and some direct broadcasting services.[66]

INTELSAT was headquartered in Washington; hence the United States acted as the main sponsoring state and 'Notifying Administration' responsible for requests for allotment and assignment on behalf of the organization in the context of the ITU.[67] Like any more classical IGO, INTELSAT also had a Headquarters Agreement with its host state, the United States, in place as well as related Protocols on privileges and immunities.[68]

At the same time, the organizational structure of INTELSAT was unique in creating a hybrid, public international corporation developing and operating an infrastructure of satellites in space at the disposal of member states in an economically sound manner.[69] It comprised both a treaty between member states parties acting as legal guardians and policy

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Commercialization (Ed. K. Tatsuzawa) (1992), 105–6; Cheng, *supra* n. 62, 545–8, 550–63; McCormick, *supra* n. 60, 85–94; M.L. Smith, *International Regulation of Satellite Communication* (1990), 29–30; Meredith & Robinson, *supra* n. 37, 213 ff.; P.A. Salin, *Satellite Communications Regulations in the Early 21st Century* (2000), 102–20.

65 *Cf.* further e.g. Salin, *supra* n. 64, 102 ff.; also further *infra*, § 5.4.2.

66 *Cf.* e.g. Courteix, *supra* n. 64, 105–6; Meredith & Robinson, *supra* n. 37, 219; Salin, *supra* n. 64, 103 ff.; Smith, *supra* n. 64, 29–30.

67 *Cf.* www.itu.int/en/ITU-R/space/pubChangeADM/USAIT_G_USA_2450.pdf, last accessed 24 February 2014; in general on the concept of the Notifying Administration, Arts. 8(4), 11, Radio Regulations Articles, Edition of 2012 (hereafter Radio Regulations), www.itu.int/pub/R-REG-RR-2012, last accessed 13 April 2014. See also e.g. Mechanick, *supra* n. 59, 197–9; further *infra*, §§ 8.2.3, 8.2.4.

68 See, further to Art. XV, INTELSAT Agreement, *supra* n. 64, Headquarters Agreement between the Government of the United States of America and the International Telecommunications Satellite Organisation, Washington, done 22–24 November 1976, entered into force 24 November 1976; TIAS 8542; 28 UST 2248; resp. Protocol on INTELSAT Privileges, Exemptions and Immunities, Washington, done 19 May 1978, entered into force 9 October 1980; 1981 UKTS 2, Cmnd. 8103.

69 *Cf.* also Art. III, INTELSAT Agreement, *supra* n. 64; also Art. V; Arts. 4(c), 8, INTELSAT Operating Agreement, *supra* n. 64. Art. V(a), INTELSAT Agreement, determined that the IGO was the owner of the space segment, which comprised apart from the satellites themselves, TT&C, monitoring and other

makers and being internationally responsible and liable for its activities, the INTELSAT Agreement, and an Operating Agreement between the respective Public Telecom Operators (PTOs) acting as signatories.[70]

As to liability, the INTELSAT Agreement provided for a cross-waiver of liability between IGO and signatories concerning 'loss or damage sustained by reason of any unavailability, delay or faultiness of telecommunications services'.[71] Beyond that, claims not satisfied through other indemnification mechanisms or insurance – which included international third-party claims under the Liability Convention[72] – had to be taken care of jointly by the signatories 'in proportion to their respective investment shares as of the date the payment by INTELSAT of such claim is due'.[73]

The PTOs, one per member state, constituted the actual users of the satellite infrastructure to which they would connect with their own terrestrial infrastructures, and hence were responsible for all lower-level decisions concerning such terrestrial operations, including up- and downlinking to the satellites as necessary.[74] Their investment shares in the IGO's operations, including new satellites as decided upon, were directly linked to the respective usage these PTOs made of the satellite infrastructure for their communication purposes through an intricate system of *a priori* estimation and *a posteriori* recalculation and reallocation of resources.[75]

The hybrid character of INTELSAT as a semi-commercial public intergovernmental corporation also became apparent in the voting structure. Whilst along classical IGO lines parties and signatories each had one vote in the Assembly of Parties and Meeting of Signatories respectively,[76] in the Board of Governors, which was responsible for the day-to-day running of the IGO, a complex system ensured that representation and voting were

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ground facilities and equipment necessary to support the operation of the satellites; Art. I(h), INTELSAT Agreement.

70 *Cf.* Art. I(f), (g), INTELSAT Agreement, *supra* n. 64; Art. 2, INTELSAT Operating Agreement, *supra* n. 64.

71 Art. 18(a), INTELSAT Operating Agreement, *supra* n. 64.

72 *Supra* n. 45; see further *supra*, § 2.3.3.

73 Art. 18(b), INTELSAT Operating Agreement, *supra* n. 64.

74 *Cf.* Art. II(b), INTELSAT Agreement, *supra* n. 64; also Meredith & Robinson, *supra* n. 37, 218–22; Lyall, *supra* n. 60, 93, 123 ff.; Salin, *supra* n. 64, 104–5; Cheng, *supra* n. 62, 556–8.

75 *Cf.* Art. V, INTELSAT Agreement, *supra* n. 64; Arts. 3(c), 4, 6–8, INTELSAT Operating Agreement, *supra* n. 64. Further e.g. Lyall, *supra* n. 60, 114–9; Meredith & Robinson, *supra* n. 37, esp. 215–8.

76 See Arts. VII(f), VIII(e), INTELSAT Agreement, *supra* n. 64.

somehow related to investment shares.[77] The 13 states with the highest investment shares automatically held a seat on the Board, and every combination of other states together meeting an investment share threshold could also claim such a seat. Finally, any group of five states, no matter what their investment share, could equally claim a seat on the Board – to partially counterbalance the power of the economically strong states for the sake of global coherence and solidarity.

A last important aspect of the intergovernmental structure of INTELSAT as an IGO harked back to the economic rationale for pooling sovereign member state resources in such an expensive and risky undertaking as satellite communications presented certainly early on: those expenses and risks would be best justified if the threat of competing systems breaking down the economies of scale and scope could be averted. To this end, a clause was inserted into the INTELSAT Agreement requiring any party or signatory intending to establish, acquire or utilize a space segment separate from INTELSAT for international public telecommunication purposes to furnish all relevant information to the Assembly of Parties to ensure technical compatibility and, more notably, to 'avoid significant *economic* harm to the global system of INTELSAT', based upon which information the Assembly should then recommend whether the party or signatory at issue had better desist from those intentions – a recommendation not carrying legally binding weight strictly speaking, but certainly a lot of political weight.[78]

5.4.2 The Privatization of INTELSAT

As a consequence of developments in the global telecommunication, including satellite communication, sector in the course of the 1980s and 1990s, pressure mounted on INTELSAT (among other satellite IGOs) to adapt to this changing environment.[79] These pressures were translated in

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[77] See Art. IX, INTELSAT Agreement, *supra* n. 64. See further e.g. McCormick, *supra* n. 60, 87–8; Jakhu, *supra* n. 64, 92–3; Cheng, *supra* n. 62, 558–9; Lyall, *supra* n. 60, 97–104, 114–7; Meredith & Robinson, *supra* n. 37, 214–5.

[78] Art. XIV(d), INTELSAT Agreement, *supra* n. 64 (emphasis added). See Lyall, *supra* n. 60, 154–78; further e.g. Salin, *supra* n. 64, 107–13; McCormick, *supra* n. 60, 89–92; Meredith & Robinson, *supra* n. 37, 230 ff., esp. 234–44; Jakhu, *supra* n. 64, 93–4.

[79] *Cf.* in general e.g. P.K. McCormick, Neo-Liberalism: A Contextual Framework for Assessing the Privatisation of Intergovernmental Satellite Organisations, in *The Transformation of Intergovernmental Satellite Organisations*

the legal realm into the WTO/GATS inclusion of satellite communications in its trade liberalization as of 1997,[80] the European Union's 1994 Satellite Directive heralding the establishment of an embryonic Internal Market for such services within Europe[81] and, most importantly for INTELSAT with a view to its nexus with the United States, the 2000 ORBIT Act calling without much hesitation for privatization of the main satellite IGOs.[82]

After an initial decision to spin off the more commercial, high-end satellites services to a newly created private company New Skies Satellites in 1998, endowed with five in-orbit satellites as a birth gift from INTELSAT,[83] the 'remainder' of INTELSAT was forced to privatize – the ultimate threat being that market access ('landing rights') for INTELSAT services in the United States, the largest single telecommunications market, could be at stake.[84]

(Eds. P.K. McCormick & M.J. Mechanick) (2013), 1–34; specifically on INTELSAT e.g. F. Lyall, On the Privatization of INTELSAT, 28 *Journal of Space Law* (2000), 101–19; L. Millstein, INTELSAT Restructuring, 2–2 *Outer Space Z News* (1999), 2–3; McCormick, *supra* n. 60, 94 ff.; S. Ospina, International Satellite Organizations: Their Evolution from 'ISOs' to 'GCSs', in *Proceedings of the International Institute of Space Law 2010* (2011), 338–44; Lyall & Larsen, *supra* n. 37, 337 ff.; Salin, *supra* n. 64, 468–72.

[80] As per the Fourth Protocol to the General Agreement on Trade and Services of 15 April 1994, Geneva, done 15 April 1997, entered into force 5 February 1998; WTO Doc. S/L/20 of 30 April 1996 (96-1750); 2061 UNTS 209; ATS 1998 No. 9; 33 ILM 1167 (1994); 36 ILM 354 (1997); in particular. See further *infra*, § 15.4.2.

[81] *Cf.* Commission Directive amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications (hereafter Satellite Directive), 94/46/EC, of 13 October 1994; OJ L 268/15 (1994). See further *supra*, § 4.3.2.2; also H. Ungerer, Transformation of ISOs: European Perspective, 2-2 *Outer Space Z News* (1999), 13–6; extensively Salin, *supra* n. 64, 310–82.

[82] *Cf.* Open-market Reorganization for the Betterment of International Telecommunications Act (hereafter ORBIT Act), Public Law 106-180, 106th Congress, 17 March 2000. The ORBIT Act was partly the result of lobbying of existing fully private competitors of INTELSAT, lamenting the absence of a level playing field in competing with the IGO; *cf.* Sec. 2; see further McCormick, *supra* n. 60, 99–103; Salin, *supra* n. 64, 487–91; Mechanick *supra* n. 59, 177.

[83] See McCormick, *supra* n. 60, 97; Lyall & Larsen, *supra* n. 37, 337; Salin, *supra* n. 64, 469–70. New Skies Satellites was originally incorporated in the Netherlands, but after several commercial transformations is now part of SES World Skies, with headquarters in both the United States and the Netherlands.

[84] *Cf.* esp. Sec. 3, ORBIT Act, *supra* n. 82, allowing the FCC to grant licences for satellite operators in the United States only if competition in the US

The main opposition to such privatization came from a majority of INTELSAT member states, fearful that commercialized operations of a private successor to INTELSAT would mean that (potentially) unprofitable services to lesser developed states and markets could be victimized – and precisely those states generally depended more than others upon INTELSAT to provide satellite infrastructure for their international communications. More than 60 states thus claimed the IGO provided 'lifeline international connectivity' to them.[85]

When following several years of negotiating and restructuring in 2001 a new institutional structure arose, it reflected these political stances and interests. As per an amended INTELSAT Agreement now labelled ITSO Agreement,[86] the ownership of the space segment and full accountability (and liability) for its operations was handed over to a newly created private entity Intelsat, which remained located in Washington.[87]

At the same time, to assuage the aforementioned fears of being left out of future benefits resulting from access to an international satellite infrastructure, the private operator by way of the ITSO Agreement and an accompanying Public Services Agreement faced a Lifeline Connectivity Obligation (LCO) for at least 12 years as of 2001, to provide relevant access with the same quality and financial parameters as before.[88]

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markets would not be distorted as per a 'Competition Test' specifically referencing INTELSAT (as well as INMARSAT; see further *infra*, § 5.5.2).

[85] See Lyall & Larsen, *supra* n. 37, 339–40; Salin *supra* n. 64, 471–2; McCormick, *supra* n. 60, 107–10.

[86] Agreement Relating to the International Telecommunications Satellite Organization (ITSO) (hereafter ITSO Agreement), Washington, done 20 August 1971, entered into force 12 February 1973, as amended 13 November 2000, amended version entered into force 30 November 2004; Cm. 5092; *Space Law – Basic Legal Documents*, C.V.1. See further e.g. McCormick, *supra* n. 60, 81–117; Mechanick, *supra* n. 59, 175–221; also e.g. Lyall & Larsen, *supra* n. 37, 325–43.

[87] See further McCormick, *supra* n. 60, 103 ff. As a consequence, Intelsat no longer enjoys functional IGO immunities, notably vis-à-vis its host state, and other benefits accruing from an intergovernmental status; it also became subject to US tax and anti-trust law.

[88] See Mechanick, *supra* n. 59, 187–8, 191–3, esp. 199–203. Termination of the LCO in principle is possible after 2013 at the discretion of Intelsat as it is now basically provided by way of bilateral LCO contracts between the company and any state so interested; *cf.* Art. I(h), ITSO Agreement, *supra* n. 86. The LCO *i.a.* included protection against price increases above the 2000 level, protection of the satellite capacity used for LCO against possible alternate uses, and the right to benefit from price reductions in certain circumstances; but raised issues beyond 2013 and the duration of individual LCO contracts versus unilateral

In order to provide some oversight in particular over compliance with this obligation, the old IGO INTELSAT was transformed into a new IGO, ITSO.[89] The private operator had to pay for its own watchdog; ITSO was funded for basic expenses to the tune of US$ 1.2 million annually, adjustable for inflation up to 3 per cent, and Intelsat was also to provide for a contingency fund for disputes with its own supervisor of US$ 0.5 million a year.[90]

5.5 INMARSAT

5.5.1 INMARSAT Prior to Privatization

The success of INTELSAT in the 1970s also prompted IMO[91] to consider the use of satellites, then the establishment of an independent satellite system, for the purpose of maritime communications, in particular in the context of safety at sea.[92] This led to the establishment of the International Maritime Satellite Organization INMARSAT in 1976.[93]

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hesitation to prolong them on the part of the company; *cf.* e.g. Report on Status of Lifeline Connectivity Program, IAC-12-8E W/03/10, of 25 March 2010, www.itsointernational.org/dmdocuments/IAC-12-8E_LCO_document_w_attach. pdf, last accessed 13 April 2014. Currently, the Intelsat website does not provide any reference to a Lifeline Connectivity Obligation; *cf.* www.intelsat. com/ ?s=Lifeline+Connectivity+Obligation, last accessed 25 February 2014.

[89] See e.g. McCormick, *supra* n. 60, 107–10; Lyall & Larsen, *supra* n. 37, 338–43; also Mechanick, *supra* n. 59, 185 ff. ITSO could only be terminated after 2013 by a 2/3 majority decision of ITSO member states, currently numbering 149; see Art. XXI, ITSO Agreement, *supra* n. 86. In 2006 there was a claim that Intelsat did not meet with its obligations under the LCO; *cf.* McCormick, *supra* n. 60, 108. See for a proposal to somehow maintain the LCO also beyond 2013, McCormick, *ibid.*

[90] See Mechanick, *supra* n. 59, 195–9; *cf.* also Art. VII, ITSO Agreement, *supra* n. 86.

[91] IMO was established by way of the IMCO Convention, *supra* n. 41.

[92] *Cf.* further e.g. D. Sagar & P.K. McCormick, Inmarsat: In the Forefront of Mobile Satellite Communications, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 35–8; Lyall, *supra* n. 60, 209–12; Lyall & Larsen, *supra* n. 37, 344–5; Salin, *supra* n. 64, 121.

[93] By way of the Convention on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Convention), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 105; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 1052

As INMARSAT's prospective membership from the start would overlap to a considerable extent with the membership of INTELSAT, the establishment of the former had to comply with the 'no significant economic harm' clause applicable in the context of the latter.[94] As INMARSAT was, contrary to INTELSAT, exclusively focusing on mobile satellite services (MSS), at the time limited moreover to a maritime context, the risk of such significant economic harm being done to INTELSAT was found to be negligible, and the establishment of INMARSAT could proceed as planned.[95]

Also INMARSAT quickly became a success, growing until it numbered 87 member states in 2000, with some 90 more non-member states also regularly using its satellite infrastructure. By then, INMARSAT, headquartered in London hence dependent upon the United Kingdom, for instance for its frequency assignments in the ITU context, had ten satellites in orbit.[96] Compared to INTELSAT, *inter alia* because of the safety focus of INMARSAT's operations through the provision of search-and-rescue communication devices and services, INMARSAT included both the United States and the Soviet Union but far fewer developing states than the other IGO.[97]

The governance structure of INMARSAT at the highest level, however, was remarkably similar to that of INTELSAT. INMARSAT was also ruled by a Convention under which the states parties were responsible for

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(1976); and the Operating Agreement on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Operating Agreement), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 213; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 233, 1075 (1976). See on INMARSAT in general Sagar & McCormick, *supra* n. 92, 35 ff.; Lyall, *supra* n. 60, 209–43; Lyall & Larsen, *supra* n. 37, 344–50; Jakhu, *supra* n. 64, 94–5; Smith, *supra* n. 64, 31–2; Salin, *supra* n. 64, 120–6; Meredith & Robinson, *supra* n. 37, 213 ff.

94 See *supra*, § 5.4.1.

95 *Cf.* e.g. Lyall, *supra* n. 60, 213–7; Jakhu, *supra* n. 64, 95.

96 *Cf.* e.g. in general Salin, *supra* n. 64, 121–6; Lyall & Larsen, *supra* n. 37, 348–51; Mechanick, *supra* n. 59, 197. INMARSAT also had the typical IGO–host state arrangements in place vis-à-vis the United Kingdom: see the Headquarters Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the International Maritime Satellite Organisation, London, done 25 February 1980, entered into force 25 February 1980; 1203 UNTS 131; 1980 UKTS 44, Cmnd. 7917; and Protocol on the Privileges and Immunities of the International Maritime Satellite Organisation (INMARSAT), London, done 1 December 1981, entered into force 30 July 1983; 1328 UNTS 149; 1982 BPP Misc 6, Cmnd. 8497 respectively.

97 See e.g. Mechanick, *supra* n. 59, 178.

the overarching policies and legal aspects[98] and an Operating Agreement one level down with the PTOs of the member states (who were also acting as PTOs in the context of INTELSAT as applicable) as signatories,[99] responsible for the terrestrial infrastructure and usage of the satellite capacity through such infrastructure.[100]

Liability of INMARSAT member states in the context of INMARSAT activities is expressly limited to damage 'in relation to non-Parties or natural or juridical persons they might represent in so far as such liability may follow from treaties in force between the Party and the non-Party concerned'[101] – an obvious reference to the Liability Convention.[102] Otherwise, essentially the same cross-waiver and hold-harmless arrangements between IGO and signatories applied as in the INTELSAT case.[103]

Again, the hybrid character of the IGO as a public consortium operating in accordance with economic principles was reflected in both financing and decision-making procedures. The investment shares and other capital contributions were once more linked to actual usage by way of an intricate financing system.[104] Though voting in the Assembly, the supreme organ of the IGO, followed the classical 'one state one vote' principle,[105] the Council as the day-to-day managing body operated on a different premise: consisting of the largest investors, it decided by weighted voting.[106]

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98 *Cf.* Arts. 11, 12, INMARSAT Convention, *supra* n. 93.

99 Again only one signatory per member state was admitted; see Arts. 2(33), 4, INMARSAT Convention, *supra* n. 93.

100 Operational arrangements were codified by means of Land Earth Station Operator Agreements, which could also encompass non-member states; see Art. XIV(2), INMARSAT Operating Agreement, *supra* n. 93. *Cf.* further e.g. Sagar & McCormick, *supra* n. 92, 52; also Lyall & Larsen, *supra* n. 37, 348.

101 Art. 22, INMARSAT Convention, *supra* n. 93. See also Sagar & McCormick, *supra* n. 92, 38.

102 *Supra* n. 45; see further *supra*, § 2.3.3.

103 See Art. XI, INMARSAT Operating Agreement, *supra* n. 93; *cf. supra*, § 5.4.1.

104 See Arts. 5(1), (2), 19, INMARSAT Convention, *supra* n. 93; (esp.) Arts. III, V, VI(1), INMARSAT Operating Agreement, *supra* n. 93; Annex to the INMARSAT Operating Agreement. See further e.g. Lyall, *supra* n. 60, 231–4; Lyall & Larsen, *supra* n. 37, 346–8; Meredith & Robinson, *supra* n. 37, 215–8; Sagar & McCormick, *supra* n. 92, 38.

105 See Art. 11(1), INMARSAT Convention, *supra* n. 93.

106 *Cf.* Arts. 13(1), 14(2) and (3), INMARSAT Convention, *supra* n. 93; see also Art. 15. See further e.g. Lyall, *supra* n. 60, 224–6; Lyall & Larsen, *supra* n. 37, 347; Salin, *supra* n. 64, 123; Sagar & McCormick, *supra* n. 92, 39; Jakhu, *supra* n. 64, 95.

Finally, INMARSAT also had a 'no significant economic harm' clause, phrased in this context with specific reference to 'separate space segment facilities to meet any or all of the maritime purposes of the INMARSAT space segment',[107] in which case both Council and Assembly could – strongly – recommend desisting from establishment of such a competing space segment.[108]

5.5.2 The Privatization of INMARSAT

By and large the developments forcing INTELSAT to privatize also asserted their impact on INMARSAT – and, partly because of technological developments in the mobile (satellite) communications subsector going faster than those in the fixed satellite subsector, partly because of the relatively larger partisanship of developed countries, INMARSAT's privatization process actually kicked off slightly ahead of INTELSAT's.[109]

These technological developments especially concerned the shrinking of technology so that mobile satellite communication devices became options also outside of the specific shipping-safety context – and already in 1994 the name of the IGO was changed to International *Mobile* Satellite Organization to reflect this, even if the acronym INMARSAT remained.[110] Competition threatened in particular in these mobile handheld markets by looming new LEO constellations such as Iridium, Globalstar and Teledesic, and the 1996 rejection by the signatories of establishment of a new INMARSAT International Navigation Satellite

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107 Art. 8(1), INMARSAT Convention, *supra* n. 93.

108 *Cf.* Art. 8(2), (3), INMARSAT Convention, *supra* n. 93. See further e.g. Lyall, *supra* n. 60, 236; Meredith & Robinson, *supra* n. 37, 230 ff., esp. 244–5; Salin, *supra* n. 64, 123–4; Jakhu, *supra* n. 64, 95.

109 *Cf.* in general e.g. McCormick, *supra* n. 79, 1–34; specifically on INMARSAT e.g. D. Sagar, INMARSAT: A New Beginning, 2-2 *Outer Space Z News* (1999), 6–8; Lyall & Larsen, *supra* n. 37, 344–55; Sagar & McCormick, *supra* n. 92, 41 ff.; Mechanick, *supra* n. 59, 177–81; also e.g. U.M. Bohlmann, K.U. Schrogl & I. Zilioli, Report of the 'Project 2001' Working Group on Telecommunication, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 219–20; Lyall & Larsen, *supra* n. 37, 350 ff.; Salin, *supra* n. 64, 472–4; Ospina, *supra* n. 79, 345, at n. 7.

110 *Cf.* e.g. Sagar & McCormick, *supra* n. 92, 37; Salin, *supra* n. 64, 121; Lyall & Larsen, *supra* n. 37, 344.

Service to many was proof that the IGO was not the right vehicle for competing in such a market environment.[111]

The first major step was branching off the high-end MSS applications to a newly established private company ICO Global Communications in 1995, which also became headquartered in London and quickly developed plans for a satellite system in MEO for future hand-held satellite communication services consisting of ten satellites.[112] Though ICO's corporate life was to follow a rocky road, the company is still active today.[113]

This step, however, could not ultimately avert the need to privatize the remainder of INMARSAT as well, and following a complex privatization process in 1998 a new construct was created – at least on paper, as fully-fledged implementation would take a few more years.[114]

Under this new construct, a private operator Inmarsat (which remained headquartered in London) took charge of all the satellite operations, service provision and attendant market operations,[115] whilst the IGO INMARSAT transformed into a much smaller IGO under a new acronym IMSO with the sole task of ensuring that the private operator would continue to comply with certain public service obligations as enshrined in the Public Services Agreement (PSA).[116]

The most important of those public service obligations concerned the Global Maritime Distress and Safety System (GMDSS), a search-and-rescue satellite service at the heart of the original IGO operations.

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[111] See e.g. Sagar & McCormick, *supra* n. 92, 45–6; Salin, *supra* n. 64, 211–23; further Lyall & Larsen, *supra* n. 37, 379 ff.

[112] See http://en.wikipedia.org/wiki/Pendrell_Corporation, last accessed 25 February 2014; *cf.* further Sagar & McCormick, *supra* n. 92, 45–6l; Salin, *supra* n. 64, 121–2.

[113] See http://en.wikipedia.org/wiki/Pendrell_Corporation, last accessed 25 February 2014.

[114] *Cf.* Convention on the International Mobile Satellite Organization (hereafter IMSO Convention), London, done 3 September 1976, entered into force 16 July 1979, as amended 1998, amended version entered into force 31 July 2001; ATS 2001 No. 11.

[115] See Sagar & McCormick, *supra* n. 92, 47 ff., esp. 58–61; Lyall & Larsen, *supra* n. 37, 351–4; Salin, *supra* n. 64, 472–4.

[116] The original version of the PSA reflected a later abandoned construction of two private companies, but the contents presumably have remained the same; *cf.* Public Services Agreement Between the International Mobile Satellite Organization And Inmarsat One Limited And Inmarsat Two Company (hereafter PSA), London, done April 1999. Also in this case, the private operator basically paid for its own watchdog; see Art. 10(1), IMSO Convention, *supra* n. 114; Art. 15, PSA.

Established as such by the IMO, under a 1988 amendment to the SOLAS Convention the provision of GMDSS was to be provided by INMARSAT as of 1992.[117] As per the PSA, GMDSS services should henceforth be maintained by the private operator, even if unprofitable, at the same levels of quality and user cost.[118] Inmarsat can only become discharged from those GMDSS obligations in case of formal agreement thereto by IMSO – for example if an alternative service provider could be found to provide GMDSS within the same parameters.[119]

5.6 EUTELSAT

5.6.1 EUTELSAT Prior to Privatization

The origins of the European Telecommunications Satellite Organization EUTELSAT[120] as evolving from a set of ESA optional programmes on

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[117] See e.g.www.imso.org/GMDSS.asp, last accessed 31 December 2013; with reference to the original 1974 SOLAS Convention, *supra* n. 43. See further Sagar & McCormick, *supra* n. 92, 37, 48–50, 62–3; Lyall & Larsen, *supra* n. 37, 344–5.

[118] See Arts. 3(a), 8(b), IMSO Convention, *supra* n. 114; Art. 2.1, PSA, *supra* n. 116.

[119] *Cf.* Art. 18, PSA, *supra* n. 116. When the IMSO Convention, *supra* n. 114, was amended again in 2008, IMO took over the oversight function with respect to GMDSS to the extent other service providers might offer this service; *cf.* Sagar & McCormick, *supra* n. 92, 64.

[120] Established as per the Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9069; *Space Law – Basic Legal Documents*, C.II.1; and the Operating Agreement Relating to the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Operating Agreement), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9154; *Space Law – Basic Legal Documents*, C.II.2. See on EUTELSAT in general also C. Roisse, The Evolution of EUTELSAT: A Challenge Successfully Met, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 120–8; K. Madders, *A New Force at a New Frontier* (2000), 506–7; Lyall, *supra* n. 60, 264–95; Lyall & Larsen, *supra* n. 37, 356–60; Jakhu, *supra* n. 64, 95–6; Courteix, *supra* n. 64, 106–7; Smith, *supra* n. 64, 32; Meredith & Robinson, *supra* n. 37, 213 ff.; Salin, *supra* n. 64, 365–72.

satellite communications into a separate 'daughter' entity have already been addressed.[121]

At this point, therefore, it suffices to reiterate that EUTELSAT was established on the same footing as INTELSAT and INMARSAT, with a two-level construction at the heart: EUTELSAT member states were parties to the EUTELSAT Convention, the PTOs – again, one per member state[122] – signatories to the EUTELSAT Operating Agreement and hence in primary control of, as well as directly benefiting from, the actual provision of telecommunication services through the organization and its satellite system.[123] This two-level construction also included a system for aligning *ex post facto* levels of usage to the investments committed *a priori*.[124]

Headquartered in Paris, France, EUTELSAT had 18 satellites in geostationary orbit by the time the same pressures that caused INTELSAT and INMARSAT to privatize started to affect also the European organization.[125] The similarities in this respect between the three organizations and the situations they found themselves in were considerably heightened – and the resulting anti-competitive character of satellite communications aggravated – by the fact that the same national entities held the status of PTO under all three organizations, to the extent, of course, that their states were members of the respective organizations.[126]

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[121] See *supra*, § 4.2.6.2.

[122] See Arts. I(f), II(b), EUTELSAT Convention, *supra* n. 120; also Preamble, EUTELSAT Operating Agreement, *supra* n. 120.

[123] *Cf.* Arts. VI–XIII, EUTELSAT Convention, *supra* n. 120; Arts. 2–9, EUTELSAT Operating Agreement, *supra* n. 120. See further e.g. Roisse, *supra* n. 120, 123–7; Lyall, *supra* n. 60, 284–6; Lyall & Larsen, *supra* n. 37, 358–9.

[124] *Cf.* esp. Arts. 8–10, EUTELSAT Operating Agreement, *supra* n. 120; also e.g. Roisse, *supra* n. 120, 125; Madders, *supra* n. 120, 506–7; Lyall, *supra* n. 60, 287–9.

[125] *Cf.* http://en.wikipedia.org/wiki/Eutelsat, last accessed 4 March 2014. EUTELSAT as an IGO also had concluded the necessary agreements with its host state France to guarantee its functional immunities and privileges as an IGO; see Headquarters Agreement between the European Telecommunications Satellite Organisation (EUTELSAT) and the Government of the French Republic, Paris, done 15 May 2001, www.eutelsatigo.int/en/docs/HQ_agreement.pdf, last accessed 13 April 2014; and Protocol on the Privileges and Immunities of the European Telecommunications Satellite Organisation (EUTELSAT), Paris, done 13 February 1987, entered into force 17 August 1988; 1990 UKTS 4, Cm. 1106; UK Misc. 3, Cmnd. 305 respectively.

[126] *Cf.* Meredith & Robinson, *supra* n. 37, 213 ff., esp. 217–8; F.G. von der Dunk, *Private Enterprise and Public Interest in the European 'Spacescape'*

5.6.2 The Privatization of EUTELSAT

Apart from the general global pressures on telecommunications, including satellite communications, becoming more responsive to market demands and less to governmental and/or public legal interests putting pressure on INTELSAT and INMARSAT, as evidenced in the legal context by the developments in the context of the WTO and GATS,[127] EUTELSAT felt such pressures also in a specific European context – including a legal one.[128]

In this case, these pressures in a sense were partly – inadvertently – triggered by EUTELSAT itself. Like INTELSAT and INMARSAT, EUTELSAT had a requirement that member states would not allow for satellite systems to arise within their jurisdiction if these could cause 'any significant economic harm' to EUTELSAT's operations, read potentially compete with it.[129] Different from the two global organizations, however, EUTELSAT in a landmark 'case' did make use of its competence to issue guidelines to limit potential competition.

In 1985 SES (Société Européenne des Satellites) had been established in Luxembourg,[130] a member state of EUTELSAT, whereas British Telecom, the UK PTO at the time, was a major investor in SES – and also the United Kingdom was a EUTELSAT member state. Whilst

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(1998), 189–90, esp. at n. 112; *The Reform of International Satellite Organisations 1995*, 1996, Policy Roundtables, OCDE/GD(96)123, www.oecd.org/regreform/sectors/1920271.pdf, last accessed 13 April 2014.

[127] See *supra*, §§ 5.4.2, 5.4.3; on the role of the WTO and GATS in satellite communications in more detail *infra*, § 15.4. Also McCormick, *supra* n. 79, 1–34; Salin, *supra* n. 64, 69–85.

[128] *Cf.* e.g. Roisse, *supra* n. 120, 127–32; C. Roisse, EUTELSAT Privatisation, 2–2 *Outer Space Z News* (1999), 4–5; Ungerer, *supra* n. 81, 13–6; more in general McCormick, *supra* n. 60, 1–34.

[129] Art. XVI(a), EUTELSAT Convention, *supra* n. 120. In deference to the earlier organizations INTELSAT and INMARSAT, additions to their space segments were excluded from the requirements to consult with and accept any 'guidelines' provided by the EUTELSAT organs; whereas in deference to national sovereignty and the requirement of EUTELSAT to not become involved in military satellite communications (*cf.* Art. III(e), (f)) the same applied to space segment equipment 'solely for national security purposes'; Art. XVI(c). See further e.g. Madders, *supra* n. 120, 512–3; Meredith & Robinson, *supra* n. 37, 230 ff., esp. 246–7; Courteix, *supra* n. 64, 106; Jakhu, *supra* n. 64, 96; Lyall, *supra* n. 60, 289–90.

[130] See e.g. www.ses.com/4337028/history, last accessed 19 February 2014; also e.g. Madders, *supra* n. 120, 528–32; *cf.* also 509; further Salin, *supra* n. 64, 374–5; Lyall & Larsen, *supra* n. 37, 378–9.

starting up its business, including the preparation for its first Astra satellite's operations, in 1987 the EUTELSAT Assembly of Parties and Board of Governors in the first instance concluded that SES indeed presented 'considerable economic prejudice' to EUTELSAT operations, as both the IGO and SES were focusing on the European broadcasting markets.[131]

Consequently, the EUTELSAT Assembly 'imposed' a code of good behaviour, applicable until 1998, under which essentially no more than four EUTELSAT customers could be lured away by SES.[132] As it was only the rapidly expanding number of TV channels which allowed SES to survive and thrive, this did provide a clear example of 'anti-competitive' behaviour in an environment becoming increasingly more commercialized and privatized. Thus, it provided a major push also for the European Community to start asserting jurisdiction in this field, where so far there had been none.[133]

The main result of that push was the 1994 Satellite Directive,[134] which *inter alia* required

> Member States which are party to the international conventions setting up the international organizations Intelsat, Inmarsat, Eutelsat and Intersputnik for the purposes of satellite operations [to] communicate to the Commission, at its request, the information they possess on any measure that could prejudice compliance with the competition rules of the EC Treaty or affect the aims of this Directive or of the Council Directives on telecommunications.[135]

Under the EU competition rules, EUTELSAT, even though an independent IGO, qualified as an 'undertaking' for the purpose of competition law, and its actions vis-à-vis SES could thus be seen as 'abuse of a dominant position'.[136] Also, the imposition of national monopolies of PTOs within

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[131] See Courteix, *supra* n. 64, 106; *cf.* also Salin, *supra* n. 64, 368, also 537; Lyall & Larsen, *supra* n. 37, 319.

[132] *Cf.* Madders, *supra* n. 120, 529–30; Courteix, *supra* n. 64, 106.

[133] See further *supra*, § 4.3.2.2.

[134] *Supra*, n. 81.

[135] Art. 3, Satellite Directive, *supra* n. 81. The mention of INTERSPUTNIK referred to the fact that since reunification the reunited Germany had succeeded to the membership of the former German Democratic Republic to the organization, which had originally been established as the communist counterpart to INTELSAT; see further *infra*, § 5.7.1; also Ungerer, *supra* n. 81, 14–6; Madders, *supra* n. 120, 512–4.

[136] *Cf.* the current version of Art. 102, Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter

respective member states could be viewed as either such an abuse of a dominant position by EUTELSAT, or more directly as market-sharing arrangements amounting to 'collusive conduct' (cartelization) by the relevant group of PTOs.[137] Combined with the fundamental requirement for EU member states to comply with the competition rules referenced and the Satellite Directive as such, that Directive would ultimately leave no other way for the EU member states among the EUTELSAT member states to ensure proper privatization of the latter organization – or leave it altogether.[138]

The result of the global and European pressures combined was that EUTELSAT was also gradually privatized, more or less within the same timeframe as INTELSAT and INMARSAT. First, the organization announced that it would henceforth no longer apply the 'considerable economic prejudice' clause.[139] Second, EUTELSAT would allow for 'multiple signatories' per member state, so as to phase out the existing national monopolies.[140]

In 1999 the most fundamental step of proper and formal privatization was decided upon.[141] As of the formal entry into force in 2002 of the

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Treaty on the Functioning of the European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/47 (2009); also e.g. R. Barents, The Competition Policy of the EC, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn., 2008), 810–16; A. Dashwood *et al.*, *Wyatt and Dashwood's European Union Law* (6th edn., 2011), 765 ff.; L. Woods & P. Watson, *Steiner & Woods EU Law* (11th edn., 2012), 661–78.

137 *Cf.* on 'collusive conduct' the current version of Art. 101, Treaty on the Functioning of the European Union, *supra* n. 136; also e.g. Barents, *supra* n. 136, 795–810; Dashwood, *supra* n. 136, 729 ff.; Woods & Watson, *supra* n. 136, 641–61.

138 It may be noted here that the (at the time) fifteen member states of the European Union provided about 88% of the total investment by member state PTOs in EUTELSAT, and thus had at least the politico-economic power to actually ensure privatization – and could be held accountable consequently if such privatization would not come about. By contrast, with regard to INTELSAT and INMARSAT those percentages were 28 respectively 34; see Towards Europe-wide systems and services – Green Paper on a common approach in the field of satellite communications in the European Community, Communication from the Commission, COM(90) 490 final, of 20 November 1990, 12–4, 138–9. *Cf.* further e.g. (on EUTELSAT) Madders, *supra* n. 120, 512.

139 See e.g. Roisse, *supra* n. 120, 132–4; Madders, *supra* n. 120, 513.

140 See e.g. Roisse, *supra* n. 120, 133–4; Madders, *supra* n. 120, 514.

141 See Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention as amended),

amended EUTELSAT Convention, the satellite operations and related business activities would all be conducted by a private operator, Eutelsat S.A.[142] A residual intergovernmental organization, EUTELSAT IGO, like the private operator remaining established in Paris, would ensure oversight over the private operator in order 'to ensure that the Basic Principles set forth in this Article are observed by the Company Eutelsat S.A.'.[143]

Due to the different constituency of the old EUTELSAT those Basic Principles were not of the same level of political urgency as the LCO or GMDSS in the context of respectively INTELSAT and INMARSAT, but embodied the fears that a new private operator might still unduly benefit from its pedigree as an IGO: EUTELSAT IGO was to ensure, as appropriate, the maintenance by Eutelsat of public service and universal service obligations, pan-European coverage by the satellite system, non-discrimination and compliance with fair competition.[144] EUTELSAT IGO 'shall also have the purpose of ensuring continuity regarding rights and obligations under international law, in particular under the Radio Regulations for the use of frequencies deriving from the operation of the EUTELSAT space segment transferred to the Company Eutelsat S.A.'[145]

Heralding in the new age of privatized operations, November 2001 would see the first sale by an incumbent ex-PTO, now shareholder, of its shares to a non-ex-PTO – Telecom Italia sold its 21 per cent to Lehman

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Paris, done 15 July 1982, entered into force 1 September 1985, as amended 20 May 1999, amended version entered into force 28 November 2002; Cm. 4572; *Space Law – Basic Legal Documents*, C.II.1. Further on the privatization of EUTELSAT e.g. Roisse, *supra* n. 128, Roisse, *supra* n. 120, 119–73; Mechanick, *supra* n. 59, 175–221; Lyall & Larsen, *supra* n. 37, 356–64; Madders, *supra* n. 120, 514.

142 *Cf.* Art. II(b), EUTELSAT Convention as amended, *supra* n. 141. See further e.g. Roisse, *supra* n. 120, 146–61; Lyall & Larsen, *supra* n. 37, 360–4.

143 Art. III(a), EUTELSAT Convention as amended, *supra* n. 141. It should be noted that EUTELSAT formally continued to be referred to as 'EUTELSAT' also after all its operational tasks had been privatized and transferred to Eutelsat; however, to allow for easy distinction between the 'old' EUTELSAT prior to privatization and the 'new' EUTELSAT post-privatization, in this book in the case of the latter reference will be made henceforth to 'EUTELSAT IGO' as this moniker is also used informally in many everyday transactions. See further Roisse, *supra* n. 120, 162–72; also e.g. Roisse, *supra* n. 128, 4–5; Lyall & Larsen, *supra* n. 37, 361–4; Ospina, *supra* n. 79, at n. 7.

144 See Art. III(a), (i)–(iv) respectively, EUTELSAT Convention as amended, *supra* n. 141.

145 Art. III(b), EUTELSAT Convention as amended, *supra* n. 141.

Brothers.[146] Ultimately by 2005, with the first Initial Public Offering requiring a minimum of 30 per cent of the new shares to be made available to 'newcomers', the process of privatization may be said to have been rounded off for all practical purposes.[147]

As proof of its commercial success, Eutelsat has since then branched out, both in terms of product and service markets – tackling multi-media and Internet as well as the terminals markets – and in terms of geographical markets – in particular in Africa, partly because of the easy access to that continent from the geostationary slots already occupied by Eutelsat satellites.[148] As of this moment, Eutelsat has 34 satellites in the geostationary orbit, making it one of the world's largest satellite operators.[149]

5.7 INTERSPUTNIK

5.7.1 The Evolution of the INTERSPUTNIK System

The International System and Organization of Space Communications INTERSPUTNIK was established in 1971[150] essentially as 'the communist INTELSAT' – the Soviet Union had viewed INTELSAT as too much US-dominated to consider acceptance of the invitation to become a member (which view and non-consideration then *de facto* were also extended to its communist allies at the time).[151] As a consequence,

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146 See www.efinancialnews.com/story/2003-03-31/eutelsat-leaves-field-open-for-buy-out-firms?ea9c8a2de0ee111045601ab04d673622, last accessed 4 March 2014.

147 See Roisse, *supra* n. 120, 150–1; Lyall & Larsen, *supra* n. 37, 360–1.

148 *Cf.* e.g. Roisse, *supra* n. 120, 158–61.

149 See e.g. http://en.wikipedia.org/wiki/Eutelsat, last accessed 19 February 2014.

150 As per the Agreement on the Establishment of the 'INTERSPUTNIK' International System and Organization of Space Communications (hereafter INTERSPUTNIK Agreement), Moscow, done 15 November 1971, entered into force 12 July 1972; 862 UNTS 3; TIAS 859 (1973) No, 12343; *Space Law – Basic Legal Documents*, C.VIII.1. On INTERSPUTNIK in general see e.g. Lyall, *supra* n. 60, 296–303; Lyall & Larsen, *supra* n. 37, 364–8; Cheng, *supra* n. 62, 548–50; V.S. Veshchunov & V.D. Stovboun, Intersputnik International Organization of Space Communications: An Overview, 29 *Journal of Space Law* (2003), 121–30; V.S. Veshchunov, Reorganization of INTERSPUTNIK, 2-2 *Outer Space Z News* (1999), 9–10; Smith, *supra* n. 64, 30–1.

151 See e.g. Lyall, *supra* n. 60, 296–8; Lyall & Larsen, *supra* n. 37, 364–6; Smith, *supra* n. 64, 30.

INTERSPUTNIK did not have a two-level structure like INTELSAT, INMARSAT and EUTELSAT,[152] although its system of financing did refer to the more 'free-market'-oriented system of aligning investment to usage.[153] INTERSPUTNIK was headquartered in Moscow, hence the then-Soviet Union acted, for example, as its sponsoring state in the context of the ITU regime.[154] The organization largely focused on satellite broadcasting, TV programming comprising some 80 per cent of its activities, plus some FSS.[155]

As the Soviet Union ceased to exist in 1991, the global pressures towards commercialization, privatization and market liberalization also started to exert themselves to some extent vis-à-vis INTERSPUTNIK. Thus, in the mid-1990s amendments to the INTERSPUTNIK Agreement resulted in the realization of the INTERSPUTNIK Operating Agreement, partisanship to which however – in contrast with the three other IGOs discussed above – remained optional.[156] Interestingly, from the start it offered the possibility to designate more than one signatory per member state.[157] Currently, 19 out of the 25 member states have actually approved the Operating Agreement.[158]

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[152] For its main structural aspects, see Arts. 2, 4, 6, 8–13, INTERSPUTNIK Agreement, *supra* n. 150. For the liability arrangement, see Art. 10. See also Lyall, *supra* n. 60, 302.

[153] See Art. 15(1), INTERSPUTNIK Agreement, *supra* n. 150; the provision, however, does not go into any detail as to how this should work in practice.

[154] See on the ITU regime further *infra*, § 8.2.

[155] See e.g. www.intersputnik.com/services/, last accessed 4 March 2014; also slides 32, 33, www.intersputnik.com/userfiles/files/intersputnik_presentation_2012.pdf, last accessed 13 April 2014; Courteix, *supra* n. 120, 104.

[156] See Operating Agreement of the INTERSPUTNIK International Organization of Space Communications (hereafter INTERSPUTNIK Operating Agreement), done 4 November 2002, entered into force 4 February 2003, as most recently amended 15 November 2011; INTERSPUTNIK D.B./D.C./XXXIX/13-OC/7-2011-1; 31 *Journal of Space Law* (2003), 162, www.intersputnik.com/userfiles/files/protocol_annex_7_operating_agreement.pdf, last accessed 19 February 2014; also e.g. Veshchunov & Stovboun, *supra* n. 150, 121 ff.; Lyall & Larsen, *supra* n. 37, 364–75.

[157] See Art. 2(2), Protocol on the Amendments to the Agreement on the Establishment of the 'INTERSPUTNIK' International System and Organization of Space Communications (hereafter INTERSPUTNIK Protocol), done November 1996, entered into force 4 November 2002; *Space Law – Basic Legal Documents*, C.VIII.2.1; 29 *Journal of Space Law* (2003), 131.

[158] See www.intersputnik.com/about_organization/documents/, last accessed 19 February 2014. Apart from former republics of the Soviet Union and formerly communist countries in Middle and Eastern Europe, membership comprised

Following these amendments to the legal framework, a new Operations Committee consisting of signatories is charged with major decision-making on such issues as construction, procurement, lease and operation of spacecraft; further development of the satellite system; access by non-signatories to the satellite system; and determination of the size of the share capital.[159] That share capital is now more precisely determined to come from signatories' contributions, such capital to be used for R&D related to space segment and terrestrial control systems including their design, construction, procurement or leasing.[160] Such contributions finally are provided for under a complicated system of mandatory contributions, additional contributions and voluntary contributions, with additional clauses regulating the other financial aspects of the organization's operations.[161]

The INTERSPUTNIK satellite system by now has been used by over 100 states and private telecommunication operators, and in 1997 even formed a joint venture with Lockheed Martin (Lockheed Martin Intersputnik, LMI), to combine the manufacturing and marketing capabilities of the latter with the operating system involving a number of important states and markets.[162] As of today, it has 12 satellites with 41 transponders in operation.[163]

5.7.2 The Dispute on the Notifying Administration

Probably the most interesting international legal dispute regarding an intergovernmental organization involved in satellite communications concerned the dispute over the 'Notifying Administration' of INTERSPUTNIK. Shortly after the break-up of the Soviet Union, in 1993 Belarus had

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Afghanistan, Cuba, Germany (as successor state to the former German Democratic Republic), India, Laos, Mongolia, Nicaragua, North Korea, Syria, Vietnam and Yemen.

159 *Cf.* Arts. 8, 10, INTERSPUTNIK Protocol, *supra* n. 157, amending Arts. 11, 12, INTERSPUTNIK Agreement, *supra* n. 150.

160 *Cf.* Art. 13, INTERSPUTNIK Protocol, *supra* n. 157, amending Art. 15, INTERSPUTNIK Agreement, *supra* n. 150.

161 *Cf.* Arts. 4, 5, also Arts. 6, 7, INTERSPUTNIK Operating Agreement, *supra* n. 156. Art. 9 now provides the main liability clause, e.g. limiting signatories' liabilities to their shares in the share capital except if third-party liability claims are at issue; Art. 9(3) & (4).

162 *Cf.* further e.g. www.un.org/events/unispace3/speeches/20sput.htm, last accessed 26 February 2014; Veshchunov & Stovboun, *supra* n. 150, 128; Veshchunov, *supra* n. 150, 10; Lyall & Larsen, *supra* n. 37, 375.

163 See e.g. http://en.wikipedia.org/wiki/Intersputnik, last accessed 19 February 2014.

taken over from Russia this role as Notifying Administration responsible in particular for requesting coordination of orbital slots and frequencies on behalf of the organization within the ITU context.[164]

Presumably in that capacity, Belarus had requested allotment and assignment of three satellite frequencies and the complementary positions at 75° E. While Belarus claimed that the allotment achieved under the ITU regime was a national allotment, and hence allowed the state to treat this as a national assignment, INTERSPUTNIK organs by contrast contended that the requests for coordination had been made on behalf of the organization.[165]

As the INTERSPUTNIK governing bodies consequently tried to undo the Notifying Administration status of Belarus to solve the quagmire, in 2009 Belarus informed the Radiocommunication Bureau of the ITU that it would (only) continue acting as Notifying Administration for those three satellites, whilst Russia informed the same bureau that it would take over that role for all satellites and that all other INTERSPUTNIK member states also viewed the actions of Belarus as inappropriate and not in accordance with its role as Notifying Administration for the IGO.[166]

Unfortunately, under ITU practice honouring the sovereignty of its member states as well as the principle of non-interference with entities established by those, a Notifying Administration can only be replaced by simultaneous notification of both the old and the new Notifying Administration.[167] However, the Radiocommunication Bureau received only the relevant Russian request; Belarus still claimed it enjoyed Notifying Administration status for the three satellites at issue and requested recognition of an exclusive national right to one, with suspension of the use of the assignments of the other two until the dispute was solved.[168]

Trying to solve the regulatory vacuum, ITU authorities started looking into a 2006 precedent, where Venezuela as the Notifying Administration

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[164] See V.S. Veshchunov & E. Zaytseva, New Legal Dimensions of the Orbital Frequency Management: Conflict of Interests Between a Group of Administrations and Its Notifying Administration, in *Proceedings of the International Institute of Space Law 2011* (2012), 404–8. For the ITU regime, see further *infra*, § 8.2.

[165] See Veshchunov & Zaytseva, *supra* n. 164, 405.

[166] *Ibid.*, 405–6.

[167] *Ibid.*, 406.

[168] *Ibid.*, 405.

on behalf of ASETA[169] was to be replaced by Colombia.[170] Originally, no formal confirmation had been received by the ITU from Venezuela, but that omission was corrected soon, so that the precedent did not provide any proper guidance on how to handle the INTERSPUTNIK case.

In 2011 finally, the ITU Radio Regulations Board, concluding that under the present Rules of Procedure the refusal of a Notifying Administration to relinquish its status was an internal affair, requested amendment of those Rules. As a result, a new rule was instituted, which provided that where an intergovernmental satellite communication organization wishes to designate a new Notifying Administration vis-à-vis the ITU for its satellite networks, the Radiocommunication Bureau shall effect corresponding modifications upon receipt of due written notification to that effect by a legal representative of the IGO under its own constitutive act, such notification to include evidence of agreement from a newly named Administration to act as Notifying Administration on behalf of the IGO.[171]

Following these amendments, in July 2011 Belarus was formally replaced by Russia as Notifying Administration for all INTERSPUTNIK allotments, thereby solving this particular issue. In the process, however, it had become clear that it could under certain circumstances become not only necessary but also legally justified for one intergovernmental organization (the ITU) to *de facto* interfere with the internal affairs of another (INTERSPUTNIK) to the extent the respective sovereign member states of the latter found themselves deadlocked within their own IGO-internal dispute.

5.8 ARABSAT

The last intergovernmental organization offering satellite communications capacity to its member states is the Arab Corporation for Space Communications ARABSAT, established in 1976 by the Arab League.[172]

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169 Asociación de Empresas de Telecomunicaciones de la Comunidad Andina (ASETA); see www.aseta.org, last accessed 19 February 2014.

170 See Veshchunov & Zaytseva, *supra* n. 164, 406–7.

171 *Ibid.*, 407–8.

172 As per the Agreement of the Arab Corporation for Space Communications (ARABSAT) (hereafter ARABSAT Agreement), Cairo, done 14 April 1976, entered into force 15 July 1976; *Space Law – Basic Legal Documents*, C.VII.1; 44 *Telecommunications Journal* (IX/1977), 422. On ARABSAT in general see e.g. Lyall, *supra* n. 60, 303–8; A. Ziadat, Arabsat: Regional Development in

Headquartered in Riyadh, Saudi Arabia acts as Notifying Administration in the context of the ITU.[173]

ARABSAT consists of three organs: the General Body or Assembly, including the five largest shareholders as permanent members plus another four on a rotational basis, the Board of Directors as main executive organ and a General Manager ensuring actual implementation of the Board's decisions.[174]

The ARABSAT Agreement does not refer to liability issues, which presumably means that as for liability disputes between member states and/or the organization, the general dispute settlement clause[175] would be seized upon using legal principles generally applicable in the region, whereas third states suffering damage compensable under the Liability Convention might address any particular ARABSAT member state as having at least (co-)procured the launch of a relevant satellite.[176] ARABSAT launched its first satellite in 1985, and presently has five operational satellites.[177] Its largest contributors currently are Saudi Arabia with 36.7 per cent, Kuwait with 14.6 per cent, Libya with 11.3 per cent, Qatar with 9.8 per cent and the United Arab Emirates with 4.7 per cent of the share capital.[178]

Satellite Communications: Lessons from the Arabsat Venture, 37 *Zeitschrift für Luft- und Weltraumrecht* (1988), 35–45; Lyall & Larsen, *supra* n. 37, 375–7; Lyall, *supra* n. 60, 303–9; Smith, *supra* n. 64, 32–3; also http://en.wikipedia.org/wiki/Arab_Satellite_Communications_Organization, last accessed 24 February 2014.

[173] See www.itu.int/online/mm/scripts/org_br_admin.list?_ctryid=18&_sortby=2&_languageid=1, last accessed 24 February 2014.

[174] See Arts. 9–15, ARABSAT Agreement, *supra* n. 172; also Ziadat, *supra* n. 172, 38–9; Lyall & Larsen, *supra* n. 37, 376–7; Lyall, *supra* n. 60, 305–7.

[175] This concerns Art. 19, ARABSAT Agreement, *supra* n. 172. Also Art. 17 on withdrawal only refers in general terms to responsibility of the withdrawing member state for 'all of the obligations which were contracted before the discontinuance of … membership'.

[176] *Cf.* Art. I(c)(i), Liability Convention, *supra* n. 45. It may be noted that at least some of the major shareholding countries of ARABSAT are parties to the Convention, such as Saudi Arabia, Kuwait, Qatar and the United Arab Emirates. Moreover, as there is no launch facility in the Arab world as of yet, launches would take place from elsewhere, qualifying other states as relevant 'launching States' at the very least on account of their territory being so used.

[177] See www.itu.int/online/mm/scripts/org_br_admin.list?_ctryid=18&_sortby=2&_languageid=1, last accessed 24 February 2014.

[178] See www.itu.int/online/mm/scripts/org_br_admin.list?_ctryid=18&_sortby=2&_languageid=1, last accessed 24 February 2014; *cf.* Arts. 5–8, ARABSAT Agreement, *supra* n. 172, on the financial structure of the organization.

Whilst its 21 member states all come from the Arab world broadly speaking – North Africa from Morocco to Somalia and the Comoros, as well as the Arab sub-continent including Palestine – four states have since obtained the status of observers: Brazil, Eritrea, India and Venezuela, whereas in total over 100 states are covered by the broadcasts that form ARABSAT's main type of satellite activities.

5.9 IGO INVOLVEMENT IN SPACE LAW: A LEGAL ASSESSMENT

5.9.1 IGO Law and the Sources of International (Space) Law Revisited

International space law being generally perceived as a specific branch of public international law,[179] as discussed, the famous clause of the Statute of the International Court of Justice does not specifically refer to intergovernmental organizations or law developed in their context.[180] Among the sources that *are* referenced, treaty law and customary law are the two primary sources most relevant here.

Regulations and decisions of all sorts enunciated within the framework of IGOs could be, and indeed often are, considered part of treaty law as being based on the constitutive treaties establishing the IGOs and their competences, but their effects largely remain within their limited realm of application, usually confined to the internal operation of the IGO itself.[181] More importantly, therefore, the question now arises to what extent the roles and activities of these IGOs have, or may have, a special impact on customary international space law, in view of the special role of the operational intergovernmental organizations in outer space and space activities.[182] Customary international law is generally perceived to

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179 See further *supra*, § 2.1.1.

180 Art. 38(1)(b), Statute of the International Court of Justice, *supra* n. 6; further *supra*, § 5.2.1.

181 See again *supra*, § 5.2.1.

182 International cooperation more generally is of course a principal aim of space activities and space law; *cf.* Art. III, Outer Space Treaty, *supra* n. 18; whereas Arts. VI and XIII, Outer Space Treaty, already point to a major role of such cooperation institutionalized by way of IGOs; see further also *supra*, § 2.3.1.1.

be constituted of a *usus*, a general 'state practice', plus the attendant *opinio juris sive necessitatis*, meaning that practice is being accepted as law.[183]

Customary international law by that token, however, turns out to be a very complex phenomenon. State practice and *opinio juris* often represent two sides of the same coin, giving rise to considerable discussion on the proper distinction between the two.[184] This is particularly true in the realm of outer space, where (because of cost, risk and the necessary technological know-how) 'physical' activities are relatively rare, inherently giving rise to heightened importance of 'paper' activities in determining 'state practice' such as national law or other documents – which inherently at the same time also convey the requisite *opinio juris*.

Moreover, an inherent paradox arises: 'States must act in a certain way … because they believe they are legally obligated to do so [without a treaty formally and clearly providing evidence thereof]. However, before a legal norm comes into existence already, such a belief would be mistaken.'[185] Furthermore, since no practice or belief is normally labelled as such in any formal sense by these states, it is *interpretation in hindsight* of that practice-plus-belief – by academic experts or (in specific dispute contexts) state advocates, arbitrators or judges including those of the ICJ – as, somehow, rising to the level of a rule of customary international law.[186]

Finally, customary international law represents a process of moving along a gliding scale from a clear and undisputed *absence* of any state practice and/or *opinio juris* to a presumably undisputed full-fledged

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183 See e.g. the *North Sea Continental Shelf Cases* (Federal Republic of Germany v. Denmark, and Federal Republic of Germany v. Netherlands), International Court of Justice, 20 February 1969, I.C.J. Rep. 1969, at para. 77; also H. Thirlway, The Sources of International Law, in *International Law* (Ed. M.D. Evans) (2003), 125; Crawford, *supra* n. 1, 23; M.N. Shaw, *International Law* (4th edn., 1997), 59.

184 See e.g. Thirlway, *supra* n. 183, 125–6; Shaw, *supra* n. 183, esp. 59; *cf.* also Crawford, *supra* n. 1, 23.

185 B.D. Lepard, The Legal Status of the 1996 Declaration on Space Benefits: Are Its Norms Now Part of Customary International Law? in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 292, as argued in more detail in B.D. Lepard, *Customary International Law: A New Theory with Practical Applications* (2010), esp. 22–3.

186 *Cf.* also Crawford, *supra* n. 1, 23, referring to 'the conclusion drawn by someone (a legal adviser, a court, a government, a commentator)'.

presence of relevant state practice and/or *opinio juris*.[187] It has thus been appropriately likened

> to the gradual formation of a road across vacant land. After an initial uncertainty as to direction, the majority of users begin to follow the same line which becomes a single path. Not long elapses before that path is transformed into a road accepted as the only regular way, even though it is not possible to state at which precise moment this latter change occurs.[188]

In short, customary international law, in contrast to treaty law, most fundamentally remains a fluid, imprecise and uncertain phenomenon: it cannot be literally seen or touched, and it does not enjoy a binary character of being law in clearly delineated contexts whilst not being law in others – by contrast, which states are subject to a treaty and the beginning and end of treaty obligations are usually determined quite precisely at least at a primary level.[189]

It is in this light that the question whether the unprecedented role of intergovernmental organizations in outer space in this context would or could translate an IGO's practice somehow into 'joint state practice' of its member states possibly giving rise to customary international law has to be answered.

5.9.2 Space IGOs and Customary International Space Law

The point of departure for properly assessing the possible special role of space IGOs in the formation of customary international space law is that these organizations are ultimately still controlled by the totality of their member state constituencies by way of the respective constitutive documents. Role and competences of the major organs of the organizations to take action are thus defined in deference to the sovereign member states; ultimately little IGO activity of external legal relevance can be deployed

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[187] See further on this argument F.G. von der Dunk, *Contradictio in terminis* or *Realpolitik*?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 52–3.

[188] C. de Visscher, *Theory and Reality in Public International Law* (3rd edn., 1960), 149, as quoted in Shaw, *supra* n. 183, 62.

[189] See on this in general the Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969); spelling out the precise rules on application of treaty law in these and many other such contexts.

without their consent. From that perspective, it could easily be understood how an IGO's practices could come to be viewed as 'joint state practice' of its member states.

Whilst it is not possible to provide within the present context an exhaustive analysis of the extent to which IGO practice might thus result in something akin to 'joint state practice' for the purpose of formation of rules of customary international law, a few leading examples will be discussed which should allow at least for a preliminary assessment of such possible scenarios.

5.9.2.1 The European Space Agency as possible 'generator' of 'joint state practice'?

As regards ESA, the main operational space IGO in Europe, the Council is its highest organ, comprised of all member states' representatives and tasked *inter alia* with approving programmes, activities, budgets and policies, by simple majority unless otherwise indicated.[190] Does this mean that all decisions of the Council and the activities following from it could be regarded as 'joint state practice' and/or expressions of a 'joint *opinio juris*' of the member states? Or only those where unanimity *was* required?[191] Whilst there could be arguments made both ways, the detailed nature of those decisions and activities makes it unlikely that they could be seen as true potential candidates for a rule of customary law: they would normally be much too idiosyncratic, dealing with specific and unique circumstances each and every time, to give rise to any consistent 'state practice' with a commensurate consistent belief of the practice being required *ipso facto* by law.

The same applies to the unique but intricate system whereby ESA combines mandatory and optional programmes within one international intergovernmental institution, the former being focused on science and requiring all states by definition to contribute according to a pre-set scale, the latter being focused on more operational and application-oriented space activities allowing for an *à la carte*-approach for member states both in terms of participation per se and level of financial contribution

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[190] See Art. XI(5), (6) (esp. *sub* (d)), Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1; see further *supra*, §§ 4.2.2, 4.2.3. See further on ESA esp. *supra*, §§ 4.2.2–4.2.5.

[191] See e.g. on this issue T. Treves, Customary International Law, in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. II (2012), 946–8.

once having decided to participate.[192] Whilst the result is a uniquely flexible framework, has worked well, and has meanwhile been copied by EUMETSAT[193] – and for such reasons is viewed as possibly *the* most likely trait of the Agency which prospective international space cooperation organizations in other parts of the world would like to copy, it still would not mean that this dual system of mandatory and optional activities can be deemed customary international law.

The member states of ESA comply with it because of the ESA Convention, the detailed mechanisms provided by it and the competences for ESA organs to develop programmes as spelled out by it – not because of some inherent belief that every scientific activity in outer space should be conducted by or through the IGO, and should be financed by all its member states according to a pre-determined scale of contributions. If in Africa, Latin America or Southeast Asia international operational space organizations were indeed to arise, nothing would keep them from ultimately deciding upon a rather different system of organizing such organizations' activities, much as they may currently admire ESA's example.

Only if in some further future those other areas of the world were to start to 'copy' this ESA approach semi-automatically, assuming 'science' to constitute as a matter of law a public activity requiring standard defrayal of costs whereas application programmes should be treated on a more commercial, 'pay-as-you-think-you'll-benefit' basis, would this conclusion change. It still would be a stretch even then, however, to argue that this approach would also be binding upon a particular region bent upon following a different approach.

5.9.2.2 The satellite communication IGOs as possible 'generators' of 'joint state practice'?

The same analysis essentially holds true for the generally identical constructions applicable to INTELSAT, INMARSAT and EUTELSAT in their pre-privatized stages, where the financial contributions by the respective member states to the costs of building, maintaining and

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[192] *Cf.* Arts. V(1)(a) & (b), XI(5)(a), (b) & (c), XIII, ESA Convention, *supra* n. 190; further *supra*, § 4.2.3.

[193] *Cf.* e.g. Madders, *supra* n. 120, 189–95; G. Lafferranderie, *European Space Agency* (2005), 74–89. On EUMETSAT see further e.g. F.G. von der Dunk, European Satellite Earth Observation: Law, Regulations, Policies, Projects, and Programmes, 42 *Creighton Law Review* (2009), 403–6.

operating a satellite infrastructure through their PTOs would be *de facto* adjusted for their actual proportion of use made of the infrastructure.[194]

This approach was considered hugely successful in many respects and a noteworthy example, INMARSAT following it because of INTELSAT's success and then EUTELSAT following upon both in turn. It was later on by and large also adopted by INTERSPUTNIK[195] as well as ARABSAT[196] – but meanwhile of course that financial approach was discarded as part of the privatization processes for the other three organizations. More than presenting a possible candidate for a rule of customary international law, matching *a priori* investment *a posteriori* with actual usage was simply a matter of common (business) sense.

Also, in the aforementioned context of ESA, not a satellite IGO yet also investing billions in operational space activities annually, another, even more complicated financial approach was developed: that of geographical distribution or 'fair return'. Basically, under this approach member states were supposed to by and large see their contributions to specific ESA programmes 'returned' to their domestic space industry in the form of ESA contracts.[197] Though for some time legally under challenge, in particular from the perspective of the European Union where this system could be viewed as anti-competitive and therefore (possibly) in violation of the EU's competition regime,[198] it persists until today as a major element of the ESA structure.[199]

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[194] See respectively Art. V, INTELSAT Agreement, *supra* n. 64; Arts. 3(c), 4, 6–8, INTELSAT Operating Agreement, *supra* n. 64; Arts. 5(1), (2), 19, INMARSAT Convention, *supra* n. 93; (esp.) Arts. III, V, VI(1), INMARSAT Operating Agreement, *supra* n. 93; Annex to the INMARSAT Operating Agreement; Art. V, EUTELSAT Convention, *supra* n. 120; Arts. 4, 6, 7, EUTELSAT Operating Agreement, *supra* n. 120. Further *supra*, respectively §§ 5.4.1, 5.5.1 and 5.6.1.

[195] *Cf.* Art. 15(1), INTERSPUTNIK Agreement, *supra* n. 150; also *supra*, § 5.7.1.

[196] *Cf.* Art. 6(2), ARABSAT Agreement, *supra* n. 172; also *supra*, § 5.8.

[197] See *supra*, § 4.2.4; also in general e.g. S. Hobe, M. Hofmannová & J. Wouters (Eds.), *A Coherent European Procurement Law and Policy for the Space Sector* (2011), 70–8; B. Schmidt-Tedd, The Geographical Return Principle and its Future within the European Space Policy, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 87–9; Lafferranderie, *supra* n. 193, 108–15; Madders, *supra* n. 120, 384–8.

[198] It would principally fall within the remit of the prohibition on state aid; see Art. 107(1), Treaty on the Functioning of the European Union, *supra* n. 136. *Cf.* further e.g. F.G. von der Dunk, ESA and EC: Two Captains on One Spaceship?, in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 427–9; F.G. von der Dunk, Perspectives for a Harmonised Industrial Policy of ESA and the European Union, in *'Project 2001 Plus'* –

Ultimately, therefore, also these financing issues, problems and approaches are too idiosyncratic and need to be far too detailed in order to be acceptable and workable to even come near to a consistent (joint) state practice and attendant *opinio juris*. Neither the 'investment-equals-usage-level' approach of the satellite IGOs nor the 'investment-equals-contract-volume' approach of ESA can probably be deemed to oblige the respective member states beyond the very specific and detailed regulations of the constitutive documents and other internal regulations – let alone have any customary international legal effect outside of these respective member state constituencies.

5.9.2.3 The exception: The case of 'exclusively peaceful purposes'

The main exception to the general conclusion that IGO practice can only seldom be seen as 'joint state practice *cum opinio juris*' of the IGO's member states to such an extent as to give rise to a rule of customary international space law applicable also outside of the IGO's context may well lie in further clarifying general concepts of law found in relevant treaties, of which the term 'peaceful purposes' in turn may well represent the main successful example.[200]

As regards space law, this term was most forcefully introduced by the Outer Space Treaty, which provides: 'The Moon and other celestial bodies shall be used by all States Parties to the Treaty *exclusively for peaceful purposes*.'[201] The meaning of 'exclusively for peaceful purposes' is not further spelled out, other than that:

> The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any

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Global and European Challenges for Air and Space Law at the Edge of the 21st Century (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2006), 181–6. *Cf.* also *supra*, § 4.4.5.

199 Actually, EU law itself also allowed for exceptions to application of the competition regime, as long as agreed to at the EU level itself; *cf.* esp. Art. 107(3), Treaty on the Functioning of the European Union, *supra* n. 136.

200 By contrast, e.g. when it comes to the term 'national activities in outer space' of Art. VI, Outer Space Treaty, *supra* n. 18, as requiring authorization and continuing supervision, no consistency in the state practice of the 15 or so states currently having established national space laws can be discerned; see on this e.g. F.G. von der Dunk, Towards 'Flags of Convenience' in Space?, in *Proceedings of the International Institute of Space Law 2012* (2013), 822–6.

201 Art. IV, 2nd para., Outer Space Treaty, *supra* n. 18 (emphasis added).

> equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.[202]

Originally, the intentional vagueness of the clause allowed both the United States ('military use, as long as defensive in nature, is serving peaceful purposes, hence allowed') and the Soviet Union ('any military use is by definition not peaceful, so not allowed with the exception of the few specific cases mentioned in the clause itself') to uphold their respective interpretation – and hence to ratify the treaty in the first place.[203] For that very reason, any effort – either in hard-letter law or by way of customary acquiescence – at further specification of this statement would have been doomed to fail.

The phrase, however, in various versions, then found its way into a host of other space-related treaties. The Outer Space Treaty as the starting point had already added that states were to conduct space activities 'in the interest of maintaining international peace and security',[204] which echoed the UN Charter's basis purpose to 'maintain international peace and security'.[205] The other UN space treaties in turn echoed these sentiments, '[b]elieving' for example that the establishment of an international liability regime 'will contribute to the strengthening of international cooperation in the field of the exploration and use of outer space *for peaceful purposes*'.[206]

So far, however, these clauses did not add the adverb 'exclusively'. Most notably, then, an almost similar clause, 'for exclusively peaceful purposes', was inserted in the ESA Convention, in order to principally exclude any potential involvement of ESA in security-related space activities, apparently closer to the Soviet than to the US point of view, although it did exclude military activities not so much from European states' roster of space activities as from ESA's roster.[207]

As time wore on, however, it became clear that the legal attitude to permissible military use of outer space was shifting. In spite of its seeming assertion to the contrary, the Soviet Union also used space infrastructure for military purposes such as reconnaissance and satellite navigation – in 1996 its successor-state Russia would offer open access to certain positioning, timing and navigation signals of its GLONASS

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202 Art. IV, 2nd para., Outer Space Treaty, *supra* n. 18.
203 *Cf.* further also *infra*, § 6.3.1, also *supra*, § 1.4.
204 Art. III, Outer Space Treaty, *supra* n. 18.
205 Art. 1(1), UN Charter, *supra* n. 17.
206 Preamble, 5th para., Liability Convention, *supra* n. 45 (emphasis added).
207 Art. II, ESA Convention, *supra* n. 190.

satellite navigation system, like GPS in the United States owned, operated and controlled by the military.[208]

Also, the general international legal attitude to the use of force was changing. The UN Charter had principally recognized only two categories where the use of armed force was allowed, that of self-defence (if applicable, including collective self-defence)[209] and that of mandated use of force against states officially labelled aggressors by the UN Security Council.[210] Outside of the UN Charter, a broader customary right of self-defence or a more general right to use force as a proportional reprisal had often been claimed – but equally often been disputed or at least been eyed suspiciously as giving rise too easily to abuse.[211]

ESA provided one particular regional example thereof, as it gradually became involved in GMES/Copernicus, which was originally billed as 'Global Monitoring for Environmental Security' but then surreptitiously came to stand for 'Global Monitoring for Environment *and* Security', broadening the concept of security to civil and even, arguably – and notably without major resistance from the individual member states – military security issues.[212]

Such changes in attitude, however, were reflected most visibly and uniquely in the worldwide INMARSAT and Inmarsat context.[213] The former, at the time still operating as a public international consortium of member states, had gained worldwide exposure when *in situ* reporters on the Gulf War in early 1991 used INMARSAT satellite connections. More to the point, pictures appeared in the press showing US forces using INMARSAT terminals during military operations. INMARSAT's Director General raised concerns with the US government about this, and called attention to the opinion by the organization's legal adviser that had been released four years earlier.

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[208] See e.g. Lyall & Larsen, *supra* n. 37, 389 ff.; also N. Frischauf, Satellite Navigation, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 124–9. Also further *infra*, esp. § 10.2.2..2.

[209] See Art. 51, UN Charter, *supra* n. 17.

[210] See Arts. 42 ff., UN Charter, *supra* n. 17.

[211] See e.g. Cassese, *supra* n. 1, 305–13; Crawford, *supra* n. 1, 747–57, 768–74; Wallace, *supra* n. 1, 252–4; Malanczuk, *supra* n. 1, 311–8.

[212] See on this in more detail F.G. von der Dunk, Europe and Security Issues in Space: The Institutional Setting, 4 *Space and Defense* (2010), 75–8, 89 ff., esp. 92.

[213] See in general Sagar & McCormick, *supra* n. 92, 37, 64–6; W. von Noorden, Inmarsat Use by Armed Forces: a Question of Treaty Interpretation, 23 *Journal of Space Law* (1995), 1–17.

That opinion had been drafted in response to concerns that were privately raised by some members of the organization regarding extensive use of INMARSAT shipboard terminals by the United Kingdom during the Falklands War of 1982, addressing the relevant Article 3 (the 'Purpose') of the INMARSAT Convention:

> (1) The purpose of the Organization is to make provision for the space segment necessary for improving maritime communications and, as practicable, aeronautical communications, thereby assisting in improving communications for distress and safety of life, communications for air traffic services, the efficiency and management of ships and aircraft, maritime and aeronautical public correspondence services and radio determination capabilities; …
>
> (3) The Organization *shall act exclusively for peaceful purposes*.[214]

Interpreting the clause in a strict sense, the conclusion of the opinion had been that use of INMARSAT shipboard terminals on ships engaged in armed conflict, even in situations where they would be acting in self-defence, would not be considered a use for peaceful purposes and hence in violation of the INMARSAT Convention.

When INMARSAT was privatized,[215] Article 3 of the INMARSAT Convention was not changed in substance, only it was this time up to IMSO to ensure that the company Inmarsat would be 'acting exclusively for peaceful purposes'.[216] Also the private operator then became involved in a discussion on the proper meaning and effect of this phrase. Although the question of the legality of the use of Inmarsat's capabilities was indeed raised during the US military operations in Afghanistan and Iraq, it seems to have bothered Inmarsat's management less than it did in previous years. For example, Inmarsat openly announced:

> Global security events in recent years have had a positive effect on the group's revenues, particularly in the land sector. In 2003, despite decreased demand for our services from Afghanistan and neighbouring countries, revenues were higher than in the previous year because of demand fed by the conflict in Iraq.[217]

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214 Art. 3, INMARSAT Convention, *supra* n. 93 (emphasis added).
215 See further esp. *supra*, § 5.5.2.
216 Art. 3(c), IMSO Convention, *supra* n. 114.
217 Inmarsat Group Limited, Annual Review 2003, 17, www.inmarsat.com/wp-content/uploads/2013/10/Inmarsat_Annual_Review_2003.pdf, last accessed 7 February 2014.

This happened, moreover, alongside plans being announced by Inmarsat to construct a Ka-band broadband system that will be substantially faster than its Broadband Global Area Network service in response primarily to the requirements of the US government – to meet military needs such as unmanned aerial vehicle downloads.[218] All this took place without any visible corrective action on the part of IMSO officials: clearly, then, these developments corroborated and indeed enhanced the increasing global acceptance of a broader interpretation of which space activities would be permissible under the concept of '(exclusively for) peaceful purposes'.[219] In other words: in the context of the gradually broadening acceptance of peaceful purposes as encompassing anything except *aggressive* military uses, IGOs like ESA and in particular INMARSAT/IMSO played a commensurate catalysing role in shaping such an arising customary international law interpretation.

5.10 SATELLITE COMMUNICATION IGO PRIVATIZATION: A LEGAL ASSESSMENT

The privatization of three of the major space IGOs, INTELSAT, INMARSAT and EUTELSAT, represented a major milestone in the development of international space activities and hence also space law, even if its direct effect on treaty and customary law was seen to remain of a rather circumscribed character. It may be noted that in the early era of space activities and space law the Soviet Union's focus on a rather absolute theory of state sovereignty was based on a suspicion that both IGOs and private companies were but barely veiled vehicles to further politico-economic interests of the capitalist world, notably led by the United States.[220] A final aspect of these privatizations warranting attention, therefore, concerns the legal consequences of moving from an IGO status to that of a private operator.

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[218] See *Defense Systems*, 20 August 2010, www.defensesystems.com/Articles/2010/08/20/Inmarsat-addresses-growing-military-broadband-needs.aspx, last accessed 7 February 2014.

[219] Another interesting example would concern the role of the European Union with respect to security-related (space) activity; see on this e.g. von der Dunk, *supra* n. 212, 78 ff.

[220] See also *supra*, §§ 1.1, 2.2.2.3.

5.10.1 The Original Satellite Communication IGOs and Their International Space Law Status

As addressed before, by way of Articles VI and XIII, the Outer Space Treaty contains two relevant clauses specifying that its regime applies to international *intergovernmental* organizations, meaning that international NGOs are not covered by those clauses.[221] Also the other main space treaties contain clauses specifically offering IGOs an independent, albeit effectively secondary, legal status where they qualify as 'launching authorities'[222] or 'launching States'[223] of space objects, or would become active on the moon or other celestial bodies.[224] All such space treaty clauses deal with specific consequences following from the fact that relevant activities are carried out with the crucial involvement of IGOs, which are, however, viewed as mere platforms for individual states to cooperate, rather than as separate entities.[225]

This conforms, of course, to the general public international law concept of an IGO.[226] Thus, in spite of their hybrid character (PTOs and

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221 See e.g. Bohlmann & Süss, *supra* n. 2, 8.

222 See Art. 6, Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968); also *supra*, § 2.3.2.2.

223 See respectively Arts. XXII in conjunction with I(c), Liability Convention, *supra* n. 45; Arts. VII in conjunction with I(a), Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975); also *supra*, §§ 2.3.3.8, 2.3.4.3.

224 See Art. 16, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979); also *supra*, § 2.3.5.1.

225 *Cf.* the phrasing of Arts. VI and XIII, Outer Space Treaty, *supra* n. 18; also M. Gerhard, Article VI, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 122–3; U.M. Bohlmann & G. Süss, Article XIII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 216–20.

226 See e.g. Brownlie, *supra* n. 2, 675–99, esp. 687–9; Malanczuk, *supra* n. 1, 92–3; Cassese, *supra* n. 1, 69–71; Wallace, *supra* n. 1, 68–9; Bohlmann & Süss, *supra* n. 2, 8; further *supra*, § 5.1.

private operators, such as Comsat or KDD, as signatories to the underlying operating agreements being in charge of the day-to-day running of the telecommunication operations as well as providing for the financing and the revenue-sharing mechanism), prior to their privatization INTELSAT, INMARSAT and EUTELSAT were undoubtedly IGOs in the sense of the aforementioned Articles VI and XIII of the Outer Space Treaty. These satellite IGOs were all composed of member states which were represented in the ultimate ruling body, and under whose control also the members of the chief governing body, consisting of representatives of the 'signatories', were designated.[227]

5.10.2 The Transition from Operational IGOs to Supervisory IGOs and Space Law

Whilst the privatization processes did fundamentally transfer all the satellite and attendant ground infrastructure and market operations to the newly created Intelsat, Inmarsat and Eutelsat companies, they did not result in the complete elimination of IGO structures. INTELSAT as an IGO was replaced by the International Telecommunication Satellite Organization or ITSO,[228] INMARSAT by the International Mobile Satellite Organization or IMSO,[229] and EUTELSAT by EUTELSAT IGO.[230]

ITSO, IMSO and EUTELSAT IGO are still composed of member states as the ultimate bearers of competence to determine the legal structure, role and personality of the organizations;[231] and as such still undoubtedly qualify as IGOs. These three residual organizations continue

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227 For INTELSAT, *cf.* Arts. I(a), (b), (f), (g), II, VI, VII (of which § (a) provides: 'The Assembly of Parties shall be composed of all the Parties and shall be the principal organ of INTELSAT.'), IX & X, INTELSAT Agreement, *supra* n. 64. For INMARSAT, *cf.* Arts. 1(a), (b), (c), 2, 4, 9–15, INMARSAT Convention, *supra* n. 93. For EUTELSAT, *cf.* Arts. I(a), (b), (e), (f), II, VII–XII, EUTELSAT Convention, *supra* n. 120. Also see generally *supra*, §§ 5.4.1, 5.5.1 and 5.6.1.

228 See *supra*, § 5.4.2.

229 See *supra*, § 5.5.2.

230 See *supra*, § 5.6.2.

231 *Cf.* e.g. Arts. I(a) & (p), II, IX, XI, XIV–XVIII, ITSO Agreement, *supra* n. 86; Arts. 1(a) & (c), 6(1), 8, 12, 14, 16–18, IMSO Convention, *supra* n. 114; and Arts. I(a) & (d), II(a), IV, VII, XI, XIII–XIV, XVI–XVIII, EUTELSAT Convention as amended, *supra* n. 141; respectively. Further e.g. Mechanick, *supra* n. 59, 185–204; Ospina, *supra* n. 79, 338–9.

to enjoy functional privileges and immunities, especially in their respective host states the United States, the United Kingdom and France.[232]

Thus, it is essentially the scope of tasks and competencies of these IGOs which has now been greatly reduced when compared to their predecessors. With a view to the application of the space treaties, however, this does raise the question of whether these new IGOs are still materially and directly impacted. For example, the Outer Space Treaty is concerned with 'activities in outer space' and 'activities in the use or exploration of outer space',[233] and the Rescue Agreement and Liability and Registration Conventions focus on entities actively involved in launching space objects.[234]

From that perspective, ITSO's main purpose is now simply '*to ensure*, through the Public Services Agreement, *that the Company provides*, on a commercial basis, international public telecommunications services, in order to ensure performance of the Core Principles'.[235] Article V of the ITSO Agreement further defines that purpose as 'supervision', imposing a general obligation that 'ITSO shall take all appropriate actions' to that end. Similarly, IMSO is '*to ensure* that the basic principles set forth in this Article *shall be observed by the Company*',[236] and as for EUTELSAT IGO, 'the primary purpose of

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[232] See Art. XIII(b) & (c), ITSO Agreement, *supra* n. 86; Art. 9(5) & (6), IMSO Convention, *supra* n. 114; and Art. XII(b) & (c), EUTELSAT Convention as amended, *supra* n. 141; respectively; also Headquarters Agreement between the European Telecommunications Satellite Organisation (EUTELSAT) and the Government of the French Republic, *supra* n. 125; see Lyall & Larsen, *supra* n. 37, 362 incl. n. 157.

[233] See e.g. Arts. VI, XIII, Outer Space Treaty, *supra* n. 18.

[234] *Cf.* the concepts of 'launching authority' and 'launching State' found throughout these treaties; further e.g. *supra*, §§ 2.3.2, 2.3.3.1 and 2.3.4.

[235] Art. III(a), ITSO Agreement, *supra* n. 86 (emphasis added). These Core Principles are further spelled out in Art. III(b). In addition, the functions of ITSO's main organ, the Assembly of Parties, in Art. IX(c) & (d), are essentially focused on that supervisory role. So also e.g. Mechanick, *supra* n. 59, 185 ff., esp. 199–203; Ospina, *supra* n. 79, 338–42; further F. Lyall, The Protection of the Public Interest in the Light of the Commercialisation and Privatisation of the Providers of International Satellite Telecommunications, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 442–4.

[236] Art. 3, IMSO Convention, *supra* n. 114 (emphasis added). The phrase 'the Company' refers to Inmarsat. The remainder of Art. 3 on the substance of these 'basic principles' as well as Art. 8 on the functions of the General Assembly of IMSO, further spell out the key elements of such supervisory function. See further e.g. Lyall, *supra* n. 235, 444–5; Mechanick, *supra* n. 59, 185–6.

EUTELSAT is *to ensure* that the Basic Principles set forth in this Article *are observed by the Company Eutelsat S.A.*'.[237] These are all, clearly, not 'activities in outer space' in the sense of Article VI of the Outer Space Treaty or 'launching' activities from the perspective of the Rescue Agreement, Liability Convention and Moon Agreement.

By contrast, and as a consequence, in the case of ITSO 'the international telecommunications satellite organization's *space system is transferred*' to Intelsat,[238] in the case of IMSO it is Inmarsat which will henceforth operate the satellite system,[239] whereas in the case of EUTELSAT IGO, 'Eutelsat S.A. will be established *to operate a satellite system and to provide satellite services* and for this purpose, EUTELSAT's assets and operational activities will be transferred to the Company Eutelsat S.A.'.[240]

5.10.3 The Net Results of IGO Privatization in Terms of International Space Law

With the privatization of the operations of the satellite IGOs remaining under some form of supervision by residual IGOs the last question to be addressed here then concerns the extent to which these transformations have resulted in major changes to the application and applicability of international space law, notably the four UN space treaties widely ratified and the ITU regime, as another overarching regime continuing to be of key relevance for the newly privatized operators and their inter-governmental watchdogs.

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237 Art. III(a), EUTELSAT Convention as amended, *supra* n. 141 (emphasis added). The remainder of Art. III(a) spells out the details of those Basic Principles. See further Art. IX for the functions of the Assembly of Parties in this regard.

238 Art. I(d), ITSO Agreement, *supra* n. 86 (emphasis added). See further Preamble, in particular its 5th para. *Cf.* also e.g. Ospina, *supra* n. 79, 339.

239 See Art. 1(b), IMSO Convention, *supra* n. 114. See further Preamble, in particular its 6th para.; also e.g. Bohlmann, Schrogl and Zilioli, *supra* n. 109, 219; D. Sagar, Inmarsat Since Privatization, in *Proceedings of the Project 2001 Workshop on Telecommunication* (2000), 166.

240 Art. II(b)(i), EUTELSAT Convention as amended, *supra* n. 141 (emphasis added). See further Preamble, in particular its 5th para. stating 'the will to transfer the operational activities and associated assets of EUTELSAT to a limited liability company to be established under a national jurisdiction, such company to operate on a sound economic and financial basis having regard to accepted commercial principles' as a major reason for privatization.

5.10.3.1 The Outer Space Treaty

As regards the Outer Space Treaty, the essential boundary between its application to satellite IGOs and to private companies respectively lies with the requirements of authorization and continuing supervision under Article VI and of consultation in cases of potentially hazardous activities under Article IX as far as the latter is concerned, although this may be more of a formal distinction.[241]

Presently, single-state responsibility of the state whose 'national activities in outer space' are at issue[242] applies to the privatized satellite operators – in the case of Intelsat, the United States; Inmarsat, the United Kingdom; and Eutelsat, France. This single-state responsibility arises notwithstanding the continuing existence of ITSO, IMSO and EUTELSAT IGO respectively and their exercise of legally entrenched control and supervision activities over the three now private companies, as such control and supervision remain limited to a few explicitly delineated public-interest aspects.[243] Thus, it may be concluded that in each case crossing the Rubicon towards privatization has resulted in the new operators now being subjected to formalized and explicit requirements as to their key international public duties, accompanied by substantial legal and jurisdictional tools for the revamped IGOs to ensure conformity with those requirements.

The explicit character of those public duties and the need to preserve them in a privatized environment may well turn out to be an interesting development not only in the specific context of those respective IGOs and former IGOs, but also for the broader development of international

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[241] Note that ISOs *de facto* will also operate under some system of authorization and possibly also supervision by their member states – only, in this case, through their governing multilateral treaties and statutes instead of through a single-state licensing process. Similarly, Arts. VI and XIII, Outer Space Treaty, *supra* n. 18, jointly make clear that states are also required to consult in appropriate cases targeted by Art. IX since ISOs are principally viewed as 'frameworks' for state activities, not as independent actors whose responsibilities are separate or to be separated from those of their member states.

[242] Art. VI, Outer Space Treaty, *supra* n. 18; see further *supra*, § 2.3.1.1.

[243] *Cf.* respectively Arts. I(j), III(b), V, VII(a), ITSO Agreement, *supra* n. 86; Arts. 3, 4, 8(b), 10(1), IMSO Convention, *supra* n. 114; also Arts. 2, 15, PSA, *supra* n. 116; Arts. I(l), II(d), III, V(b), IX(a), (b) & (d), EUTELSAT Convention as amended, *supra* n. 141. See also for more details F.G. von der Dunk, Crossing a Rubycon? The International Legal Framework for ISOs – Before and After Privatisation, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 224 ff., esp. 238–42; further Ospina, *supra* n. 79, 340–4.

space law, if only because the conflicts between commercial interests and general public interests are now more likely to lead to proper legal disputes requiring legal solutions, as opposed to being dealt with at an international political (member state) level. All the same, the United States, the United Kingdom and France remain the primary addressees of any question of legality of the operations of Intelsat, Inmarsat and Eutelsat respectively, and will be held accountable by third states.

5.10.3.2 The Rescue Agreement

As regards the Rescue Agreement, the main result of the privatization process is that the actual operators of the three satellite systems since being privatized can no longer claim rights of recovery and return directly, even in theory, as dependent upon a relevant declaration under Article 6, but now in every case would require their respective launching authority (or launching authorities) to do so.[244] In addition, they would not be held directly responsible under international space law for any possible violations of the relevant obligations, in this case referring to issues of rescue, recovery and return. However, as discussed, when it comes to possible violations of any rules of space law, as per the Outer Space Treaty in the case of a satellite IGO, there would always be a residual responsibility for those states members of the IGO, so that the difference in that respect would not be very substantial.[245]

5.10.3.3 The Liability Convention

EUTELSAT is the only one among the three original satellite IGOs at issue to have actually declared its acceptance of rights and obligations under the Liability Convention by means of a relevant declaration.[246] While that declaration may persist also with respect to the EUTELSAT IGO which took the place of the old EUTELSAT,[247] it remains to be seen what this means in light of the fact that any space operations of note –

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[244] *Cf.* also *supra*, § 2.3.2.2. None of the three ISOs had been able to comply with all relevant requirements under Art. 6, Rescue Agreement, *supra* n. 222.

[245] See further in general von der Dunk, *supra* n. 243, 242 ff., esp. 246–7.

[246] As per 30 November 1987. See United Nations treaties and principles on outer space and related General Assembly resolutions, Addendum, Status of international agreements relating to activities in outer space as at 1 January 2009; ST/SPACE/11/Rev.2/Add.2, at 16; also e.g. N. Jasentuliyana, The Future of International Telecommunications Law, in *Legal Visions of the 21st Century: Essays in Honour of Judge Christopher Weeramantry* (Eds A. Anghie & G. Sturgess) (1998), 399 at n. 26.

[247] Nothing can be found in the EUTELSAT Convention as amended, *supra* n. 141, to suggest that, in transferring all operational activities and related assets

the kind of activities potentially triggering application of the Liability Convention – have been transferred to Eutelsat in the course of the privatization process.

On the 'defendant side', with a view to the definition of the 'launching State', applicability of the Convention could only become an issue to the extent that EUTELSAT IGO would itself 'procure' the launch of another satellite on behalf of Eutelsat.[248] Such a situation, however, would now be highly unlikely, as the main legislative efforts driving privatization of the satellite IGOs called for operational independence of the private operator from the supervising public entity. For Europe, the 1994 EU Satellite Directive required full-fledged privatization of the satellite IGOs *inter alia* through deletion of any special or exclusive rights, state aid of any sorts as well as other benefits IGOs could derive from such a status.[249] Likewise, for the United States the 2000 ORBIT Act[250] required privatization to be comprehensive in order to allow fair competition of the privatized former IGOs with private operators that did *not* evolve from IGOs, such as PanAmSat, which had lobbied the US government vehemently to get it to ensure a level playing field in those respects.[251]

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from EUTELSAT to Eutelsat, the remaining EUTELSAT IGO has taken or would take steps to disavow the declaration made by EUTELSAT in 1987.

[248] Note that the definition of 'procurement' is also far from universally agreed upon; *cf.* M. Gerhard, The State of the Art and Recent Trends in the Development of National Space Law, in *Nationales Weltraumrecht/National Space Law* (Eds. C. Brünner & E. Walter) (2008), 67–8; M. Chatzipanagiotis, Registration of Space Objects and Transfer of Ownership in Orbit, 56 *Zeitschrift für Luft- und Weltraumrecht* (2007), 235. See also *supra*, § 2.3.3 esp. § 2.3.3 1.

[249] See Arts. 2, 3, Satellite Directive, *supra* n. 81, applying Commission Directive on the competition in the markets of telecommunications services, 90/388/EEC, June 28, 1990, OJ L 192/10 (1990), to the satellite sector. See further e.g. S. Ospina, International Satellite Service Providers, in *Proceedings of the Project 2001 Workshop on Telecommunication* (2000), 155–6; Ungerer, *supra* n. 81, 13–6.

[250] See Secs. 2, 601–602, also Secs. 622–625, 641–643, 661, ORBIT Act, *supra* n. 82. See further e.g. McCormick, *supra* n. 60, 99 ff.; Salin, *supra* n. 64, esp. 509–10; Lyall & Larsen, *supra* n. 37, 341–2, 351, 383–5.

[251] See P.A. Salin, An Illustration of the Privatization Process of Outer Space, 50 *Zeitschrift für Luft- und Weltraumrecht* (2001), 217–36; further Bohlmann, Schrogl and Zilioli, *supra* n. 109, 218–9; P.A. Salin, Impact of Recent US Legislation and Regulations on International Satellite Communication Regulations, 48 *Zeitschrift für Luft- und Weltraumrecht* (1999), 52–5; Salin, *supra* n. 64, 202 ff., 487–9.

On the ‘claimant side’, EUTELSAT IGO by its declaration would still qualify as an IGO entitled under Article XXII of the Convention to the rights and duties of states under the Convention, but, as discussed, for assertion of a claim for compensation of damage suffered, it would depend upon a member state. The sole difference being that, were EUTELSAT IGO to be treated as the entity itself suffering damage (namely ‘through’ the private operator it is monitoring following the privatization of the operations, as if by proxy), any EUTELSAT IGO member state could be called upon to assert a claim on behalf of Eutelsat. However, if such damage could not be legally constructed so as to give rise to implementation of the EUTELSAT declaration, only France (as the state of nationality of Eutelsat) would be entitled to put forward such a claim.[252]

Thus, if Eutelsat satellites were to cause damage under the Liability Convention, Eutelsat would be faced with liability reimbursement arrangements as part of its licence, as a consequence of the reference of the French Law on Space Operations to compensation possibly due under the Outer Space Treaty in conjunction with its reference to licensing obligations for any operations in space and (limits to) indemnification under such a licence also for damage caused after the launch phase has ended.[253]

Crossing the threshold from IGOs to private companies for Inmarsat likewise means that it henceforth requires a licence from the UK authorities which, *inter alia*, deals with the potential for the United Kingdom to be held liable as a consequence of Inmarsat’s procurement of launches, and generally speaking ensure control of the respective authorities over the technical, operational, economic, social and ecological quality of the activities.[254]

Only in the case of Intelsat, would the imposition of international third-party liability arrangements through the licence (which licence itself was suggested by Article VI of the Outer Space Treaty and obligatory

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[252] See further e.g. von der Dunk, *supra* n. 243, 251–61.

[253] See esp. Arts. 14 and 17, Law on Space Operations (Loi relative aux opérations spatiales; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453; further *supra*, § 3.3.3.1.

[254] See esp. Secs. 3–6, Outer Space Act (hereafter UK Outer Space Act), 18 July 1986, 1986 Chapter 38; *National Space Legislation of the World*, Vol. I (2001), at 293; *Space Law – Basic Legal Documents*, E.I; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 12; further *supra*, § 3.3.2.3.

under the Commercial Space Launch Act) be unlikely.[255] Apparently, the US authorities do *not* consider mere operations of Intelsat involving its satellites and causing damage to possibly give rise to claims for compensation under the Liability Convention or even as part of reparation for internationally wrongful acts involving such damage under Article VI of the Outer Space Treaty.[256]

Crossing the threshold from IGO to private operator finally also meant that, henceforth, all three operators would depend upon their respective states of nationality *only*, in the event that they suffered damage and would like to use the Liability Convention to get such damage compensated. If, for whatever reason, the United States, the United Kingdom or France would not consider taking up a case under the Liability Convention on behalf of Intelsat, Inmarsat or Eutelsat for damage caused to their respective satellites, the only option left to those private operators might well be to sue in a private capacity in the courts of (presumably) the (or a) 'launching State'.[257]

5.10.3.4 The Registration Convention

Article VII(1) of the Registration Convention allows an IGO to become a *de facto* party to its regime under the same basic regime as the Liability Convention.[258] However, this did not apply to INTELSAT, INMARSAT or EUTELSAT, and currently does not apply to ITSO, IMSO or EUTELSAT IGO.

Thus, the transition from IGO to private operator has had varying consequences as far as the Registration Convention is concerned. In the

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[255] See von der Dunk, *supra* n. 243, 254–5; *cf.* also e.g. P. Vorwig, Regulation of Satellite Communications in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 422–3.

[256] *Cf.* on this issue in general e.g. F.G. von der Dunk, Liability Versus Responsibility in Space Law: Misconception or Misconstruction?, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 363–71.

[257] For Intelsat, in theory also Luxembourg (Intelsat's corporate headquarters being registered there) might try to assert a claim on the international level; in that case, however, the absence of a genuine link of Intelsat's operations with Luxembourg and the absence of any relevant licensing requirement imposed by Luxembourg may minimise the chance of Luxembourg successfully doing so.

[258] Thus, Art. VII(1), Registration Convention, *supra* n. 223, only refers to substantive rights and obligations under the Convention as opposed to procedural ones such as signature (*cf.* Art. VIII(1)), ratification (*cf.* Art. VIII(2)), and amendment (*cf.* Art. IX); and requires the same threefold conditions to be fulfilled before an IGO would become such a *de facto* party. See further *supra*, § 2.3.4.3.

IGO context registration of satellites was rather straightforward, any member state being able to register on behalf of the IGO as being a state 'procuring' the launch of that satellite through the 'vehicle' of the IGO.[259] Following the transition, however, for Inmarsat and Eutelsat the situation became even more straightforward, with the United Kingdom considering itself to be a 'launching State' for any satellite the launch of which was procured by Inmarsat,[260] and hence tasked to ensure proper registration, and the same applying *mutatis mutandis* to France and Eutelsat;[261] whereas in the case of Intelsat the state or states entitled and obliged to realize registration might more readily differ from case to case and might not even necessarily include the United States.[262]

5.10.3.5 The ITU regime

In the context of the ITU regime, more particularly its procedures for coordination of radio frequency usage and the occupation of attendant orbits or orbital slots,[263] the rights to such usage and orbits/slots are allotted to 'administrations'.[264] However, this term refers exclusively to relevant state organs: an administration is defined as 'any *governmental department or service* responsible for discharging the obligations undertaken in the Constitution of the International Telecommunication Union, in the Convention of the International Telecommunication Union and in the Administrative Regulations'.[265]

As IGOs thus do not have any formal independent say in this ITU process, or can even request for allotment at the ITU level, they require one state or another firstly to go through the allotment process, and, where necessary prior to that, the allocation process, and secondly to then assign the frequencies ultimately so allotted to them in order to be able to use them under the ITU system.

Mirrorwise, ITU member states are explicitly held internationally responsible for telecommunication activities by entities '*authorized* by them to establish and operate telecommunications and which engage in international services or which operate stations capable of causing

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259 As indicated, normally of course for practical reasons this would actually be done by the host state of the IGO at issue.

260 See Sec. 1(a), UK Outer Space Act, *supra* n. 254.

261 See Art. 2(3), French Law on Space Operations, *supra* n. 253.

262 *Cf.* argument *supra*, § 5.10.3.3.

263 See further *infra*, §§ 8.2.3, 8.2.4.

264 *Cf.* Sec. 1.17, Radio Regulations, *supra* n. 67.

265 Sec. 1.2, Radio Regulations, *supra* n. 67 (emphasis added). See also no. 1002, Annex, ITU Constitution, *supra* n. 21.

harmful interference to the radio services of other countries'.[266] This provision literally refers to 'operating agencies'. An 'operating agency' is defined in the Annex to the ITU Constitution as '[a]ny individual, company, corporation or governmental agency', and should be read as including an '*international* (multi) government agency'.[267]

Thus, the only distinction between satellite IGOs and private satellite operators in terms of obtaining a nominal guarantee of interference-free usage of usable frequencies from the ITU lies in the fact that, for IGOs, at least in law *any* member state of that IGO could propose allocation of frequency bands if needed and request allotment of specific frequencies effectively on behalf of that IGO. For a private operator there could usually only be one administration undertaking those efforts: that of the state of nationality (that is, incorporation and headquarters) of the company concerned.[268]

In practice, not even that distinction may have mattered much. In the cases of the old INTELSAT, INMARSAT and EUTELSAT, for obvious reasons of efficiency and coherence, the task of taking up the interests of these IGOs in the ITU context was delegated to the host state of the organization – the United States, the United Kingdom and France respectively, precisely the states that post-privatization would continue to do the same on behalf of respectively Intelsat, Inmarsat and Eutelsat.[269] Even the inherent support including, where necessary, votes in favour from the other member states of INTELSAT, INMARSAT and EUTELSAT in the ITU decision-making processes, for respective US, UK or French efforts would normally not be lacking in the case of the private operators due to the existence of ITSO, IMSO and EUTELSAT IGO respectively, whose member states should still be generally interested in seeing the private operators succeed.

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[266] Art. 6(2), ITU Constitution, *supra* n. 21 (emphasis added). *Cf.* also Art. VI, Outer Space Treaty, *supra* n. 18, essentially providing for a similar level of international responsibility.

[267] No. 1007, Annex, ITU Constitution, *supra* n. 21.

[268] It may be reiterated here that allocations are generally handled at the bi- or triennial ITU World Radio Conferences, that is essentially by all ITU member states collectively, whereas requests for allotment concern activities of individual states addressed on an ongoing basis to the Radio Regulations Board. See further *infra*, § 8.2.3.

[269] *Cf.* also e.g. Art. XII, ITSO Agreement, *supra* n. 86.

5.10.3.6 Assessing the consequences under international space law of IGO privatization

In sum, a major result of the privatization of the satellite IGOs was a fragmentation and diversification of the legal framework(s) within which they had to operate. In the international arena, the private operators will have to count on their host states to a much greater extent than the satellite IGOs used to do, for even if they still could avail themselves of support from ITSO, IMSO or EUTELSAT IGO, these IGOs obviously have only a specific and limited interest in the operators' activities, resulting in limited responsibilities and even more limited liabilities. After all, the whole idea behind the privatization process was that, apart from some public duties which should remain guaranteed, the operators should act under as much commercial freedom as possible, meaning that the new IGOs might be less broadly and actively interested in the success of the particular operator they were supervising.

Consequently, private operators have to look to their national authorities for issues of recovery of damages under the Liability Convention or for satellites to be recovered under the Rescue Agreement, which thereby become a matter of national law. This opens the door to diversification of applicable regimes, except to the extent that the inherent global character of the satellite communications market would serve as a force promoting international harmonization.

In the last resort, therefore, the Rubicon crossed by the privatization of the IGOs was more of a practical, economic and political character than of a strictly speaking legal character, although the legal framework did – apart from reflecting the relevant practical, economic and political paradigm changes – result in a juridification of the regimes and in considerably more precision regarding the allocation of responsibilities and liabilities. Also, as a consequence of the fact that the Rubicon so to speak was crossed at different fords by INTELSAT, INMARSAT and EUTELSAT, the general legal framework was seen to diversify and fragment considerably. From that perspective there is no doubt that also legally speaking the world of international satellite communications has changed profoundly following the privatization of these three IGOs.

5.11 CONCLUDING REMARKS

By and large, intergovernmental organizations play a more substantial and fundamental role in the development of the specific area of international space law than in general public international law. The increased need for international cooperation both in a regulatory context – due to the inherent international character of space activities and the 'global commons' status of the area – and, even more, in an operational one – due to the exceptional costs, risks and technologies involved in space activities – has caused a number of intergovernmental organizations to be established which have played central roles in the development of space activities, and thereby – albeit largely – indirectly of space law as well.

Especially the operational organizations, some global in scope but focused on one particularly relevant satellite application, some regional and of varied focus, present a complex picture from the perspective of international space law. They are both major players that have to operate within the same general space law parameters as individual states (though often through them, rather than directly) and private enterprise, and major platforms for the formation of international space law, from the preliminary phase of developing soft law through contributing to customary law to treaty law.

At the same time, the fact that three of those IGOs have meanwhile gone through a rigorous privatization process, even though some level of direct intergovernmental oversight could not be done without, would then be testimony that the establishment of IGOs can often be of an intermediary nature in bringing the benefits of space activities to large parts of the world's population: in between the impossibility for most states (true space powers excepted) to undertake such activities and the interest of the private sector to undertake such activities for commercial purposes.

So far these developments have remained confined to satellite communications, the most important terrestrial application of space technology and infrastructure, but it might be expected that similar developments *mutatis mutandis* might also arise in due course in other space sectors, once sufficiently mature to give rise to a more commercialized and privatized environment.

6. Legal aspects of the military uses of outer space

Fabio Tronchetti

6.1 INTRODUCTION

Military use has been a key feature of space activities since the dawn of the space era.[1] The appearance of the first satellites coincided with their application for the purpose of military intelligence. Nowadays, the utilization of satellites in the military field has widely proliferated among space-faring states. Satellites not only play a crucial role in the context of military operations but also are crucial components of the national security strategies of the most technologically advanced states.[2]

The use of outer space for military purposes has been the object of heated diplomatic and academic discussions, mostly focused on the legality of and limits to military activities in space.[3] The controversy over military uses of outer space has been largely related to four factors: (1) the use of outer space for military reasons is a highly sensitive issue and states are often reluctant to accept legal restrictions or prohibitions to such a use; (2) a unitary legal framework governing military operations in space is missing – instead, the applicable rules are distributed among various sources of law, including general public international law, international humanitarian law and international space law; (3) these rules fail, at times, to provide a clear understanding of key terms and concepts;

[1] See K.U. Schrogl & J. Neumann, Article IV, *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 71.

[2] *Cf.* E.S. Waldrop, Integration of Military and Civilian Space Assets: Legal and National Security Implications, 55 *Air Force Law Review* (2004), 157–231; W. Rathgeber & N.L. Remuss, *Space Security: A Formative Role and a Principled Identity for Europe*, *ESPI Report*, January 2009.

[3] See generally on this point F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 499–532; Schrogl & Neumann, *supra* n. 1, 71–2; Peaceful and Military Uses of Outer Space: Law and Policy (2005), www.e-parl.net/pages/space_hearing_images/BackgroundPaper%20McGill%20Outer%20Space%20Uses.pdf, last accessed 5 November 2013.

and (4) space technologies (especially as for launch vehicles) and space objects (notably satellites) are usually of a dual-use character, as they have the potential to be used for civil and military applications.

The basic provisions governing military activities in outer space are to be found in the United Nations-sponsored space treaties, particularly the 1967 Outer Space Treaty[4] and the 1979 Moon Agreement.[5] These two treaties establish some broad, albeit rather vague, clauses limiting the use of space for military purposes. However, the space treaties fall short of setting forth a comprehensive legal structure regulating all military uses of space; thus, they need to be complemented with other relevant clauses and principles of international law, notably the principles laid down in the UN Charter,[6] the provisions of a few general disarmament and arms control treaties which, although not specifically dealing with outer space, include space-related issues,[7] and the provisions of a number of international and national regimes regulating the international trade in military or dual-use goods.[8]

In short, a coherent and comprehensive legal framework governing military activities in outer space is currently missing. While certain specific military uses of outer space are adequately regulated, others remain substantially unaddressed and of controversial implementation. In the light of the above, the purpose of this chapter is to provide a wide-ranging analysis of the legal framework regulating military uses of outer space and to shed light on its most debated issues.

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[4] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967). See further in general *supra*, § 2.3.1.

[5] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979). See further in general *supra*, § 2.3.5.

[6] Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1. See further *infra*, §§ 6.4, 6.5.1, 6.5.2.

[7] See further *infra*, § 6.4.

[8] See further *infra*, § 6.6, also §§ 7.5.1, 7.5.2.

6.2 MILITARIZATION VERSUS WEAPONIZATION OF OUTER SPACE

Before analysing the legal framework regulating military uses of outer space it is essential to understand what military activities in outer space actually comprise, and to draw a distinction between the concepts of militarization and weaponization of outer space respectively. Indeed, the latter concepts should not be confused or used as equivalents.

The term 'military activities' (at least in the context of outer space) refers to the use of space capabilities to support military operations occurring on earth. Currently, space-based systems have become crucial to warfare, as they enable precise navigation, furnish real-time weather data, allow instantaneous global communications, warn of possible missile threats, collect intelligence and carry out surveillance and reconnaissance.[9] The aforementioned use of space systems in the context of terrestrial military operations is generally referred to as 'militarization of outer space'.[10] Although a minority of legal scholars deem such a militarization of outer space to be in violation of space law rules, the overwhelming majority of experts consider it to be consistent with the legal regime governing activities in outer space.[11] State practice also confirms the legality of this type of military use of outer space.

Instead, the term 'weaponization' is used with reference to the deployment of weapons of offensive nature in space or on the ground with their

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[9] The importance of satellites for modern warfare was clearly demonstrated during 'Operation Iraqi Freedom'. For example, all secure communication among coalition forces were transmitted through space, space systems detected 26 rocket launches from Iraq, and the Predator UAV (Unmanned Aerial Vehicle) used space platforms for data transmission. See in this respect M.N. Schmitt, International Law and Military Operations in Space, 10 *Max Planck Yearbook of United Nations Law* (2006), 90–1; M. Bourbonnière & R.J. Lee, Legality of the Deployment of Convention on Weapons in Earth Orbit: Balancing Space Law and the Law of Armed Conflict, 18 *European Journal of International Law* (2007), 873–901.

[10] On the distinction between militarization and weaponization of outer space see C.M. Petras, The Debate Over the Weaponization of Space – A Military-Legal Conspectus, 28 *Annals of Air and Space Law* (2003), 171; A.G. Quinn, The New Age of Space Law: The Outer Space Treaty and the Weaponization of Space, 17 *Minnesota Journal of International Law* (2008), 475; J. Su, The Peaceful Purposes Principle in Outer Space and the Russia-China PPWT Proposal, 26 *Space Policy* (2010), 81.

[11] See further *infra*, § 6.3.1.

intended target located in space.[12] The legality of these types of operations is rejected by the majority of states and legal scholars,[13] due to their inconsistency with basic principles of public international law and space law. Although outer space is currently not being 'weaponized', fear that this may happen in the not-too-distant future is spread across a vast number of states as well as within the diplomatic and legal community. Such fear is the result of the growing dependence of modern societies on space systems for both military and civil purposes and of the consequent need to protect and ensure the security of these systems. In recent years, initiatives aimed at preventing a similar deleterious development have been launched.[14]

6.3 THE LEGAL FRAMEWORK REGULATING MILITARY USES OF OUTER SPACE: THE UN SPACE TREATIES

The five UN-sponsored outer space treaties provide the legal foundation regulating human activities in outer space.[15] Among these treaties, the

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[12] See e.g. J. Monserrat, Acts of Aggression in Outer Space, *Proceedings of the Forty-Fourth Colloquium on the Law of Outer Space* (2002), 365–75; M.C. Mineiro, The United States and the Legality of Outer Space Weaponization: A Proposal for Greater Transparency and a Dispute Resolution Mechanism, 32 *Annals of Air and Space Law* (2008), 441.

[13] For example, UNGA Res. 65/44 of 8 December 2010 on the Prevention of an arms race in outer space was adopted during the 65th Session of the General Assembly with 179 positive votes, 0 negative votes and 2 abstentions, https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195dc97a630525656f005b8adf/b99a05476cf36ca1852577f2007991e9?OpenDocument&ExpandSection=3#_Section3, last accessed 14 April 2014.

[14] See further *infra*, § 6.7.

[15] In addition to the Outer Space Treaty, *supra* n. 4, and the Moon Agreement, *supra* n. 5, these are the 1968 Rescue Agreement (Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968)); the 1972 Liability Convention (Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971)); and the 1975 Registration Convention (Convention on Registration of Objects Launched into Outer Space, New York, done 14 January 1975, entered into force 15 September

Outer Space Treaty and the Moon Agreement are the only two instruments containing specific provisions limiting the use of outer space for military purposes. The remaining three space treaties include clauses which have only an indirect impact on such use.

6.3.1 The Outer Space Treaty

Article IV is usually viewed as the crucial part of the Outer Space Treaty dealing with the military uses of outer space. Indeed, this Article includes provisions on arms control and sets forth certain boundaries to the possibility to undertake military activities in outer space.[16]

Article IV reads as follows:

> States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
>
> The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.

Thus, the first paragraph prohibits the placement of objects carrying nuclear weapons or any other kind of weapons of mass destruction in orbit around the earth. Before ascertaining the extent of such prohibition, one should understand the meaning of the terms used. As this paragraph does not define either 'nuclear weapons' or 'weapons of mass destruction', the proper interpretation of these concepts is to be determined in accordance with Articles 31 to 33 of the 1969 Vienna Convention on the Law of Treaties,[17] which reflect customary international law[18] and apply to the Outer Space Treaty as a treaty of international law. Accordingly, the basic criterion for treaty interpretation is the ordinary meaning of the

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1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975)).

16 See further Schrogl & Neumann, *supra* n. 1, 71 ff.

17 Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969).

term, to be considered in its context and in the light of its object and purpose.[19] The ordinary meaning of the word ‘weapon’ is ‘[a]n instrument of attack or defense used in combat’.[20]

Article IV(1) expressly forbids only two types of weapons, namely nuclear weapons and other weapons of mass destruction. Some authors have argued that only nuclear weapons which indeed cause ‘mass destruction’ could not be placed in earth’s orbit, while those not having such an effect could be stationed.[21] Pursuant to this approach, the stationing of mini-nuclear space mines or nuclear-powered weapons in outer space should not be prohibited, as long as their use does not lead to mass destruction.

However, such interpretation appears to be inconsistent with the historical background and purpose of Article IV(1),[22] which is to ban the placement and use of any kind of nuclear weapons in space. This is also supported by the terms of the Partial Test Ban Treaty which prohibits any nuclear explosion in space.[23] Importantly, not all forms of nuclear *reactions* in space are prohibited. For example, recourse to small atomic bombs for propulsion of a spacecraft is allowed, as such a spacecraft does not qualify as a nuclear weapon and its main goal is to carry passengers and materials in space. Yet, the clause should be deemed to include all types of nuclear *weapons* as the plain text would indicate that all nuclear weapons by definition are weapons of mass destruction.

The ordinary meaning of ‘weapons of mass destruction’ is more complicated to assess. Generally speaking, this term refers to weapons aimed at causing widespread devastation and loss of life, particularly chemical, biological or nuclear weapons.[24] With specific reference to outer space the term ‘weapons of mass destruction’ refers both to weapons which, if used in space, would generate mass destruction on

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[18] For a comprehensive analysis of the Vienna Convention on the Law of Treaties, see *Vienna Convention on the Law of Treaties*: *A Commentary* (Eds. O. Dörr & K. Schmalenbach) (2011).

[19] See Art. 31(1), Vienna Convention on the Law of Treaties, *supra* n. 17.

[20] See *The Free Dictionary*; www.thefreedictionary.com/weapon, last accessed 16 March 2014.

[21] See B. Cheng, *Studies in International Space Law* (1997), 530.

[22] *Cf.* Schrogl & Neumann, *supra* n. 1, 72.

[23] Art. I, Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (hereafter Partial Test Ban Treaty), Moscow, done 5 August 1963, entered into force 10 October 1963; 480 UNTS 43; TIAS No. 5433; 14 UST 1313; UKTS 1964 No. 3; ATS 1963 No. 26.

[24] *Cf. The Free Dictionary*, www.thefreedictionary.com/nuclear+weapon, last accessed 16 March 2014; *cf.* also Schrogl & Neumann, *supra* n. 1, 78.

earth, and to weapons which, if detonated on earth, result in mass destruction on earth.[25] By making express reference to nuclear weapons and weapons of mass destruction, it is evident that the present prohibition does not cover conventional weapons, such as anti-satellite weapons (ASATs), and military satellites. Therefore, they can be lawfully placed in an orbit around the earth.

Article IV(1) then prohibits the placing of nuclear weapons and weapons of mass destruction in orbit around the earth and the installation of such weapons on celestial bodies, or the stationing of such weapons in outer space in any other manner.

Firstly, the expression 'placing in orbit around the earth' must be interpreted in a broad sense, so as to prohibit the placing of such weapons in various earth orbits, including low earth orbits (LEO) and other orbits such as the geostationary orbit (GEO). Nevertheless, the mere transit of weapons of mass destruction through outer space, for example by means of intercontinental ballistic missiles (ICBMs), does not fall under the prohibition of this Article. ICBMs are in outer space only for a limited time and cannot be considered as being 'placed' in space.[26] Similarly, the Outer Space Treaty does not explicitly ban the actual use of such weapons – merely their placement in outer space.[27] Thus, as far as Article IV(1) is concerned outer space may be employed as a transit area for weapons aimed at and used on earth.

Secondly, the Article forbids the installation of nuclear weapons and weapons of mass destruction on celestial bodies. Thus, states are not allowed to place such weapons on the surface, or even in the sub-surface, of any celestial body in the solar system. It has been argued that the expression 'installing a weapon' in the context of this clause should be taken to mean 'placing of weapons on celestial bodies for use'.[28] However, a similar interpretation infers that, if a state places a weapon on a celestial body and claims that it has no intention to use it, such a placing would be allowed. As such a statement would hardly be accepted, or even believed, by other states, this interpretation is largely questionable.

Furthermore, the first paragraph prohibits the stationing of nuclear weapons and weapons of mass destruction either in outer space or in any

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25 See Schrogl & Neumann, *supra* n. 1, 77.

26 See Petras, *supra* n. 10, 184; S. Gorove, Arms Control Provisions in the Outer Space Treaty: A Scrutinizing Reappraisal, 3 *Georgia Journal of International and Comparative Law* (1973), 115.

27 *Cf.* Schrogl & Neumann, *supra* n. 1, 79.

28 *Cf.* Gorove, *supra* n. 26, 117; Schrogl & Neumann, *supra* n. 1, 80.

other manner. The term 'stationing' seems, thus, to be used in a broader sense than 'installing in orbit around the earth' as the prohibition refers to the stationing of these weapons in outer space, including on celestial bodies. It has to be pointed out that, although not expressly mentioned, the moon is covered in the scope of Article IV(1). The ordinary meaning of the term 'celestial bodies' already indicates that the moon qualifies as such.[29] Two types of weapons stationed in space can be envisioned: weapons that can be aimed at targets on earth and weapons that can target other space objects, such as anti-satellite weapons and killer satellites. As long as such weapons are not nuclear weapons or weapons of mass destruction, their use is not prohibited by Article IV.

In short: Article IV(1) of the Outer Space Treaty only provides for a partial prohibition of arms in outer space. States remain free to deploy in outer space any type of military satellites, be they for reconnaissance, communications, navigations, meteorological and other purposes, to transit ICBMs through space or to test and theoretically use conventional weapons in outer space. However, it has to be kept in mind that these provisions must be read in the light of the generally recognized principles of international law and, in particular, those included in the UN Charter.[30]

Article IV(2), by contrast, deals with the use of the moon and other celestial bodies, reserving them 'exclusively for peaceful purposes' – and thus, omitting any reference to 'outer space', does not address the empty space between the celestial bodies.[31] An analysis of the *traveaux préparatoires* of this clause demonstrates that this omission was intentional, as states wanted to remain at liberty to carry out certain space activities for military purposes, such as reconnaissance.[32]

Article IV(2) establishes that the moon and other celestial bodies shall be used *exclusively for peaceful purposes*. Although the Outer Space Treaty makes several references to the use of outer space for 'peaceful purposes', it fails to provide a definition of that term.[33] Consequently, the interpretation of this term has generated much debate. Two different

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[29] See P.G. Dembling & D.M. Arons, The Evolution of the Outer Space Treaty, 33 *Journal of Air Law & Commerce* (1967), 419; C.Q. Christol, The 1979 Moon Agreement: Where Is It Today?, 27 *Journal of Space Law* (1999), 1.

[30] See further *infra*, § 6.5.

[31] See Cheng, *supra* n. 21, 257.

[32] See Petras, *supra* n. 10; C.Q. Christol, *The Modern International Law of Outer Space* (1982), 24 ff.

[33] *Cf.* e.g. Preamble, 2nd, 4th, 8th paras.; Art. III, Outer Space Treaty, *supra* n. 4.

interpretations of this term, the first as 'non-military',[34] the second as 'non-aggressive'[35] have been proposed.

The 'non-military' approach holds the prohibition of non-peaceful purposes to prohibit the use of outer space for *any* military purpose. The supporters of this approach often make reference to the 1959 Antarctic Treaty, where 'peaceful purposes' is indeed intended to mean 'non-military'.[36] Despite being popular in legal doctrine, however, the 'non-military' interpretation appears to be contradicted by states' practices.[37] As discussed, the analysis of the preparatory works of the Outer Space Treaty does not provide elements to support its validity either.[38]

The 'non-aggressive' approach argues that, as long as military activities in space are carried out in accordance with Article 2(4) of the UN Charter, which prohibits the threat and use of force, they are consistent with international law.[39] This approach, advanced in particular by the

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[34] This view is supported by authors such as M.G. Markoff, Disarmament and Peaceful Purposes Provisions in the 1967 Outer Space Treaty, 4 *Journal of Space Law* (1976), 3; I.A. Vlasic, Disarmament Decade, Outer Space and International Law, 6 *Annals of Air and Space Law* (1981), 26; C.Q. Christol, The Common Interest in the Exploration, Use and Exploitation of Outer Space for Peaceful Purposes: The Soviet-American Dilemma, 18 *Akron Law Review* (1984), 193.

[35] The non-aggressive view is supported e.g. by Dembling & Arons, *supra* n. 29, 434; A. Meyer, Interpretation of the Term Peaceful in the Light of the Space Treaty, 18 *Zeitschrift für Luft- und Weltraumrecht* (1969), 28, 34.

[36] *Cf.* Preamble, Arts. I, IV, Antarctic Treaty, Washington, done 1 December 1959, entered into force 23 June 1961; 402 UNTS 71; TIAS 4780; 12 UST 794; UKTS 1961 No. 97; Cmnd. 913; ATS 1961 No. 12.

[37] Military uses of outer space basically coincided with the beginning of the space era. In this regard, the United States, while supporting the 'non-military' approach in the late 1950s, soon turned to the 'non-aggressive' approach. See US Senate Comm. on aeronautical & space sciences, Documents on international aspects of the exploration and use of outer space, 1954–62, 88th Cong., 1st Sess. Also the Soviet Union, while being officially in favour of the 'non-military' doctrine, used satellites to carry out military activities in the guise of scientific research. See also *supra*, §§ 1.1–1.4.

[38] During the negotiation of the treaty India proposed to extend the application of 'exclusively for peaceful purposes' of Art. IV(2), Outer Space Treaty, *supra* n. 4, to all areas of outer space. This proposal was rejected because neither the United States nor the Soviet Union wanted a final definition of 'peaceful purposes' in the light of the expected limitations which this would have put on both states' future uses of space; see U.N. Doc. A/AC.105/PV.3, of 20 March 1962, 63.

[39] Art. 2(4), UN Charter, *supra* n. 6, provides: 'All Members shall refrain in their international relations from the threat or use of force against the territorial

United States, has progressively gained support. In this regard, states have shown acceptance of certain passive military uses of outer space, such as reconnaissance and surveillance, thus legalizing this type of military activity. One should also keep in mind that the UN Charter specifically foresees two exceptions to the prohibition on use of force: self-defence and interventions authorized by the UN Security Council under Chapter VII of the Charter. The use of force in outer space triggered by any of these two exceptions should be viewed as legal.[40]

Significantly, the European approach to military uses of outer space was for many years also rather restrictive. For example, following the ESA (European Space Agency) Convention the aim and purposes of ESA were 'to provide for and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems'.[41] This use of the expression 'exclusively peaceful purposes' was meant to point out the peaceful nature of ESA's activities and its legal inability to get involved in military and security-related space projects. However, more recently, ESA has adopted a more liberal approach and can now be involved to a certain extent in military and defence-related security activities.[42]

Regardless of the interpretation given to the term 'peaceful' by other parties of the Outer Space Treaty, the fact that Article IV(2) combines it with the word 'exclusively' and that these two words are taken together is significant. Indeed, the provision speaks of the moon and other celestial bodies 'to be used exclusively for peaceful purposes only' and not 'for exclusively peaceful purposes'. By crafting the wording in this manner, it is made clear that an activity is legal as long as it is peaceful; once non-peaceful elements are introduced, its legality is lost. In short, the moon and other celestial bodies shall be free from military uses of any type.

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integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations'.

[40] See further *infra*, § 6.5.1.

[41] Art. II, Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1.

[42] For details on the involvement of ESA in security-related issues see F.G. von der Dunk, Europe and Security Issues in Space: The Institutional Setting, 4 *Space and Defense* (2010), 71–99.

In this respect the second sentence of Article IV(2) specifies that no bases, installations or fortifications can be established on celestial bodies. Furthermore, the testing of all types of weapons and the conduct of military manoeuvres on celestial bodies is forbidden. This encompassing prohibition of military activities included in the first two sentences of the Article has an exception in the last sentence thereof. Indeed, that last sentence explicitly permits the use of military personnel for scientific research and for any other peaceful purposes on the moon and other celestial bodies. The exact nature of the permitted actions is not explained in this sentence and thus depends on the interpretation of the term 'peaceful purposes'. Furthermore, states may '[u]se any equipment or facility necessary for peaceful exploration'.[43]

Summing up, Article IV(2) fully demilitarizes the moon and other celestial bodies, as the placement and testing of any type of weapons, the establishment of military installations and facilities, and any kind of military manoeuvres are banned. Nevertheless, the use of military personnel and facilities in the context of scientific and peaceful activities is permitted.

Alongside the provisions of Article IV of the Outer Space Treaty those included in Article IX are of specific relevance for our analysis, as they provide for some 'indirect' limitations to military activities in outer space. Indeed, the obligation for states parties to undertake consultations where they believe that an activity or experiment would cause harmful interference with the activities of other states parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, may clearly have implications for their military uses of outer space.[44] Allegedly, this obligation was the only one violated by China when carrying out the anti-satellite test in 2007.[45]

In conclusion, Article IV fails to provide a comprehensive regime to govern all aspects of the military uses of outer space and the interpretation and practical application of its provisions remains somewhat controversial.

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[43] Art. IV(2), 4th sent., Outer Space Treaty, *supra* n. 4.

[44] See Art. IX, 3rd sent., Outer Space Treaty, *supra* n. 4.

[45] For the 2007 Chinese ASAT test see further *infra*, n. 186. For an analysis of the relation between the Chinese ASAT test and Article IX see e.g. F.G. von der Dunk, Target Practising in a Global Commons: The Chinese ASAT Test and Outer Space Law, 10 *The Korean Journal of Air and Space Law* (2007), 181–99; M.C. Mineiro, FY-1C and USA-193 ASAT Intercepts: An Assessment of Legal Obligations under Article 9 of the Outer Space Treaty, 34 *Journal of Space Law* (2008), 321.

6.3.2 The Moon Agreement and Relevant Provisions of the Remaining Space Treaties

Apart from the Outer Space Treaty, as regards the impact on military uses of outer space, the most significant clauses are contained in the 1979 Moon Agreement. Article 3(2) of the Agreement supplements and expands the prohibition included in Article IV(2) of the Outer Space Treaty, in the sense that it prohibits any threat or use of force or any hostile act or threat of hostile act on the moon.[46] Article 3(3) also goes beyond what was previously set forth in Article IV of the Outer Space Treaty as it bans the placement of objects carrying nuclear weapons or any kind of weapons of mass destruction not only on the moon, but also in orbits around, or other trajectory to or around, the moon. It has to be emphasized that when referring to the moon, the Moon Agreement also includes celestial bodies.[47]

The 1968 Rescue Agreement does not contain a specific provision referring to military personnel. The 1975 Registration Convention requires the launching state to register with the United Nations any space object launched into earth orbit and to provide details about the space object, *inter alia* regarding its general function.[48] While, in theory, military uses could be indicated as the 'general function' of a space object, no requirement to provide such specific information exists.

6.4 THE LEGAL FRAMEWORK REGULATING MILITARY USES OF OUTER SPACE: OTHER RELEVANT INTERNATIONAL REGIMES

As previously described, the UN space treaties and in particular the Outer Space Treaty, while setting forth some limitations on the use of outer space for military purposes, leave other important aspects thereof mostly unaddressed. Consequently, in order to partially fill the gaps arising from the interpretation and application of the space treaties, one should consider the provisions of additional international legal instruments. It is important to point out that these instruments, despite not specifically

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[46] On this see V.S. Vereshchetin, Limiting and Banning Military Uses of Outer Space: Issues of International Law, in *Essays in International Law in Honour of Judge Manfred Lachs* (Ed. J. Makarczyk) (1984), 671–84.

[47] See Art. 1(1), Moon Agreement, *supra* n. 5.

[48] See Art. II and Art. IV(1) respectively, Registration Convention, *supra* n. 15.

focusing on space law-related matters, have a direct impact on space activities. This is particularly true for those treaties and agreements which deal with disarmament and arms control, negotiated both at multilateral and bilateral level.

The 1963 Partial Test Ban Treaty[49] is chronologically speaking the first international treaty on arms limitation in outer space, as it makes a clear distinction between allowed terrestrial military activities and those prohibited in the atmosphere and in outer space. In this sense, the Treaty represents an exception as it was never meant to supplement the provisions of the space treaties – which were after all negotiated after the entry into force of the Partial Test Ban Treaty – but rather to initiate the legal regulation of military uses of outer space.

According to Article I of the Partial Test Ban Treaty, nuclear tests and nuclear explosions of any kind are prohibited in the atmosphere and beyond, including outer space. States parties shall also refrain from causing, encouraging or being involved in any way in nuclear tests and explosions in any of these environments.[50] The Treaty does not ban underground testing so long it does not affect the territory of other states.[51] Clearly, Article I of the Partial Test Ban Treaty was a source of inspiration for Article IV(1) of the Outer Space Treaty.

Despite its relevance, the Partial Test Ban Treaty presents some shortcomings. Firstly, the Treaty does not prohibit the placing or use of nuclear weapons in outer space per se but refers to the testing of these types of weapons in selected physical environments. Secondly, the Treaty lacks any procedure to verify compliance with the obligations included, leading to the legal status of the Treaty as a whole being generally viewed as weak. Thirdly, Article IV of the Treaty enables states to withdraw from the Treaty with a period of notice of three months in case of 'extra-ordinary events'. As any definition of the term 'extra-ordinary event' is missing, the state withdrawing from the Treaty itself remains the sole judge.[52]

Subsequent to the Partial Test Ban Treaty, both the United States and the Soviet Union announced their decision to refrain from stationing any objects carrying nuclear weapons or other weapons of mass destruction

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[49] The Partial Test Ban Treaty, *supra* n. 23, is also often referred to as the Limited Test Ban Treaty.

[50] See Art. 1(2), Partial Test Ban Treaty, *supra* n. 23.

[51] *Cf.* US Department of State, Narrative of the Partial Test Ban Treaty, www.state.gov/t/isn/4797.htm, last accessed 17 March 2014.

[52] See P.G. Alves, *Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament* (1991), 56–7.

in outer space. This decision was later inserted into Resolution 1884(XVIII) of 17 October 1963.[53]

The Convention on the Prohibition of Military and Other Hostile Use of Environmental Modification Techniques (ENMOD Convention) was signed in 1977 and entered into force in 1980.[54] It now has 76 parties, including space powers such as the United States, Russia and China. The ENMOD Convention deals with the deliberate manipulation of the natural process for military or hostile purposes.[55] The Convention has a more encompassing scope than, for example, the Partial Test Ban Treaty, as it prohibits states parties from engaging in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects in specified areas including outer space.[56] Article II of the Convention stipulates that '"environmental modification techniques" refers to any technique for changing – through the deliberate manipulation of natural processes – the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space'. However, the ENMOD Convention expressly authorizes the use of environmental modification techniques for peaceful purposes.[57]

The ENMOD Convention assumes particular relevance at the present time because it may create restrictions on the use of a specific weapon in space, namely anti-satellite weapons (ASATs). The use of destructive, hit-to-kill ASATs, indeed, has a deleterious effect on the space environment, because, as demonstrated in the case of the 2007 Chinese ASAT test, satellite destruction results in the creation of huge amounts of space debris. Once generated, such space debris may remain in orbit for an indefinite number of years, putting at risk the safety of space objects.[58] The use of ASAT weapons may have widespread, long-lasting and severe

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[53] Question of general and complete disarmament, UNGA Res. 1884(XVIII), of 17 October 1963; UN Doc. A/RES/18/1884.

[54] Convention on the Prohibition of Military and Other Hostile Use of Environmental Modification Techniques (hereafter ENMOD Convention), Geneva, done 18 May 1977, entered into force 5 October 1978; 1108 UNTS 151; TIAS No. 9614; 31 UST 333; 31 UST 333; UKTS 1979 No. 24; Cmnd. 6985; ATS 1984, No. 22; 16 ILM 88 (1977).

[55] See generally M. Benkö, The Problem of Space Debris: A Valid Case Against the Use of Aggressive Military Systems in Outer Space?, in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 167 ff.

[56] See Art. I, ENMOD Convention, *supra* n. 54.

[57] *Cf.* Art. III, ENMOD Convention, *supra* n. 54.

[58] See further *infra*, esp. § 13.2.1.

effects on the space environment, thus falling within the scope of Article II of the Convention.

Nevertheless, the ability of the ENMOD Convention to create legal barriers to the deployment of ASAT weapons, or at least specific usage of these weapons, is undermined by the wording of the Convention itself. In order for the Convention to be applicable there must be a case of states making use of military or hostile use of other environmental modification techniques, in other words against other states – it is difficult to see how this prohibition could apply to China's destruction of its own satellite. The Chinese ASAT test was, indeed, not performed in the course of a military confrontation and was not intended to have a hostile effect on any specific state. Therefore, while putting some limits to the use of weapons in space causing long-lasting environmental detrimental effects, the ENMOD Convention does not seem to be able to halt one of the highly perceived threats to the safety of space objects, namely the testing of hit-to-kill ASAT weapons.

Though not a treaty, Resolution 2625(XV), the so-called Friendly Relations Declaration of 24 October 1970,[59] is relevant for the purpose of our analysis. The Declaration reiterates the basic principles laid down in the UN Charter by establishing that states 'shall refrain from any action, which may aggravate the situation so as to endanger the maintenance of international peace and security, and shall act in accordance with the purposes and principles of the United Nations'.[60] Consequently, states shall avoid any military use of or activity in outer space which may result in a threat to international peace and security.

The 1996 Comprehensive Nuclear Test Ban Treaty[61] goes beyond the 1963 Partial Test Ban Treaty as it bans nuclear explosions in all environments either for military or civilian purposes. Under the Treaty, states parties shall refrain from carrying out or encouraging in any way nuclear weapons test explosions or any other nuclear explosion and shall prohibit and prevent any such nuclear explosion in any place under their jurisdiction.[62]

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[59] United Nations Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations, UNGA Res. 2625(XXV), of 24 October 1970; UN Doc. A/8028.

[60] Princ. 2(4), UNGA Resolution 2625(XXV), *supra* n. 59.

[61] Comprehensive Nuclear Test Ban Treaty, New York, done 24 September 1996, not yet entered into force; Cm. 3665; 35 ILM 1439 (1996); S. Treaty Doc. No. 105-28 (1997).

[62] See Art. I, Comprehensive Nuclear Test Ban Treaty, *supra* n. 61.

Significantly, the Treaty foresees a system to verify compliance with its provisions. This system shall operate in the least intrusive manner and be based on objective information provided by the states parties. The Treaty was opened for signature on 24 September 1996; as of March 2014, 162 states have ratified the Treaty and another 21 have merely signed it.[63] Three nuclear weapon states, notably India, North Korea and Pakistan, have not signed the Treaty. Among others, China, Iran, Israel and the United States[64] have signed the Treaty but not yet ratified it.

Another important legal instrument related to military uses of outer space is the International Code of Conduct against Ballistic Missile Proliferation (ICOC).[65] Its importance stems not only from the fact that ballistic missiles carrying nuclear warheads traverse outer space, but also because these types of missiles can be modified to serve as launch vehicles[66] as well as workable ASATs. The purpose of the ICOC is to stop ballistic missile proliferation. Subscribing states commit not to support ballistic missile programmes in countries suspected of developing nuclear, biological or chemical weapons.[67] Additionally, they are asked to ensure 'the necessary vigilance' in assisting other countries' space launch programmes, which could be used to disguise ballistic missile programmes.[68] The ICOC establishes transparency and confidence-building measures by asking subscribing states to submit an annual declaration providing an outline of their ballistic missile policies and to exchange pre-launch notifications on ballistic missile and space launch vehicle launches.[69]

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63 See http://en.wikipedia.org/wiki/Comprehensive_Nuclear-Test-Ban_Treaty, last accessed 14 April 2014; for information and updates on the Treaty, see www.ctbto.org, last accessed 14 April 2014.

64 The US Senate refused to ratify the Treaty in 1999; see www.armscontrol.org/act/1999_09-10/ctbso99, last accessed 14 April 2014.

65 For the text of the ICOC see www.armscontrol.org/documents/icoc, last accessed 14 April 2014. For an analysis of the ICOC, see L. Marta, The Hague Code of Conduct Against Ballistic Missile Proliferation: 'Lessons Learned' for the European Union Code of Conduct for Outer Space Activities, 34 *ESPI Perspectives* (June 2010).

66 For example, the Soviet Proton rocket originally designed to carry nuclear warheads is now used for heavy lift services into orbit.

67 See Art. 3(5), ICOC, *supra* n. 65.

68 Art. 3(4), ICOC, *supra* n. 65.

69 See Art. 4(1), ICOC, *supra* n. 65. Further *cf.* J. Robinson, The Role of Transparency and Confidence-Building Measures in Advancing Space Security, 28 *ESPI Report* (September 2010), 21–2.

The ICOC is not a treaty; it is a typical example of a so-called 'soft law' instrument, an instrument which does not have binding character and is therefore voluntary in nature. Despite lacking such obligatory value, its provisions are not to be entirely neglected, as they carry considerable political authority. Significantly, the Code has 133 subscribing states, including the United States and Russia. However, several key countries that are active in the field of ballistic missiles, such as North Korea, Iran and China, as well as others such as Brazil, Mexico and Saudi Arabia, have not subscribed to the Code. It appears, thus, that most of the countries located in the area from North Africa to East Asia do not participate in the Code. This seriously undermines its credibility as a universal security tool.

There are also a number of bilateral agreements that stipulate arms limitation or disarmament measures and by that token have an impact on the military uses of outer space. It has been observed that while being bilateral in character, these agreements had the potential to become multilateral or become customary in space law within the international community as a whole due to the fact that they were negotiated between the two most relevant space powers at that time, the United States and the Soviet Union.[70] In this respect, the most significant bilateral agreement was the 1972 Anti-Ballistic Missile (ABM) Treaty[71] because it represented the first concrete legal step to reinforce the partial demilitarization of outer space since the time of the Outer Space Treaty. The ABM Treaty banned the testing and deployment of space-based, sea-based, and air-based ABM systems and components.

Article V of the Treaty thus provided: 'Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.' It also imposed a ban on ASATs by stating that '[e]ach Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article'.[72] Furthermore, it established that '[e]ach Party undertakes not to use deliberate concealment measures which impede verification by national technical means of

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70 *Cf.* Rathgeber & Remuss, *supra* n. 2, 16.

71 Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems (hereafter ABM Treaty), Moscow, done 26 May 1972, entered into force 3 October 1972, no longer in effect 13 June 2002; 944 UNTS 13; TIAS No. 7503; 23 UST 3435.

72 Art. XII(2), ABM Treaty, *supra* n. 71.

compliance with the provisions of this Treaty'.[73] Following the withdrawal of the United States in 2002, the Treaty is officially void. This fact has a serious negative effect on the security of space objects and outer space as a whole because it can be said that there is no longer a treaty prohibition against testing or deploying weapons in space other than weapons of mass destruction or nuclear weapons.[74]

Chronologically, the ABM Treaty was followed by seven-year long negotiations, concluded in Vienna in 1979 with the signing of the Strategic Arms Limitation Treaty (SALT II).[75] This Treaty limited the number of strategic nuclear delivery vehicles (ICBMs, SLBMs and heavy bombers), MIRV systems and strategic offensive arms. It likewise imposed a ban on construction of new land-based ICBM launchers and incorporated verification provisions.

Due mainly to a number of unresolved issues, the SALT II Treaty never entered into force. In July 1991 instead the bilateral Strategic Arms Reduction Treaty (START) was announced.[76] It called for specific limits on launchers and the first physical reduction in US and Soviet strategic nuclear weapons ever agreed too. A new Strategic Arms Limitation Agreement was signed by Presidents Barack Obama and Dmitri Medvedev in April 2010, replacing the expired 1991 START Treaty.[77] The 2010 agreement reduced the number of deployed nuclear warheads to 1,550 and the number of delivery vehicles (ICBMs, submarines and bombers) to 800 (down from 1,600 under the START agreement).[78] These developments have an impact on space activities because delivery

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[73] Art. XII(3), ABM Treaty, *supra* n. 71.

[74] See J. Dean, Future Security in Space: Treaty Issues, *INESAP Information Bulletin* 20 (2002), 21 July 2002; www.inesap.org/sites/default/files/inesap_old/bulletin20/bul20art03.htm, last accessed 14 April 2014; T. Hitchens, *Future Security in Space – Charting a Cooperative Course*, Center for Defense Information (2004), 83.

[75] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms (hereafter SALT II Treaty), Vienna, signed 18 June 1979, not entered into force; UST LEXIS 220; 18 ILM 1112 (1979); S. Exec. Doc. Y, 96-1.

[76] Treaty on the Reduction and Limitation of Strategic Offensive Arms (hereafter START I Treaty), Moscow, done 31 July 1991, not entered into force; S. Treaty Doc. No. 102-20.

[77] See http://abcnews.go.com/topics/news/world/strategic-arms-reduction-treaty.htm, last accessed 14 April 2014.

[78] See Art. 2(b), (c), Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms, Prague, done 8 April 2010, entered into force 5

vehicles capable of carrying intercontinental warheads can be modified to serve as launchers of payloads in outer space. From this perspective, an important legal question is whether such a modification could constitute one of the reductions required under the above treaties.

Finally, an additional treaty framework, not belonging to the area of arms limitation strictly speaking, is still worth mentioning here as its provisions are also relevant to the military uses of outer space, in particular the use of military satellites: the 1992 Constitution and Convention of the International Telecommunication Union (ITU).[79] These two documents establish the framework for the use of the radio-frequency spectrum of geostationary and other satellite orbits by member states.[80] With specific regard to the use of military radio installations,[81] Article 48(1) of the ITU Constitution provides: 'Member States retain their entire freedom with regard to military radio installations.' Such a provision must be read in connection with that contained in the second paragraph of the same Article, which specifies: 'Nevertheless, these [military radio] installations must, so far as possible, observe statutory provisions relative to giving assistance in case of distress and to the measures to be taken to prevent harmful interference.' This restriction is in line with a broader obligation falling upon ITU member states, namely to avoid harmful interference to the radio services or communications of other member states, as per Article 45 of the Constitution.[82]

February 2011; Treaty Doc. 111-5, www.state.gov/documents/organization/140035.pdf, last accessed 14 April 2014.

[79] ITU Constitution (Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1), resp. ITU Convention (Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71). Since their adoption in 1992, the ITU Constitution and Convention have been amended by Plenipotentiary Conferences (Kyoto, 1994; Minneapolis, 1998 and Marrakesh, 2002). Those amendments entered into force on 1 January 1996, 1 January 2000 and 1 January 2004. See further www.itu.int/net/about/basic-texts/index.aspx, last accessed 17 March 2014.

[80] For an analysis of the ITU system see further *infra*, § 8.2.

[81] See also Schmitt, *supra* n. 9, 89–125.

[82] Art. 45(1), ITU Constitution, *supra* n. 79, reads: 'All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States or of recognized operating agencies, or of other duly authorized operating

6.5 THE LEGAL FRAMEWORK REGULATING MILITARY USES OF OUTER SPACE: GENERAL PUBLIC INTERNATIONAL LAW

6.5.1 Exceptions to the Prohibition on the Use of Force in the UN Charter

Outer space activities must be carried out in compliance with the fundamental rules of public international law, in particular those included in the UN Charter. Such applicability of public international law to outer space is formally codified by Article III of the Outer Space Treaty, which states that space activities are to be conducted 'in accordance with international law including the Charter of the United Nations, in the interest of maintaining international peace and security'.[83] Consequently, the provisions of the Outer Space Treaty dealing with the military uses of outer space, specifically those of Article IV as discussed above, must be interpreted in the light of the UN Charter which, *a fortiori*, is designed to have supremacy over subsequent treaties like the Outer Space Treaty.[84]

One of the primary goals of the United Nations is to maintain international peace and security.[85] In order to achieve this goal, the UN member states agree to take collective measure to prevent and remove threats to peace and to suppress acts of aggression. The UN system is based on the provisions of Article 2(4) of the UN Charter which prohibit the threat or use of force in interstate relations.[86] These provisions, which are generally viewed as having the value of peremptory norms of international law,[87] give direction and guidance to the remaining principles of the UN Charter. As a corollary to Article 2(4) states are required

agencies which carry on a radio service, and which operate in accordance with the provisions of the Radio Regulations.'

[83] Similar provisions referring to the applicability of public international law to space activities are included in Art. 2, Moon Agreement, *supra* n. 5.

[84] See Art. 103, UN Charter, *supra* n. 6. For an extensive analysis of the UN Charter, including its supremacy over other international treaties, see B. Simma *et al.*, *The Charter of the United Nations*: *A Commentary* (3rd edn., 2000). *Cf.* further *supra*, e.g. § 2.1.1.

[85] See Art. 1(1), UN Charter, *supra* n. 6.

[86] See C. Gray, *International Law and the Use of Force* (2nd edn., 2004); A. Belatchev, *Prohibition of Force Under the UN Charter, A Study of Art. 2(4)* (1991).

[87] *Cf.* Art. 53, Vienna Convention on the Law of Treaties, *supra* n. 17. For a description of the characteristics of 'peremptory norms' see A. Cassese, *International Law* (2005), 168.

to settle their disputes likely to endanger international peace and security by peaceful means in accordance with the provisions of Articles 2(3) and 33 of the Charter.[88]

The UN Charter foresees two main exceptions to the prohibition on the use of force in international relations: the use of force by states authorized by the Security Council under Chapter VII of the Charter and the individual or collective right of self-defence pursuant to Article 51 of the Charter. The provisions of Chapter VII and Article 51 of the Charter constitute the foundation of the so-called *jus ad bellum*, namely the circumstances under which it is lawful to have recourse to military force.[89]

As to the first exception, the Security Council plays a key role within the centralized system of collective security established by the UN Charter.[90] Firstly, the Security Council has the power to determine the existence of a threat to the peace, breach of the peace, or act of aggression and, consequently, the authority to make recommendations (as per Article 39) and to decide what enforcement measures shall be taken according to Articles 41 (referring to measures not involving force) and 42 (referring to military actions). Among the measures not involving the use of force figures the 'interruption of … radio, and other means of communication', which may include space assets.[91]

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[88] Art. 33, UN Charter, *supra* n. 6, reads as follows: '1. The parties to any dispute, the continuance of which is likely to endanger the maintenance of international peace and security, shall, first of all, seek a solution by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means of their own choice. 2. The Security Council shall, when it deems necessary, call upon the parties to settle their dispute by such means.'

[89] See R.J. Lee, The *jus ad bellum in spatialis*: The Exact Content and Practical Implications of the Law on the Use of Force in Outer Space, 29 *Journal of Space Law* (2003), 93; S. Mosteshar, Militarization of Outer Space: Legality and Implications for the Future of Space Law, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 473 ff.; N.O. Ruiz & E. Salamanca-Aguado, Exploring the Limits of International Law Relating to the Use of Force in Self-defence, 16 *European Journal of International Law* (2005), 499; N. Deller, *Jus ad Bellum*: Law Regulating Resort to Force, 30 *Human Rights* (2003), 8; Y. Dinstein *War, Aggression and Self-Defence* (3rd edn., 2001).

[90] See D. Schweigman, *The Authority of the Security Council Under Chapter VII of the UN Charter: Legal Limits and the Role of the International Court of Justice* (2001).

[91] Art. 41, UN Charter, *supra* n. 6.

Military actions are the *ultima ratio* and shall be considered only if the Security Council deems measures not involving force not adequate.[92] Only in that case may the Security Council take measures to maintain and restore peace: to this end it shall have military forces at its disposal.[93] According to Article 43 of the UN Charter, states shall make available forces to the Security Council in accordance with special agreement or agreements. However, these agreements have never been concluded, with the result that the Security Council in reality has remained without tools to implement its collective security tasks. Because of this situation, the Security Council has progressively developed the practice of authorizing individual states to use force. Generally, states inform the Security Council about their intention or willingness to use force to restore international peace and security and request from the Council authorization to do so.[94]

With regard to the second exception to the prohibition on the use of force, Article 51 of the UN Charter recognizes that UN member states have the 'inherent right of individual or collective self-defense if an armed attack occurs'. The interpretation and application of the right of self-defence have generated much debate; in particular, the main point of controversy has been the identification of the moment from which this right can be exercised. The traditional and most accepted interpretation suggests a restrictive understanding of the provisions of Article 51.[95] From this perspective, a state can act in self-defence only after an armed attack has occurred. This view has also been held by the International Court of Justice in the *Nicaragua Case*.[96]

However, an alternative interpretation claiming the existence of a pre-emptive right of self-defence, namely the right to act in self-defence before an attack has taken place, has also been put forward by some

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92 See Art. 42, UN Charter, *supra* n. 6.

93 *Cf.* esp. Arts. 43–46, UN Charter, *supra* n. 6.

94 See N. Blokker, Is the Authorization Authorized? Powers and Practice of the UN Security Council to Authorize the Use of Force by Coalitions of the Able and Willing, 11 *European Journal of International Law* (2000), 541; R.A. Falk, What future for the UN Charter System of War Prevention?, 97 *American Journal of International Law* (2003), 590; M. Reisman, Criteria for the Lawful Use of Force in International Law, 10 *Yale Journal of International Law* (1985), 279.

95 See Dinstein, *supra* n. 89, 182 ff.; J. O'Brien, *International Law* (2002), 682.

96 *Case Concerning Military and Paramilitary Activities in and Against Nicaragua (Nicaragua v United* State*s of America)*, Merits, June 26, ICJ Reports 1986, pp. 14–150, para. 195.

authors.[97] The supporters of this view claim that a customary international law right of pre-emptive self-defence existed in the period preceding the UN Charter, and that the Charter has not modified or amended such a right. According to the famous formulation of US Secretary of State Daniel Webster, adopted by the seminal *Caroline Case*, the legitimate exercise of this right requires 'a necessity of self-defense, instant, overwhelming, leaving no choice of means, and no moment for deliberation'.[98] In addition, the action taken must be proportionate.[99] In short, this right of pre-emptive self-defence could be exercised only upon compliance with strict criteria, such as the presence of a proven immediate threat against a state's territory or forces and the absence of a practicable alternative to an action of military self-defence.

Regardless of the interpretation given to Article 51, any self-defence action must comply with the principles of necessity and proportionality.[100] 'Necessity' means that forceful action is necessary to defend against an attack.[101] As correctly described: 'Its application … calls for assessments of intentions and conditions bearing upon the likelihood of attack (in the case of anticipatory self-defence) or, if an attack has already taken place, of the likelihood that peaceful means may not be effective to restore peace and remove the attackers.'[102] Recourse to force is therefore legally available only after peaceful means to settle the dispute have failed.[103] Clearly, if an attack has already taken place, the requirement of necessity is automatically complied with and the state being attacked can undoubtedly exercise its right to act in self-defence.

'Proportionality' is linked to the ultimate goal of self-defence, which is not punishment or reprisal, but rather to respond or to prevent an armed

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[97] See Simma *et al.*, *supra* n. 84, p. 678; I. Brownlie, *International Law and the Use of Force by States* (1963), 275.

[98] Note of Daniel Webster of 24 April 1841, http://avalon.law.yale.edu/19th_century/br-1842d.asp#web2, last accessed 14 April 2014. For a summary of the *Caroline Case* see M.N. Shaw, *International Law* (6th edn., 2008), 1131.

[99] For a comprehensive analysis of the right of self-defence see D. Kretzmer, The Inherent Right to Self-Defence and Proportionality in *Jus Ad Bellum*, 24 *European Journal of International Law* (2013), 235.

[100] This concept has been affirmed *i.a.* by the International Court of Justice in the *Nicaragua Case*, see *Military and Paramilitary Activities (Nicaragua v. US)*, 1986 I.C.J. 14, at 103.

[101] Cf. A.C. Arend & R.J. Beck, *International Law and The Use of Force* (1993), 72.

[102] O. Schachter, The Right of States to Use Armed Force, 82 *Michigan Law Review* (1984), 1635.

[103] *Ibid.*, 1635.

attack or an imminent threat. Any self-defence action must not exceed in its aim or manner the events which provoke it and must be, thus, proportionate to the attack.

6.5.2 Applicability of the Two Exceptions to the Prohibition on the Use of Force to Outer Space

As discussed, the Charter of the United Nations establishes two exceptions to the prohibition on the use of force: military intervention authorized by the UN Security Council and the right to act in self-defence. As per Article III of the Outer Space Treaty, international law and, in particular, the UN Charter, is relevant to outer space activities, and the applicability also of these two exceptions extends to the realm of outer space. So, while being generally prohibited from using force in outer space, states might be legally entitled to do so if authorized by the UN Security Council or if the right of self-defence is triggered.[104]

The Security Council has never discussed authorizing states to use force in outer space so far; however, this possibility cannot be excluded, especially taking into account the growing importance of space assets. This potential authorization does not seem to raise any specific legal issues, as it might be considered to fall within the scope of Chapter VII of the UN Charter and to be activated under the same prerequisites that normally trigger the application of Chapter VII. The only issues might be those related to the chronic decision-making difficulties the Security Council encounters because of the veto power of the five permanent Security Council members.[105] These difficulties raise questions about the Council's ability to effectively maintain and restore international peace and security in the event of a crisis connected to events occurring in outer space.

As far as the right to act in self-defence is concerned, while some authors question its applicability to outer space,[106] the dominant view is that states may exercise this right to protect their space assets.[107] In literature there is no agreement as to which interpretation of self-defence

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[104] On this point see generally Lee, *supra* n. 89, 93.

[105] See Arts. 23(1), 27(3), UN Charter, *supra* n. 6.

[106] *Cf.* I. Vlasic, Space Law and the Military Applications of Space Technology, in *Perspectives on International Law* (Ed. N. Jasentuliyana) (1995), 394; A. Hurwitz, *The Legality of Space Militarization* (1986), 72.

[107] See C.M. Petras, The Use of Force in Response to Cyber Attack on Commercial Space Systems – Reexamining 'Self-Defense' in Outer Space in The Light of the Convergence of US Military and Commercial Space Systems, 67

should be applied to outer space, whether a restrictive or broader one, although there is a general tendency to prefer the former. Regardless of the interpretation chosen, the application of the right of self-defence in outer space appears rather problematic.[108] In this respect, the most debated points concern the nature of the events which might trigger the right of self-defence in space and the nature of the self-defence actions which states might undertake.

As to the first point, certainly the intentional destruction of a satellite, for example by means of a kinetic weapon, would authorize a state to act in self-defence in outer space under a restrictive interpretation of Article 51 of the UN Charter, as it would meet the requirement of an 'armed attack'. Furthermore, it is arguable that an attack against a space object registered by a state could constitute an attack against that state's 'territory'.[109] This hypothesis is in line with existing international law principles, particularly those belonging to the international law of the sea, according to which attacks against a vessel carrying the flag of a state in international waters amounts to an attack against the 'territory' of the state of flag.

However, it could hardly be claimed that the mere placement in space of weapons not forbidden by Article IV of the Outer Space Treaty would constitute an 'armed attack against the territory of another state' – it is more similar to the movement of troops on the ground. A bit more difficult to ascertain would be the status of 'attacks' against a satellite that do not cause its destruction, such as a cyber attack. Certainly, such an act authorizes a state to react but the scale of this reaction is to be determined based on factors like the purpose of the cyber attack, its measure of repetitiveness, and its connection with other military activities on the ground.[110]

As to the second point, due to the delicate nature of outer space, states should refrain from military actions which may put at risk the safety of other states' space objects as well as result in the contamination of outer space. Outer space is a very peculiar environment in which one's action

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Journal of Air Law & Commerce (2002), 1213; G. Zhukov, *International Space Law* (1976), 89; J.E.S. Fawcett, *International Law and The Use of Outer Space* (1968), 39.

108 See D. Goedhuis, Legal Implications of the Present and Projected Military Uses of Outer Space, in *Maintaining Outer Space for Peaceful Purposes* (Ed. N. Jasentuliyana) (1984), 253, 260–4; Schmitt, *supra* n. 9, 89.

109 Note that Art. VIII, Outer Space Treaty, *supra* n. 4, effectively provides a state with quasi-territorial jurisdiction over a space object once registered.

110 *Cf.* e.g. Petras, *supra* n. 107, 1220.

may have negative consequences on all the other subjects involved. Indeed, unlike on earth, where the effects and the damage of a military strike can be limited to the enemy's facility or territory, in space this does not happen. For example, if a satellite is destroyed by means of a kinetic weapon, the pieces of space debris released upon the impact will threaten satellites for an extensive period of time.[111]

Currently, there are no express legal limits on how far states can go when acting in self-defence in outer space. Arguably, Article IX of the Outer Space Treaty, which would in principle impose restrictions by requiring a state not to cause harmful interference to the space activities of other states or to the space environment, is not applicable in times of war.[112] So, if a restrictive approach to self-defence is adopted, the most stringent barriers can come from the application of the principle of proportionality. Thus, in the case of an attack on the ground, a state should refrain from retaliating by striking another state's satellite, as the consequence of such an action could be disproportionate and negatively affect third parties. Additionally, in the event of the use of force against one of its space objects, a state should preferably counter-attack by targeting ground stations of the attacker, even if striking against an enemy's satellite is not expressly prohibited.

The relevance of the principle of proportionality would be even greater if a broad interpretation of the right of self-defence were used. Indeed, a preventive strike against another state's satellite would have consequences disproportionate to the primary goal of affecting that state, as not only would the space environment be contaminated, but third parties' space activities would be endangered. From this perspective, there is room to argue that states should refrain, to the greatest possible extent, from using destructive weapons in space, such as those resulting in a cloud of debris, and should opt for alternative approaches, such as using laser, radio jamming or cyber attack.

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[111] For example, on 22 January 2013 a small Russian satellite called Ball Lens in the Space (BLITS) was hit by debris from the 2007 Chinese Anti-Satellite test; see www.space.com/20138-russian-satellite-chinese-space-junk.html, last visited 18 March 2014.

[112] See L.T. Tate, The Status of the Outer Space Treaty at International Law During 'War' and 'Those Measures Short of War', 32 *Journal of Space Law* (2006), 177; M. Bourbonnière, *Jus in Bello Spatialis*, Space Studies Institute Paper Series (1999), 143.

6.5.3 International Humanitarian Law and Outer Space

Additionally, when dealing with the use of force in outer space the applicability and relevance of another set of rules must be taken into account, namely the *jus in bello* or international humanitarian law rules.[113] The term 'international humanitarian law' refers to the law regulating how war is to be conducted. The humanitarian law is mainly composed of two systems: the Geneva system[114] and the Hague

[113] This section provides only a general overview of the applicability of international humanitarian rules to outer space. A deeper analysis of this issue goes beyond the restricted scope of this chapter.

[114] The Geneva system consists of the so-called four Geneva Conventions (Geneva Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field (First Geneva Convention), Geneva, done 12 August 1949, entered into force 21 October 1950; 75 UNTS 31; TIAS No. 3362; 6 UST 3114; ATS 1958 No. 21; Geneva Convention for the Amelioration of the Condition of the Wounded, Sick and Shipwrecked Members of Armed Forces at Sea (Second Geneva Convention), Geneva, done 12 August 1949, entered into force 21 October 1950; 75 UNTS 85; TIAS No. 3363; 6 UST 3217; ATS 1958 No. 21; Geneva Convention relative to the Treatment of Prisoners of War (Third Geneva Convention), Geneva, done 12 August 1949, entered into force 21 October 1950; 75 UNTS 135; TIAS No. 3364; 6 UST 3316; ATS 1958 No. 21; and Geneva Convention relative to the Protection of Civilian Persons in Time of War (Fourth Geneva Convention), Geneva, done 12 August 1949, entered into force 21 October 1950; 75 UNTS 287; TIAS No. 3365; 6 UST 3516; ATS 1958 No. 21) and three Additional Protocols (Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (hereafter Geneva Protocol I), Geneva, done 8 June 1977, entered into force 7 December 1978; 1125 UNTS 3; UKTS 1999 No. 29; Cm. 4338; ATS 1991 No. 29; 16 ILM 1391 (1977); 72 AJIL 457 (1978); Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts (hereafter Geneva Protocol II), Geneva, done 8 June 1977, entered into force 7 December 1978; UKTS 1999 No. 30; Cm. 4339; ATS 1991 No. 30; 16 ILM 1442 (1977); 72 AJIL 502 (1978); and Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Adoption of an Additional Distinctive Emblem (hereafter Geneva Protocol III), Geneva, done 8 December 2005, entered into force 14 January 2007; Cm. 6917; S. Treaty Doc. No. 109-10 (2006); 2005 WL 4701955). The Conventions were developed at different stages between 1864 and 1949 and focused on the protection of civilians and those who can no longer fight in armed conflict. The three Protocols, which amended certain aspects of the Conventions, were developed in 1977 (Geneva Protocols I and II) and in 2005 (Geneva Protocol III). The texts of the Conventions and of the first two Protocols are also available in *Documents on the Laws of War* (Eds. A. Roberts & R. Guelff) (2000).

system.[115] The Geneva system is primarily concerned with maintaining human security and dignity during armed conflicts. The Hague system is focused on the legitimacy of the means and methods of conducting hostilities. Among the fundamental principles of humanitarian law are proportionality, humanity, discrimination and military necessity.

Fortunately, hostilities have not so far arisen in space; however, it cannot be excluded that one day outer space will become a battlefield. Although the international humanitarian law rules were not specifically developed to govern the use of force in outer space, their applicability to the realm of outer space should not be questioned. Nevertheless, this does not mean that these rules can be applied *in toto* to outer space conflicts or that they may be suited to properly regulate all possible uses of force in space in their current formulation. The most significant issue related to the use of force to, from and within outer space is that, according to international humanitarian law rules, such force can only be exercised against legitimate military objectives.[116] Due to the fact that the majority of commercial satellites have dual-use capacity and often have military clients, the determination of a legitimate military target in space is highly complicated.[117] In principle, certain dual-use satellites, such as communication, remote sensing and navigation satellites, if used in the context of military operations, would constitute legitimate targets. Instead, it would be illegal to attack a civilian object merely because of its potential value to the enemy.

After having determined that, upon certain conditions, dual-use satellites might be targeted, there are two important questions to be addressed: how these satellites could be attacked, and how collateral damage could be limited. As to the first question, an attack could be undertaken by means of a kinetic destructive hit-to-kill weapon, such as an anti-satellite missile, which causes the destruction of the targeted object, or by means

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[115] The Hague system includes two international Conventions negotiated at international peace conferences at The Hague in the Netherlands: the First Hague Conference in 1899, leading to the Convention for the Pacific Settlement of International Disputes, The Hague, done 29 July 1899, entered into force 4 September 1900; ATS 1901 No. 130; and the Second Hague Conference in 1907, leading to the Convention for the Pacific Settlement of International Disputes, The Hague, done 18 October 1907, entered into force 26 January 1910; ATS 1997 No. 6. The text of the Conventions is also available in *Documents on the Laws of War*, *supra* n. 114.

[116] See M. Bourbonnière, National Security Law in Outer Space: The Interface of Exploration and Security, 70 *Journal of Air Law & Commerce* (2005), 3.

[117] *Ibid.*, 49.

of non-kinetic techniques, such as jamming, distorting, use of laser waves and suchlike. As a criterion to select the means of attack, one could consider the collateral damage that could result upon recourse to such means. As previously described, outer space is a special environment, where a hit-to-kill strike against a satellite would not only endanger the operation and life of third states' satellites, but would also negatively affect 'users' on the ground (apart from obviously causing losses to the 'owner' of the targeted satellite). Consequently, states should opt for the use of non-kinetic weapons, or concentrate their attacks on ground stations; in any case, states should adopt an approach aimed at minimizing collateral damage or incidental injuries to civilians caused during space-related combat operations, in particular by selecting progressive negating options, with the destruction of a satellite constituting the *ultima ratio*.

The above are, however, mere suggestions, as currently there are no internationally agreed rules regulating warfare in space. Because of this situation, it has been suggested that a *jus in bello spatialis* should be developed, namely a dedicated set of rules governing armed conflicts in outer space and, thus, imposing limits in the way military force is used in space.[118] In the view of the proposers of this idea, existing international humanitarian rules and, in particular, those included in Geneva Protocol I should be duly amended to make them applicable to the space realm in a clear and unquestionable manner.

6.6 OTHER LEGAL REGIMES AFFECTING MILITARY ACTIVITIES IN OUTER SPACE

Space activities are also influenced by a series of specific regimes, both international and national, dealing, for example, with the non-proliferation of nuclear weapons as well as the regulation of the market of commodities and technologies necessary to launch, carry and use such weapons.

[118] See M. Bourbonnière, Law of Armed Conflict (LOAC) and the Neutralisation of Satellites or *Ius in Bello Satellitis*, 9 *Journal of Conflict and Security Law* (2004), 43; F. Tronchetti, The Applicability of Rules of International Humanitarian Law to Military Conflicts in Outer Space: Legal Certainty or Time for a Change, in *Proceedings of the International Institute of Space Law 2012* (2013), 357; S.R. Freeland, The Applicability of the *Jus in Bello* Rules of International Humanitarian Law to The Use of Outer Space, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 338.

While, at first glance, attempts by some nations to stem the proliferation of nuclear weapons and related technologies may appear unrelated to space activities, the connection is to be found in the dual-use nature of these technologies. Often, the technologies used to build and carry sophisticated weapons (for example ballistic missiles) are similar if not identical to the technologies required for civilian space programmes, such as for launching satellites into earth orbit. Due to the fact that these specific regimes prohibit or impose restrictions on the international transfer of these technologies and commodities, growing tensions between states wishing to develop their civilian space programmes, on one side, and states willing to prevent the traffic of dangerous military items, on the other side, have developed. In this respect, developing states have long voiced their disappointment by arguing that export control restrictions prevent them from having access to, and using, outer space. From the other end the most technologically advanced states claim that trade restrictions on dangerous military items are justified for national security and foreign policy reasons.

6.6.1 The Missile Technology Control Regime

In 1987 the governments of the leading industrial nations adopted the Missile Technology Control Regime (MTCR)[119] in order to coordinate their export controls so as to control nuclear proliferation.[120] Responding to the apparent inadequacy of the earlier non-proliferation regime based on the 1968 Nuclear Non-Proliferation Treaty,[121] the seven initial MTCR adherents[122] informally agreed in an exchange of letters to deal with the problem of global nuclear proliferation through export controls on

[119] Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles (hereafter MTCR Agreement), done 16 April 1987; 26 ILM 599 (1987). For more information on the MTCR see also www.mtcr.info/english/index.html, last accessed 5 November 2013. See also further on the MTCR, esp. in the context of launching activities, *infra*, § 7.5.1.1.

[120] See M. Fitzpatrick, Note, Arms Control: Export Controls on Missile Technology, 29 *Harvard International Law Journal* (1988), 145–6.

[121] Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty), London/Moscow/Washington, done 1 July 1968, entered into force 5 March 1970; 729 UNTS 161; TIAS 6839; 21 UST 483; UKTS 1970 No. 88; Cmnd. 3683; ATS 1973 No. 3; 7 ILM 809 (1968).

[122] The original members of the MTCR were the 'G-7' countries, i.e. Canada, Germany, France, Italy, Japan, the United Kingdom and the United States.

weapons *delivery systems*, rather than on nuclear materials and technology in order to control transfers that could make a contribution to nuclear weapons delivery systems other than manned aircraft.[123]

It is important to point out that the MTCR Agreement is not a treaty but rather a set of voluntary arrangements among concerned states. MTCR states apply a common export control policy (as per the MTCR Guidelines for Sensitive Missile-Relevant Transfers) on an agreed list (the MTCR Equipment, Software and Technology Annex).[124]

The MTCR put under strict controls the export of space launch vehicles, components and the production technologies used in civilian space programmes. Under the MTCR Agreement, all 'missile-related' technologies are divided into two categories, which separate the most strictly controlled articles from less-restricted ones.

Category I, the most restricted group, contains '[c]omplete rocket systems (including ballistic missile systems, *space launch vehicles*, and sounding rockets) and unmanned air vehicle systems … [of a certain range] as well as the specially designed production facilities for these systems'.[125] Category I technology transfers, and thus all proposed transfers of space launch vehicles, components and production facilities, are strictly controlled under the MTCR. The regime imposes a 'strong presumption to deny' export applications for the listed Category I items. This presumption may be rebutted only when the recipient state provides binding assurances that '[t]he items will be used only for the purpose stated' and that the item will not be retransferred without permission.[126] Importantly, there is no bright line between military 'missiles' and civilian 'space launch vehicles'. In fact, early civilian space projects simply adopted military technologies.

Category II comprises an extensive list of dual-use technologies which may have potential uses in MTCR-controlled projects, such as propulsion

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[123] See Canada-France-Federal Republic of Germany-Italy-Japan-United Kingdom-United States: Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles, Exchange of letters, announced 16 April 1987; 26 ILM 599 (1987).

[124] See MTCR Equipment, Software and Technology Annex (hereinafter MTCR Annex), 23 October 2012, www.mtcr.info/english/annex.html, last accessed 17 March 2014.

[125] Introduction, Definitions, Terminology, Sec. 2, Definitions, MTCR Annex, *supra* n. 124.

[126] Sec. 2, MTCR Guidelines for Sensitive Missile-Relevant Transfers (hereafter MTCR Guidelines), www.mtcr.info/english/guidetext.htm, last accessed 5 November 2013.

components, propellants, structural materials, communications equipment, avionics equipment and certain computers.[127] These transfers are presumptively permitted, provided they do not contribute to a 'project of concern'.[128] Projects of concern are identified case by case, by evaluating the risks of nuclear proliferation, the status of the recipient state's missile and space programmes, whether the transfer will contribute to the development of a delivery system, the proposed end-use of the item, and any other 'relevant multilateral agreements'.[129]

Each MTCR member is supposed to establish national export control policies for ballistic missiles, cruise missiles, unmanned aerial vehicles, space launch vehicles, drones, remotely piloted vehicles, sounding rockets, and underlying components and technologies that appear on the MTCR Annex.[130] As the MTCR is an informal non-treaty association of governments sharing common interests, no formal mechanism to enforce its provisions is in place. Thus, the controls foreseen by the MTCR Guidelines and Annex are implemented by each state in accordance with its laws and regulations.

Although the MTCR Guidelines 'are not designed to impede national space programs or international cooperation in such programs [which] could not contribute to nuclear weapons delivery systems',[131] nothing in them expressly excludes purely civilian or non-aggressive military space projects from export controls. The MTCR's stringent Category I controls have been strictly applied, in particular by the United States, with respect to space launch vehicle projects.[132] Significantly, in the United States, the Missile Technology Export Control Group, which is a governmental inter-agency group, reviews licence applications administered by the Department of Commerce (on dual-use goods) and the Directorate of Defense Trade Controls (DDTC) (on munitions). The recommendations of the Group are rarely overruled. In terms of non-proliferation, since September 1993 under the National Non-Proliferation Policy[133] the United States *does not* support the development or acquisition of MTCR

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127 See Catgeory II, MTCR Annex, *supra* n. 124.

128 See R.H. Speier, The Missile Technology Control Regime, in *Chemical Weapons & Missile Proliferation* (Ed. T. Findlay) (1991), 120.

129 Sec. 3, MTCR Guidelines *supra* n. 126.

130 See www.armscontrol.org/factsheets/mtcr, last accessed 17 March 2014.

131 MTCR Guidelines, *supra* n. 126, 600.

132 See for the US ITARs further *infra*, § 6.6.3, § 7.5.1.4; also § 7.5.2.3.

133 President Clinton Fact Sheet on Nonproliferation And Export Control Policy, 27 September 1993, www.rertr.anl.gov/REFDOCS/PRES93NP.html, last accessed 14 April 2014.

Category I systems, including space launch vehicles, in non-MTCR countries and does not encourage new (not supported pre-1987) space launch vehicle programmes in MTCR countries. The 2010 National Space Policy of the United States points out that '[US] departments and agencies should seek to enhance the competitiveness of the U.S. space industrial base while also addressing national security needs'.[134] The United States government will consider the issuance of licences for space-related exports on a case-by-case basis, pursuant to, and in accordance with, the International Traffic in Arms Regulations, the Export Administration Regulations and other applicable laws, treaties and regulations.[135]

Currently, the number of MTCR partners is 34, whilst several countries have pledged to abide by the MTCR without joining it: Israel, Romania and Slovakia have all committed to maintaining export controls consistent with the regime. Other key states in the field of missile technology and use, such as India and China, however, are outside of the MTCR framework. After several years of US pressure on these countries to join the MTCR and curtail their sales of missiles and missile technologies, China announced in November 2000 that it would not help other states build ballistic missiles capable of delivering nuclear weapons. Though declining to become an MTCR member, China has defined a 'nuclear-capable missile' in the same manner as the MTCR.[136]

6.6.2 The Wassenaar Arrangement

The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies is a multilateral export control regime which includes 41 participating states.[137] The Arrangement's purpose is to contribute to regional and international security and stability

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[134] Intersector Guidelines, Effective Export Policies, 2010 National Space Policy of the United States of America, 28 June 2010.

[135] See Intersector Guidelines, Effective Export Policies, 2010 National Space Policy of the United States of America, 28 June 2010.

[136] See http://nuclearforces.org/country-profiles/china, last accessed 14 April 2014.

[137] Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (hereafter Wassenaar Arrangement), Wassenaar, done 19 December 1995, effective 12 July 1996; www.wassenaar.org, last accessed 17 March 2014; also www.armscontrol.org/factsheets/mtcr, last accessed 14 April 2014 and www.wassenaar.org/introduction/index.html, last accessed 14 April 2014. See also further on the Wassenaar Arrangement *infra*, §§ 7.5.1.2, 7.5.2.1.

by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies to prevent destabilizing accumulations of those items. The Wassenaar Arrangement is the successor of the Coordinating Committee on Multilateral Strategic Export Controls (COCOM). During the Cold War, Western governments implemented controls derived from the Coordinating Committee on Multilateral Strategic Export Controls. When this arrangement became obsolete due to the end of the Cold War, it was realized that there was still a need for an international organization to coordinate national controls on transfers of conventional arms and dual-use goods and technologies, and that such organization had to have a broader scope than the COCOM. The members of COCOM therefore initiated negotiations, involving also the former Warsaw Pact countries, to develop a new construction, the Wassenaar Arrangement. The Arrangement became operational in 1996.

The Wassenaar Arrangement establishes lists of items for which participating countries are to apply export controls. Member governments through national policies implement these controls to ensure that transfers of the controlled items do not contribute to the development or enhancement of military capabilities that undermine the goals of the Arrangement, and are not diverted to support such capabilities. The decision to transfer or deny transfer of any item is the sole responsibility of each participating state.[138]

Every six months participating states exchange information on deliveries of conventional arms to non-Wassenaar members currently covering seven categories, *inter alia* concerning missiles and missile systems.[139] Practical implementation of the Wassenaar Arrangement varies from state to state in accordance with national procedures. The United States remains the state with the most stringent implementation of export controls, but other participating states also exercise a rather accurate measure of control over the export of conventional arms and dual-use goods under the Arrangement.

In recent years, participating states have agreed to make further use of the Regional Views exercise, implementing a rotating focus on geographic regions, and have continued to work actively to make the existing control lists more readily understood and user friendly for licensing authorities and exporters, and to ensure the detection and denial of

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[138] See Sec. II(3), Wassenaar Arrangement, *supra* n. 137.

[139] See Secs. IV(2), V, Wassenaar Arrangement, *supra* n. 137.

undesirable exports.[140] Export controls were strengthened in a number of areas, including spacecraft and passive counter-surveillance equipment of mobile telecommunications. Participating states conducted a comprehensive and systematic review of the Wassenaar Lists, which led to the adoption of the revised Lists in December 2012.[141]

The Wassenaar Arrangement is meant to complement and reinforce, without duplication, the existing control regimes for weapons of mass destruction and their delivery systems, as well as other internationally recognized measures designed to promote transparency and reduction of the threats to international and regional peace and security which may arise from transfers of armaments and sensitive dual-use goods and technologies where the risks are judged greatest.[142] Nevertheless, there might be problems in the relationship between the Wassenaar Arrangement and other non-proliferation regimes, such as the one provided for in the MTCR. Indeed, although the MTCR was developed primarily with a focus on arms and munitions (in space terms: missiles/launch vehicles), whereas the Wassenaar Arrangement tried to capture the more comprehensive spectrum of dual-use goods, services and technologies (in space terms: including notably, satellites), complications might arise as to where a particular item would best be dealt with. This is also related to the fact that the Wassenaar Arrangement had a List of Munitions to control. In any case, the voluntary character of the two international regimes and the remaining sovereign discretion of the individual states parties thereto to establish and maintain their own export control regimes as appropriate, caused such conflicts in this context to be absent, at least from public view.[143]

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140 See Public Statement of the 2012 Plenary Meeting of the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technology, www.wassenaar.org/publicdocuments/2012/WA%20Plenary%20 Public%20Statement%202012.pdf, last accessed 4 November 2013.

141 The revised control list is available at www.wassenaar.org/public documents/index_PS_PC.html, last accessed 4 November 2013.

142 See Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technology, Basic Documents, compiled by the Wassenaar Arrangement Secretariat, January 2013, 9, www.wassenaar.org/public documents/2013/Basic%20Documents%202013.pdf, last accessed 17 March 2014.

143 *Cf.* F.G. von der Dunk, A European Equivalent to United States Export Controls: European Control of International Trade in Dual-Use Space Technologies, 7 *Astropolitics* (2009), 107.

In conclusion, although the Wassenaar Arrangement is not directed against any state or group of states and does not impede bona fide civil transactions, due to the fact that it imposes restrictions on the market of rocket and ballistic missiles it may have the effect of impeding the development of space programmes and space activities in particular in certain developing countries.

6.6.3 The US International Traffic in Arms Regulations

The International Traffic in Arms Regulations (ITARs) comprise a set of US government regulations that control the export and import of defence-related articles and services which are included on the United States Munitions List (USML).[144] ITARs are interpreted and enforced by the Department of State's DDTC.[145]

All US manufacturers, exporters and brokers of defence articles, defence services or related technical data, as defined by the USML, must register with the US Department of State for the purpose of ITARs. Registration is the primary means used by the US government to obtain information on who is involved in certain manufacturing and exporting activities. Registration does not confer any export rights or privileges, but is a precondition for the issuance of any licence or other approval for export.

ITARs provide that information and material concerning defence- and military-related technologies (that is, for those items listed on the USML) can only be shared with and sold to US persons, unless authorization from the Department of State is received or a special exemption is used.[146] Under ITARs, a 'US person'[147] who wants to export USML

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[144] United States Munitions List (USML), International Traffic in Arms Regulations, Part 121, last revised 26 August 2013. The USML is a list of articles, services and related technology designated as 'defense- and space-related' by the US federal government. This designation is pursuant to Secs. 38 and 47(7), Arms Export Control Act of 1976 (22 U.S.C. 2778 and 2794(7)). These articles, services and technologies fall under the export and temporary import jurisdiction of the Department of State. For the updated USML see http://pmddtc.state.gov/regulations_laws/documents/official_itar/2013/ITAR_Part_121.pdf, last accessed 17 March 2014.

[145] See International Traffic in Arms Regulations, Part 120, Purpose and Definitions, § 120.1.a, General authorities and eligibility.

[146] See US Department of State, Directorate of Defense Trade Control, http://pmddtc.state.gov/licensing/index.html, last accessed 17 March 2014.

items to a 'foreign person' must obtain authorization from the US Department of State before the export can take place.[148]

The export authorization may take the form of:

- a Foreign Military Sales (FMS): in this case the US government sells the USML items directly to a foreign government;[149]
- an export licence, which allows the temporary or permanent export of defence articles and/or technical data to a foreign person (but not technical assistance or defence services);[150]
- a Warehouse and Distribution Agreement (WDA), which is an agreement establishing a warehouse or distribution point abroad for defence articles to be exported from the United States for subsequent distribution to entities in an approved sales territory;[151]
- a Technical Assistance Agreement (TAA), which authorizes a US manufacturer/service provider to supply defence services to a foreign person;[152] or
- a Manufacturing License Agreement (MLA), which enables a US manufacturer to provide manufacturing know-how related to defence articles to a foreign person.[153]

ITARs also include clauses on retransfer of USML items by foreign persons. Accordingly, the 'retransfer' (also called 're-export') of items on the USML by foreign persons is prohibited unless such retransfer is specifically authorized under the relevant export authorization. US persons (including organizations) can face heavy fines if they have, without

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[147] See International Traffic in Arms Regulations, Part 120, Purpose and Definitions, § 120.1.c, General authorities and eligibility, which indicates that 'A U.S. person may receive a license or other approval pursuant to this subchapter'.

[148] See International Traffic in Arms Regulations, Part 120, Purpose and Definitions, Sec. 120.1.c(iii), Part 122, Registration of Manufacturers and Exporters, Part 123, Licenses for the Export of Defense Articles, Part 125, Licenses for the Export of Technical Data and Classified Defense Articles, Part 129, Registration and Licensing of Brokers.

[149] See International Traffic in Arms Regulations, Part 126, General Policies and Provisions, § 126.6, Foreign owned military aircraft and naval vessels, and the Foreign Military Sales Program.

[150] See International Traffic in Arms Regulations, Part 123, Licenses for the Export of Defense Articles.

[151] *Ibid.*

[152] See *ibid.*, §123.22, Filing, retention, and return of export licenses and filing of export information.

[153] *Ibid.*

authorization or appropriate exemption, provided foreign persons with access to ITAR-protected defence articles, services or technical data. Significantly, the US government has substantially increased the number of actions taken against organizations and individuals responsible for breaches of ITARs since 1999.[154] The most notable enforcement action was the US$ 100 million penalty imposed upon ITT Corporation as a result of the unauthorized retransfer of night vision technology to China in 2007.[155]

ITARs have a huge impact on US space activities and specifically on the international trade in space technologies and commodities, because since 1999 all satellites, launch vehicles and related items have been transferred to the USML.[156] This transfer means that all commercial communication satellites are now subject to ITARs, which has been severely criticized by the US satellite industry and judged as detrimental to its commercial interests.[157]

Significantly, the US Administration appears to have understood the negative implications of this situation and taken steps to modify it. Indeed, in January 2013 President Obama signed the 2013 National Defense Authorization Act (NDAA),[158] which included a provision to

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[154] See http://military.wikia.com/wiki/International_Traffic_in_Arms_Regulations, last accessed 5 November 2013.

[155] *Ibid*.

[156] This decision was the consequence of three launch failures in which the Chinese Long March launch vehicles failed to properly deliver US communication satellite payloads Intelsat-708, Optus-B and Apstar-2. A Congressional Select Committee, chaired by Representative Christopher Cox (R-CA), was established in June 1998 to investigate the matter. This investigation found that US satellite manufacturers violated US export control regulations regarding the transfer of technology (in the form of technical assistance and/or data) to Chinese nationals during subsequent launch failure investigations. Furthermore, it was argued that US satellite manufacturers may have assisted Chinese launch vehicle engineers in resolving technical anomalies associated with the respective launch vehicle failures. The Committee found that such assistance would not only have helped the Chinese in improving the commercial launch vehicles, but would also have assisted them in improving their nuclear ballistic missiles – in particular the fairings on submarine-based ballistic missiles. Following the conclusion of this investigation, all satellites and related technologies returned under the control of the Department of State.

[157] For the impact of ITARs on the US satellite industry, see *infra*, esp. § 7.5.2.3.

[158] H.R. 4310 (112th); National Defense Authorization Act for Fiscal Year 2013, 112th Congress, 2011–2013. Text as of 28 December 2012, www.govtrack.us/congress/bills/112/hr4310/text, last accessed 18 March 2014.

return authority to the President to determine proper export control of commercial satellites and their parts and components. In short, this means that the US Administration, subject to Congressional oversight, is entitled to transition commercial satellites from the USML to the more flexible Commerce Control List (CCL). At the time of this writing such a transition has not yet taken place.

This has not excluded other developments significant for space, however. On 22 April 2009 Bigelow Aerospace revealed that the US DDTC had accepted Bigelow's so-called 'commodity jurisdiction' request to remove the regulation of the presence of foreign nationals on its space stations from the jurisdiction of the Department of State under the ITARs.[159]

Before this decision by the DDTC, the presence of foreign nationals on a Bigelow space station would have been a 'deemed export' of space technology under ITARs, thus necessitating a licence from the DDTC (as well as creating other regulatory burdens). In a similar scenario Bigelow would have faced extraordinary obstacles due to the expensive and time-consuming process of acquiring a separate licence from the DDTC for each foreign national on board a Bigelow space station. Notably, Bigelow's successful commodity jurisdiction request has removed this obstacle and has created a great deal of buzz in the private spaceflight industry. Indeed, the DDTC's decision is likely to extend to the participation of foreign nationals in any private spaceflight – by opening, thus, the window for the easing of the regulatory burden on the operation of these flights. From a broader perspective, Bigelow's successful commodity jurisdiction request indicates a further indication of a shift in the application of ITARs to space-related technology.

6.6.4 The EU Export Controls Regime

For quite an extensive period of time a European approach to export control of conventional weapons and dual-use goods was absent and all decisions related to these issues rested in the hands of the member states of the European Union. This approach was consistent with the idea that the Community/Union was supposed to limit its involvement in defence

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[159] See M.J. Sundahl, Bigelow Aerospace's Commodity Jurisdiction Request under ITAR and its Impact on the Future of Private Spaceflight, in *Proceedings of the International Institute of Space Law 2009* (2010), 462 ff.

and security activities. Similarly, ESA was banned from participating in space activities of a military and defence nature.[160]

In the mid-1990s, as a consequence of the general expansion of competences attributed to the European Union by various treaties and consistent with the goal of progressively achieving European harmonization of defence and security issues, the Union gradually became involved in the regulation of the control of the export of weapons and dual-use goods. From a legislative point of view the first significant step was the adoption of the 1998 European Code of Conduct on Arms Exports.[161] Two years later Council Regulation 1334/2000 setting up a Community regime for the control of exports of dual-use items and technology was adopted.[162] After numerous updates, Regulation 1334/2000 has been amended and substituted by Regulation 428/2009[163] and most recently by Regulation 388/2012,[164] which now regulate dual-use items export control in the EU.

Although these documents provide the legal foundation for the EU export control regime, they are not directly connected and constitute different tracks along which the EU addresses the overarching issue. Based on these documents, the European policy on export control subdivides export items in conventional armaments (such as munitions) and dual-use goods. While the export of the former under the Code of Conduct falls outside of the EU competence and EU member states may exempt the manufacturing and trade of arms from the rules of the

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[160] See more generally on the European Community/Union and ESA *supra*, Chapter 4; also von der Dunk, *supra* n. 42.

[161] EU Code of Conduct on Arms Exports, agreed by European Union (EU) Foreign Ministers on 25 May 1998; formally adopted at the EU Council of Ministers, 8–9 June 1998; see www.consilium.europa.eu/uedocs/cmsUpload/08675r2en8.pdf, last accessed 17 March 2014. The full text of the Code of Conduct on Arms Exports and its Operative Provisions is available at http://ec.europa.eu/external_relations/cfsp/sanctions/codeofconduct.pdf, last accessed 5 November 2013.

[162] Council Regulation setting up a Community regime for the control of exports of dual-use items and technology, No. 1334/2000/EC, of 22 June 2000; OJ L 159/1 (2000).

[163] Council Regulation setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, No. 428/2009/EC, of 5 May 2009; OJ L 134/1 (2009).

[164] Regulation of the European Parliament and of the Council amending Council Regulation (EC) No 428/2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, No. 388/2012/EU, of 19 April 2012; OJ L 129/12 (2012).

common market,[165] trade of the latter, with the exclusion of the most sensitive items, which remain under national control, falls within EU competence and the Union is empowered to oblige all member states to request licences 'to export the items on the list and to have appropriate penalties for violations as well as effective systems for enforcing the relevant legislation'.[166]

Firstly, the EU Code of Conduct on Arms Exports, which was adopted on 8 June 1998 during the Presidency of the United Kingdom, encompasses a Common List of Military Equipment, which was agreed upon in 2000 and, since then, is regularly updated.[167] In general, arms embargoes, unless specific guidance is otherwise provided, cover at least all the items included in the Common List. The EU Code of Conduct establishes eight criteria to be applied by EU members on the export of conventional arms, including software and technology, when reviewing licence requests and making decisions whether or not to make an arms export, as follows:

1. consistency of export with the exporter's international commitments arising from UN, EU, or OSCE[168] arms embargoes;[169]
2. risk that export would be used for internal repression or that the recipient country has engaged in serious violations of human rights;[170]
3. risk that export would provoke or prolong armed conflicts;[171]

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[165] See Art. 346, Consolidated version of the Treaty on the Functioning of the European Union (Treaty on European Union as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/1 (2009)).

[166] A. Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods* (2009), 49.

[167] List included in the Council Declaration of 13 June 2000. It was issued on the occasion of the adoption of the common list of military equipment covered by the EU Code of Conduct on Arms Exports (*supra* n. 161); 2000 OJ C 191.

[168] The Organization for Security and Co-operation in Europe (OSCE) traces its existence back to the Final Act of the Conference on Security and Co-Operation in Europe, Helsinki, done 1 August 1975; Cmnd. 6198, www.osce.org/mc/39501?download=true, last accessed 17 March 2014.

[169] See EU Code of Conduct on Arms Export, *supra* n. 161, Criterion One.

[170] See *ibid.,* Criterion Two.

[171] See *ibid.,* Criterion Three.

4. risk of recipient using export to undermine regional peace and security;[172]
5. effect of export on defence and national security interests of friends and allies;[173]
6. commitment of purchaser to fight terrorism and uphold international law;[174]
7. risk of diversion to third parties or to a terrorist organization;[175] and
8. risk that export would undermine the sustainable development of the recipient country.[176]

The Code also establishes a denial notification procedure obliging EU member states to consult on arms sales that one EU state might allow whilst at the same time possibly undercutting another EU state's policy that has chosen not to allow a comparable arms export. Under this procedure, member states shall transmit through diplomatic channels information on licences refused and reasons for the denial, and before granting a licence where one has been refused by another member state for the same transaction, consult the latter as it has rejected the licence in the first place.

It is important to emphasize that these eight criteria, and the EU Code on Arms Exports in its entirety, are political documents of the European Union not legally binding upon the member states; the Code is supposed to represent a moral imperative that EU member states are expected to uphold and enforce.

The 1998 Code of Conduct has certainly had a positive impact on creating an order and predictability in the field of arms export, as pointed out by the European Council: 'The code has increased mutual understanding of member state policies on conventional arms both directly through the circulation of denial notifications and consultations, and indirectly through contributing to a culture of greater transparency and openness.'[177] Yet, several shortcomings of the Code can be pointed out.

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[172] See *ibid.,* Criterion Four.
[173] See *ibid.,* Criterion Five.
[174] See *ibid.,* Criterion Six.
[175] See *ibid.,* Criterion Seven.
[176] See *ibid.,* Criterion Eight.
[177] First Annual Report according to Operative Provision 8 of the European Union Code of Conduct on Arms Exports, OJ C 315, 3 November 1999.

First, there is a lack of provisions for verifying the end-user of the exported weapons.[178] It therefore offers no means for monitoring, nor preventing, the re-export of weapons to recipients for whom export licences would otherwise not have been granted.[179]

Secondly, while each EU member state is supposed to decide upon the granting of export licences in the light of the eight specific criteria in the EU Code, the Code expressly states that '[t]he decision to transfer or deny the transfer of any item of military equipment will remain at the national discretion of each Member State'.[180] Thus, each member state is free to allow an arms sale based on its own determination regarding whether it is appropriate or not under the Code.

Thirdly, Operative Provision 8 requires that a *confidential* annual report is to be circulated by each member state to the other EU states dealing with its defence exports and its own implementation of the Code.[181] These reports are to be discussed at an annual meeting of the member states where the operation of the EU Code is reviewed, and any 'improvements' to it can be recommended to the EU Council. Subsequently, a public report is produced based on the submissions of individual states. This public document does *not* set out the complete details of *actual* arms exports allowed by EU member states, although the published annual reports made pursuant to Operative Provision 8 of the Code do provide *values* of arms export licences issued, and values of deliveries made, if available, by the exporting country. Furthermore, individual states are free to provide as much or as little detail in their national reports as they choose.

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[178] Criterion Seven, EU Code of Conduct on Arms Export, *supra* n. 161, which deals with the risk that the equipment will be diverted within the buyer country or re-exported under undesirable conditions, only contains provisions covering the period prior to the sale of the equipment and does not include any provision to verify the identity and nature of the end-user.

[179] See Criterion Seven, EU Code of Conduct on Arms Export, *supra* n. 161.

[180] Operative Provision 3, EU Code of Conduct on Arms Exports, *supra* n. 161.

[181] *Cf.* Criterion Eight, Operative Provision 8, EU Code of Conduct on Arms Exports, *supra* n. 161, which provides: 'Each EU Member State will circulate to other EU Partners in confidence an annual report on its defence exports and on its implementation of the Code. These reports will be discussed at an annual meeting held within the framework of the CFSP. The meeting will also review the operation of the Code, identify any improvements which need to be made and submit to the Council a consolidated report, based on contributions from Member States.' See http://ec.europa.eu/external_relations/cfsp/sanctions/codeofconduct.pdf, last accessed 5 November 2013.

Finally, the Code remains a non-binding legal instrument. Despite efforts to modify its legal status, all initiatives undertaken in this respect so far have failed.[182]

As to dual-use export controls in the European Union, Regulation 428/2009[183] provides the main legal basis for the regulation thereof. Regulation 428/2009, which is often referred to as the 'Dual-Use Regulation', entered into force on 27 August 2009 and replaced Regulation 1334/2000 in setting up a regime within the Union for the control of exports of dual-use items and technology. Regulation 428/2009 presents a more fundamental overhaul of the regime than providing just an update of the Lists, as it also considerably expands its scope.

Such significant changes include the introduction of controls on brokering[184] services and transit with regard to dual-use items. The Regulation also updates the list of items controlled prior to export and includes a summary (of a non-legal nature) of these changes to Annex I. The new Regulation 428/2009 includes a correlation table between the new articles and those which formed part of the repealed Regulation 1334/2000. As mentioned, the list of dual-use items referred to in Annex I of Regulation 428/2009 has recently been amended by means of Regulation 388/2012.[185]

The main principle established by Regulation 428/2009 is that controlled items cannot leave the EU customs territory without receiving an export authorization. The list of controlled items is set out in Annex I of the Regulation and is divided into ten categories, for example, Category 9 is for propulsion systems, space vehicles and related equipment. Each category is further divided into five subsets: A (equipment); B (test and inspection equipment); C (materials); D (software) and E (technologies). The list of controlled items is based on control lists adopted by

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[182] European Parliament Resolution of 13 March 2008 on the EU Code of Conduct on Arms Exports – Failure of the Council to adopt the Common Position and transform the Code into a legally binding instrument, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:066E:0048:0049:EN:PDF, last accessed 17 March 2014.

[183] *Supra*, n. 163.

[184] A 'brokering activity' is defined by Art. 2(5), Regulation 428/2009, *supra*, n. 163, as 'the negotiation or arrangement of transactions for the purchase, sale or supply of dual-use items from a third country to any other third country, or the selling or buying of dual-use items that are located in third countries for their transfer to another third country'.

[185] *Supra*, n. 164.

international export control regimes – the Australia Group, the Nuclear Suppliers Group, the Wassenaar Arrangement and the MTCR.

There are four types of export authorization referred to in the Regulation: first, the Community General Export Authorisation (CGEA) covers most of the exports of controlled items to seven countries (United States of America, Canada, Japan, Australia, New Zealand, Switzerland and Norway); second, national general export authorizations can be issued by individual member states under the conditions set out in Article 9 of the Regulation; third, global authorizations can be granted to one exporter and cover several items to several states/end-users; and fourth, individual licences, generally for one exporter and covering exports to one end-user can be granted.

Pursuant to Article 9 and Annex II of Regulation 428/2009, dual-use items listed in Annex I require a CGEA. For all other exports for which an authorization is required under the Regulation, such authorization is to be granted by the competent authorities of the member state where the exporter is established on an individual, general or global basis.[186] Importantly, the scope of the CGEA does not extend to Part 2 of Annex II, which contains items included in Annex IV and other sensitive items. In this respect, Annex IV lists items that are deemed to be so sensitive that they need authorization even before they are transferred from one EU state to another.[187]

Communication satellites and their associated components are categorized as dual-use items under Annex I.[188] Consequently, export authorization is required for the export of communication satellites from the European Union.[189] Authorization is given by the competent authorities of the member state where the exporter is located.[190] Exporters are requested to provide the competent authorities with all relevant information needed for their applications for individual and global export authorization. In particular, such information deals with the end-user, the country of destination and the end-use of the item exported.[191] The

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186 See Art. 9, Regulation 428/2009, *supra* n. 163.

187 *Cf.* Wetter, *supra* n. 166, 54.

188 See Regulation 388/2012, *supra* n. 164, Annex I, List of Dual-Use Items, Spacecraft, Definitions, Category 5, Telecommunications and Information Security.

189 See Art. 3, Regulation 428/2009, *supra* n. 163.

190 See Art. 9(2), Regulation 428/2009, *supra* n. 163.

191 See Art. 9(2) and Annex III, Regulation 428/2009, *supra* n. 163.

authorization may be subject, if appropriate, to an end-use statement or other export verification mechanism.[192]

EU member states, when deciding on the grant of an export authorization, shall take into account several factors including the obligations arising from relevant international non-proliferation regimes and export control arrangements, and considerations of national foreign and security policy,[193] including those covered by Council Common Position 2008/944/CFSP of 8 December 2008 defining common rules governing control of exports of military technology and equipment.[194] Furthermore, national authorization shall not be in conflict with existing CGEAs.

In practice, EU member states implement export authorization under national legislation and regulation in compliance with EU policy and regulation. They control satellites and other space-related goods as either munitions or dual-use goods. The ultimate decision on item categorization for items not listed in Council Regulation 428/2009 is at the discretion of the state.

Before concluding this section it is important to dedicate a few paragraphs to the involvement of ESA in security-related activities and the carve-outs that have been put in place in the EU regime to enable such an involvement. Traditionally, pursuant to the provisions of its Convention, ESA was banned from taking part in space activities of a military or defence nature.[195] Furthermore, ESA was not meant to interfere in any way with national security concerns of its member states.[196]

Recently, however, ESA's restrictions have been undergoing a gradual erosion. This process of a more clear involvement in military and defence

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192 See *ibid*.

193 See Art. 12(1.a), Regulation 428/2009, *supra* n. 163.

194 Council Common Position 2008/944/CFSP, of 8 December 2008, defining common rules governing control of exports of military technology and equipment; OJ L 335/99 (2008); see Art. 12, Regulation 428/2009/EC, *supra* n. 163.

195 ESA, following Art. II, ESA Convention, *supra* n. 41, is supposed to 'provide for and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems'.

196 In the context of ESA programmes, per Art. III(1), ESA Convention, *supra* n. 41, 'a Member State shall not be required to communicate any information obtained outside the Agency if it considers that such communication would be inconsistent with the interests of its own security or its own agreements with third parties, or the conditions under which such information has been obtained'.

activities has occurred in a rather indirect manner, mostly through political and legislative initiatives of the European Commission. In particular, ESA has been entrusted with the technical and operational setting-up of two space systems, Galileo and Global Monitoring for Environment and Security (GMES).

The Galileo project deals with the development of a satellite timing, positioning and navigation system under exclusively European control.[197] With the acceptance by EU and ESA member states of the full spectrum of services envisaged to be delivered by Galileo, the interpretation of 'exclusively peaceful purposes' in the context of the ESA Convention has shifted.[198] Under the current, broader interpretation, involvement in security issues, at least as long as of a purely defensive nature or alternatively being sanctioned at the UN level, is now considered possible.[199]

The second major European space project is GMES, now renamed Copernicus.[200] This initiative is intended to provide a pan-European contribution to the Global Earth Observation System of Systems (GEOSS), representing a global effort to enhance environmental protection with the help of satellite technology. GMES activities are not meant to deal solely with the protection of the environment but also to address security issues. In this context, the concept of 'security' is interpreted in a wide sense, beyond the more politically safe concept of 'civil security', to include the more traditional military and defence elements involved in security.[201]

6.7 RECENT DEVELOPMENTS

In recent years within diplomatic and academic fora a great deal of attention has been dedicated to the issue of the weaponization of outer space. Clearly, the placement and eventual use of weapons of defensive and offensive nature in outer space might have destabilizing effects. For example, the 2007 Chinese ASAT test[202] not only fuelled fears about the

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197 See further e.g. *supra*, § 4.4.4.1; *infra*, §§ 10.2.2.3 ff.

198 See also *supra*, § 6.3.1.

199 *Cf.* von der Dunk, *supra* n. 143, 110; also von der Dunk, *supra* n. 42, 76.

200 See further e.g. *supra*, § 4.4.4.2; *infra*, § 9.4.3.3.

201 See von der Dunk, *supra* n. 143, 110.

202 In January 2007, China destroyed its aging Fengyun-1C weather satellite by means of a kinetic kill vehicle launched by a medium-range ballistic missile. This test resulted in the creation of a large 'debris cloud' in low earth orbits,

nature and goals of the Chinese space programme, but also endangered the safety of space objects.[203] Luckily enough, the vast majority of states seem to be aware of the risks that the progressive weaponization of outer space brings; consequently, initiatives aimed at establishing legal barriers to such undertakings have been put in place.

Significantly, the issue of the prevention of weaponization of outer space has been discussed within the United Nations for over 30 years, Indeed, since 1981 the UN General Assembly has been adopting on a yearly basis Resolutions in which states are urged to contribute actively to the goal of preventing an arms race in space and to refrain from any action contrary to that goal.[204] Like General Assembly Resolutions in general, these Resolutions have no legally binding force, but rather carry (merely) considerable political and moral weight.

Progressively, within the discussions taking place in the UN Conference on Disarmament and the UN General Assembly, two main theoretical approaches to address the issue of military uses of outer space have emerged: a hard law approach and a soft law one.[205]

The former approach is based on the assumption that the only effective way to halt the weaponization of outer space is the adoption of a legally binding instrument, a treaty banning the placement and use of weapons in outer space. The supporters of this approach argue that the mandatory character of such a treaty would present the best guarantee to preserve the peaceful nature of outer space. The most elaborated proposal for a hard law instrument has been put forward by China and Russia which, in February 2008, jointly submitted a Draft Treaty on the Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (Draft PPWT Treaty)[206] to the Conference

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www.space.com/3415-china-anti-satellite-test-worrisome-debris-cloud-circles-earth.html, last accessed 5 November 2013.

[203] On 22 January 2013 Russia's BLITS satellite was struck by debris from China's 2007 ASAT test; see www.space.com/20145-russian-satellite-chinese-debris-crash-infographic.html, last accessed 5 November 2013.

[204] Part C, Prevention of an arms race in space, UNGA Res. 36/97, of 9 December 1981; UN Doc. A/36/97.

[205] For an analysis of the hard law and soft law approaches to the issue of weaponization of outer space see F. Tronchetti: A Soft Law Approach to Prevent the Weaponization of Outer Space, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 361–86; see also T. Hitchens, *Saving Space: Threat Proliferation and Mitigation* (2009), www.icnnd.org/research/Hitchens_Saving_Space.pdf, last accessed 5 November 2013.

[206] Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (hereafter Draft

on Disarmament. The Draft PPWT Treaty aims at preventing the weaponization of outer space mostly by requiring its states members

> not to place in orbit around the Earth any object carrying any kinds of weapons, not to install such weapons on celestial bodies and not to place such weapons in outer space in any other manner; not to resort to the threat or use of force against outer space objects; and not to assist or induce other States, groups of States or international organizations to participate in activities prohibited by this Treaty.[207]

The Draft PPWT Treaty has received mixed reviews and has not been accepted, signed or ratified by any state, and has been criticized for various reasons, such as for including a vague definition of weapons[208] and for the fact that it focuses on weapons based in space and fails to bar development, testing and deployment of ground-based ASATs (such as the 2007 Chinese ASAT test).[209] Currently, progress on the Draft PPWT Treaty seems to have reached an impasse, as China and Russia have not produced any fundamentally adopted follow-up to the original draft or otherwise addressed the concerns raised by other states.

The soft law approach, by contrast, is based on the idea that, due to the difficulties and length of time connected with the negotiation and entry into force of a treaty, the optimal solution is the adoption of a soft law instrument, essentially a non-legally binding document. The promoters of this approach point out that soft law has become the most commonly used instrument for the development of space law and that the adoption of a non-binding document can lead to and facilitate the adoption of a binding one at a later stage. The most significant soft law proposal is the Draft International Code of Conduct for Outer Space Activities, an initiative led by the European Union.[210] The Draft Code, which was

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PPWT Treaty); presented 12 February 2008 to the Conference on Disarmament, www.cfr.org/space/treaty-prevention-placement-weapons-outer-space-threat-use-force-against-outer-space-objects-ppwt/p26678, last accessed 18 March 2014.

[207] Art. II, Draft PPWT Treaty, *supra* n. 206.

[208] Art. I(c), Draft PPWT Treaty, *supra* n. 206, defines a 'weapon' as follows: 'The term "weapon in outer space" means any device placed in outer space, based on any physical principle, which has been specially produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth or in the Earth's atmosphere, or to eliminate a population or components of the biosphere which are important to human existence or inflict damage on them.'

[209] See Hitchens, *supra* n. 205, 15.

[210] International Code of Conduct for Outer Space Activities available at http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_

originally released in December 2008, has undergone several revisions. Its most recent version has been published on 31 March 2014.

The Code is characterized by its encompassing scope, as it applies to military as well as civil operations in outer space. Considering the hazardous nature of space activities and the usefulness of taking preventive measures, the Code demands that states implement policies and procedures to minimize the possibility of accidents in space, collisions between space objects or any form of harmful interference and, when executing manoeuvres of space objects in outer space, take all reasonable measures to minimize the risks of collision.[211] Furthermore, states shall also refrain from intentional destruction of space objects and any activity which may generate long-lived space debris.[212]

With regard to the issue of space security, the Code obliges states to refrain from 'any intentional action which will or might bring about, directly or indirectly, the damage or destruction of outer space objects unless such an action is conducted to reduce the creation of outer space debris and/or justified by imperative safety considerations'.[213] While the Code represents a significant step towards enhancing the safety and security of space activities, some negative aspects may be identified.[214] For example, the Code does not contain 'definitions' of key terms; this generates uncertainty in the interpretation and application of its provisions. Moreover, while Article 4(2) lays down specific debris mitigation guidelines, Article 4(3) softens them by allowing manoeuvres as long as there are measures to minimize the risk of collision. In addition, the national security prerogative is not an expressly authorized reason for the production of space debris; this is a factor that may be considered an unacceptable restriction by certain states.

Moreover, one of the goals of the European Union when formulating the International Draft Code of Conduct for Outer Space Activities was to achieve its universality, or, at least, the broadest possible application beyond the borders of the Union. However, this ambition faced a major

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conduct_draft_vers_31-march-2014_en.pdf, last accessed 14 October 2014. See further W. Rathgeber, N.L. Remuss & K.U. Schrogl, Space Security and the European Code of Conduct for Outer Space Activities, 4 *Disarmament Forum* (2009), 34–41.

211 See Art. 4(1), (3), Code of Conduct for Outer Space Activities, *supra* n. 210.

212 See Art. 4(2), Code of Conduct for Outer Space Activities, *supra* n. 210.

213 Art. 4(2), Code of Conduct for Outer Space Activities, *supra* n. 210.

214 See Rathgeber & Remuss, *supra* n. 2, 64.

stumbling block when the US Administration refused to join it[215] and expressed the intention to draft its own Code of Conduct for Outer Space Activities. In conclusion, even if, at the moment, there is significant awareness of the risk of a possible weaponization of outer space, a legal and diplomatic solution acceptable to the major space powers still seems a long way from being achieved.

6.8 CONCLUSION

Military activities in outer space represent one of the most significant as well as controversial issues of space law. Since the beginning of the space age states have realized the advantages that the uses of outer space could provide from a military perspective. Through the years, thanks to technological developments, military uses of outer space have significantly broadened. Nowadays, space assets are used to support military operations on the ground and have become an integral component of the national security strategies of the majority of states.

The legal regime regulating human activities in outer space and, in particular, activities of a military nature, has succeeded in keeping outer space free from military confrontations so far. Nevertheless, due to some crucial shortcomings, such as the lack of clarity concerning the legality of the deployment and testing of conventional weapons in space and the modalities of acts of self-defence in outer space, such a regime might not be able to achieve the same goal in the next decades. Indeed, as a consequence of the growing dependence of modern societies on space applications, states might be tempted to have recourse to military force to protect their valuable space objects.

Therefore, the time may have come to complement the existing legal framework regulating military uses of outer space with provisions aimed at ensuring a higher degree of security for space objects and the maintenance of the peaceful nature of the space environment. International negotiations so far have stalled, and it remains to be seen whether a solution commonly agreed to by the major space powers can be achieved. Nevertheless, efforts should continue to prevent an arms race in outer space and to avoid the military use of the moon and other celestial bodies.

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[215] See www.thespacereview.com/article/2018/1, last accessed 18 March 2014.

7. Legal aspects of launch services and space transportation

Peter van Fenema

7.1 INTRODUCTION

Launching into outer space, or space transportation, is an indispensable precursor to all modern satellite-based activities in the field of communications, navigation, remote sensing and science. In fact, it *enables* the industries concerned, which also include satellite and ground equipment manufacturing. Put differently, these industries and the markets in which their products are being sold would simply not have existed without (commercial) space transportation.[1]

Where originally only two states, the United States and the Soviet Union, performed launches for civil and military purposes, since the early 1980s other spacefaring nations have joined, while at the same time also private launch service providers made their entry into this field. Putting satellites into orbit today is an industry in which (companies from) primarily the United States, Russia, Europe, China, and to a lesser extent India and Japan, offer their services worldwide in a competitive environment.[2] But it is not a free market in which these – potential –

[1] In a report of the US Federal Aviation Administration's Office of Commercial Space Transportation (now FAA/AST), the following figures were provided to show the importance of this enabling function: during the year 2009, the US launch vehicle manufacturing and services industry generated a total of US$ 828 million in economic activity in the United States. In the same year, this launch(-related) industry and the enabled (such as satellite) industries together generated a total of US$ 208.3 billion; see *The Economic Impact of Commercial Space Transportation on the U.S. Economy in 2009*, Report, FAA Office of Commercial Space Transportation, September 2010, at 2 and 6 (Figure 1, 'Commercial space transportation and enabled industries').

[2] See also in general M. Harr & R. Kohli, *Commercial Utilization of Space* (1990), 33–4, 65; P.L. Meredith & G.S. Robinson, *Space Law: A Case Study for the Practitioner* (1992), 307–14; H.P. van Fenema, Cooperation and Competition in Space Transportation, 19 *Air & Space Law* (1994), 81–6; J.M. Lightfoot, Competitive Pricing for Multiple Payload Launch Services: The Road to Commercial Space, 10 *Space Policy* (1994), 121 ff.; H.P. van Fenema, Cooperation

competitors operate, as governments have the tendency to favour their national launch providers and there are other impediments to the functioning of this market.

It is important to note that this is a 'high tech' activity: few states had – and have – the scientific and technical expertise to develop launch vehicles from scratch. The post-war development of intercontinental ballistic missiles (ICBMs) gave the United States and the Soviet Union the necessary know-how.[3] It took those who followed many years to catch up, and this considerably slowed down the growth into maturity of the international launch industry.

Launching a rocket, with or without payload, is not a reliable routine activity as yet. It is the most vulnerable stage of any space endeavour: in the year 2011, of the 84 launches performed worldwide, six (that is 7 per cent) resulted in failure. The year 2012 saw 78 launches of which four failed (plus one partial failure in which the payload eventually did reach the intended orbit). On average, over the past 16 years, 5 per cent of all

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and Competition in Space Transportation, in *The Highways of Air and Outer Space over Asia* (Eds. C.J. Cheng & P.M.J. Mendes de Leon) (1992), 288, 293–4; H. Huikang, Space Law and Expanding Role of Private Enterprises, with Particular Attention to Launching Activities, 5 *Singapore Journal of International & Comparative Law* (2001), 55–62.

[3] US President Eisenhower's military experience in the Second World War and his perception of the intentions of the Soviet Union in the post-war period made him a firm supporter of the development of ICBMs, which could act as a deterrent to nuclear attack through their promise to deliver warheads to targets thousands of miles away. Thus, in the years after his inauguration in 1952 the US Air Force (USAF) developed the first ICBM, the Atlas (test-fired in 1955 and operational in 1959). The Titan and medium-range Thor missiles followed in the years thereafter. And USAF was allowed to develop the Minuteman, a light, solid-fuelled ICBM. The US Army, thanks to a team of mostly German engineers led by Wernher von Braun, developed its own missile, the Jupiter, based on Second World War V-2 technology. Finally, the US Navy, in 1956, developed the Polaris, a solid-fuelled Intermediate Range Ballistic Missile (IRBM) for its submarines.

In the meantime, the Soviets, with the assistance of their 'own' German V-2 engineers, had also embarked on the development of missiles, determined right from the start to beat their American competitors, both in the power and range of their ICBMs, a feat they did accomplish. The launch of Sputnik-1 in 1957 indirectly also showed their superiority in the field of missiles, see H.P. van Fenema, *The International Trade in Launch Services* (1999), 35–6 (referring to R.D. Launius, *NASA: A History of the U.S. Civil Space Program* (1994), Chapter 1 *passim*).

launches resulted in failure.[4] This '(ultra-) hazardous' character of space flight dominated, right from the start, the discussions in the UN Committee on the Peaceful Uses of Outer Space[5] and its Legal Subcommittee, and resulted in rules that address such matters as state responsibility for these activities and state liability in case of damage resulting therefrom.[6]

But first, who are the parties in this 'business'? Generally speaking, there are three categories: (1) the launch service provider; (2) the launch customer; and (3) the launch facility or spaceport. The identification of the nationality and category (government agency or private entity) of the above parties is relevant for determining which national and international laws and regulations may apply. In that connection it is important to note that space law primarily addresses the rights and obligations of states, and that the advent of private space actors has complicated, at least to some extent, the interpretation and application of the respective rules.[7]

7.2 THE MAIN CATEGORIES OF ACTORS AND THEIR RELEVANCE FROM A LEGAL PERSPECTIVE

7.2.1 Launch Service Providers

In the early days of spaceflight, the space transport or launch provider was a governmental agency. Both in the Soviet Union and in the United States the combination of, on the one hand, the military/strategic and geopolitical importance of the exploration and use of outer space and, on the other hand, the military (ICBM) origin of the technology and of the actual 'rocket' used, made a state monopoly of this activity almost unavoidable.

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[4] See *infra*, Appendix, Launch Record 1997–2012.

[5] UN COPUOS was established first as an ad hoc committee, then as a permanent committee of the UN General Assembly to address scientific, technical and legal aspects of international space activities; see Question of the peaceful use of outer space, UNGA Res. 1348(XIII), of 13 December 1958; Resolutions adopted on the reports of the First Committee, General Assembly – Thirteenth Session, at 5; International co-operation in the peaceful uses of outer space, UNGA Res. 1472(XIV)A, of 12 December 1959; Resolutions adopted on the reports of the First Committee, General Assembly – Fourteenth Session, at 5.

[6] *Cf.* further *supra*, §§ 2.3.1.1, 2.3.3.

[7] *Cf.* further *supra*, § 2.3.2.3.

7.2.1.1 The United States

In the United States traditionally two government entities took care of launching: the Department of Defense (DOD), in fact mainly the US Air Force, for military and national security-related launches, and NASA for all civil (non-)governmental launch needs.[8] The government agencies did not build the launch vehicles themselves but procured these from US private launcher manufacturing companies, such as General Dynamics, Martin Marietta and McDonnell Douglas. In other words, the industry delivered the hardware and the US government, often with assistance from the industry, provided the actual launch service from government-owned launch facilities and primarily for its own needs.

In 1972 President Nixon announced his decision to develop the Space Shuttle, planned and designed to take care of all US public and private launch needs.[9] Soon after its first flight in 1981 it was realized that there were good strategic and commercial reasons for a separate role for commercial expendable launch vehicles (ELVs) to fulfil US launch needs (and compete with Europe's Arianespace). This led to the establishment, within the Department of Transportation (DOT), of the Office of Commercial Space Transportation (OCST) as lead agency for all regulatory, including licensing, aspects of the domestic private launch industry.[10]

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[8] *Cf.* National Aeronautics and Space Act, Public Law 85-568, 85th Congress, H.R. 12575, 29 July 1958, as amended regularly; esp. Secs. 102(b), 203.

[9] 'The United States should proceed at once with the development of an entirely new type of space transportation designed to help transform the space frontier of the 1970s into familiar territory, easily accessible for human endeavor in the 1980s and 90s … It will revolutionize transportation into near space, by routinizing it'; see the White House, Statement by the President, 5 January 1972, reprinted in Launius, *supra* n. 3, at 232.

[10] See *Commercial expendable launch vehicle activities*, Executive Order 12,465 of 24 Feb. 1984, 49 FR 721. The US Congress, which had shown a keen interest in an orderly commercialization of ELVs, introduced legislation that provided DOT and its new Office with clear responsibilities in this field, the Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law – Basic Legal Documents*, E.III.3; later codified as Commercial Space Launch Activities, 51 U.S.C., Subtitle IX, Chapter 509. After internal reorganization within DOT, the Office, originally attached to the Office of the DOT Secretary, now comes under the Federal Aviation Administration (FAA) and is referred to as the FAA Office of Commercial Space Transportation or FAA/AST. It licenses and regulates all US *commercial* space launch and re-entry activity, as well as the operation of non-federal launch and re-entry sites; see further *supra*, § 3.3.1.1, and *infra*, §§ 12.3.4.2 and 12.3.4.3.

But, notwithstanding governmental policy under the Reagan Administration supporting and promoting the industry as an important alternative to the Shuttle, the latter remained the preferred tool for access to outer space, and continued to compete directly with the space launch companies for domestic and foreign customers.

It took the Space Shuttle Challenger disaster of January 1986 to radically change this awkward policy: the US government was suddenly confronted with a lengthy and dire shortage of launch capacity, also caused by a DOD Atlas failure (and by problems with the Ariane launch vehicle), and realized its vulnerability in this respect. As a result, in 1988, a Presidential Directive on National Space Policy was adopted, which removed the Space Shuttle from the international commercial launch market, to the benefit of the US private launch industry.[11] With the Space Shuttle restricted to – primarily – human space flight and other Shuttle-unique missions, the US launch industry could now fully focus on competing with Arianespace in offering services to satellite operators in the international commercial launch market.

Recent annual reports published by the FAA Office of Commercial Space Transportation (FAA/AST)[12] list US-based launch service providers falling under the regulatory oversight of the Office. The companies, which include Boeing, Lockheed Martin, Sea Launch, Orbital Sciences and SpaceX, are all in private hands.[13]

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[11] *The President's space policy and commercial space initiative to begin the next century,* Fact sheet, The White House, Office of the Press Secretary, of 11 February 1988, announcing and explaining the National Security Decision Directive, signed by the President on 5 January 1988.

[12] *Commercial Space Transportation: 2010 Year in Review*, Federal Aviation Administration, Office of Commercial Space Transportation (FAA/AST), January 2011; *Commercial Space Transportation: 2011 Year in Review*, Federal Aviation Administration, Office of Commercial Space Transportation (FAA/AST), January 2012, *Commercial Space Transportation: 2012 Year in Review*, Federal Aviation Administration, Office of Commercial Space Transportation (FAA/AST), January 2013, at www.faa.gov/about/office_org/headquarters_offices/ast/, last accessed 14 January 2014. Of the 74 launches performed worldwide in 2010, 15 (4 commercial, 11 non-commercial) were US launches (performed both by the government and by private industry). Figures for 2011 were: a total of 84 launches, of which 18, all non-commercial, were US launches. Figures for 2012: total 78, of which 13 (2 commercial, 11 non-commercial) were US launches.

[13] US launch companies, with the launch vehicles they operate:

- Boeing Launch Services – using Delta launchers;
- Lockheed Martin Commercial Launch Services (LMCLS) – using Atlas launchers;

In accordance with Article VI of the Outer Space Treaty,[14] the FAA Office of Commercial Space Transportation regulates US private space launch activities. The Commercial Space Launch Act and the implementing regulations concerned[15] forbid such activities to take place without a proper licence, and apply to launches by any person from US territory and, unless an agreement with a relevant foreign country provides otherwise, launches by US citizens outside the United States.[16] The

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- United Launch Alliance (Boeing + LMCLS) – using Delta and Atlas launchers (for the US government only);
- United Space Alliance (Boeing + LMCLS) – using the Space Shuttle (for the US government only) until its retirement in July 2011;
- Sea Launch (since 2011 Swiss-based, Russian (95% majority)-owned joint venture with *inter alia* Boeing) – using Ukrainian Zenith 3SL launchers (launched from the Odyssey platform in the Pacific Ocean); Boeing and Norwegian Kvaerner originally held 40% and 20% of the shares respectively, but in 2011 these share holdings were reduced to a total of 5% (Boeing + Norwegian Aker ASA, which owns 24% of Kvaerner); the FAA now licenses Energia Logistics Ltd, a Delaware, United States, registered company and daughter of Russian owner Energia, as the launch operator conducting the launch;
- Orbital Sciences Corporation (OSC) – using the (air-launched) Pegasus, Taurus-XL and Minotaur vehicles; and
- Space Exploration Technologies Corp. (SpaceX) – using the Falcon; in May and October 2012 it successfully launched its first cargo flights, using the Dragon capsule, to the International Space Station (ISS). With the Space Shuttle definitively retired, it competed with OSC for contracts of NASA under the latter's so-called COTS and CRS programs for routine operations to the ISS and for other government-procured launch contracts, and succeeded in getting the contract – it is the first private US company operating unmanned reusable vehicles to and from the ISS; see FAA/AST *2012 Year in Review Report*, January 2013, 13.

[14] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[15] See Sec. 50901-23, Commercial Space Launch Act, *supra* n. 10; and 14 C.F.R. Chapter III (FAA/AST Regulations).

[16] Sec. 50904 (Restrictions on launches, operations and re-entries), Commercial Space Launch Act, *supra* n. 10, provides: '(a) Requirement. – A license issued or transferred under this chapter, or a permit, is required for the following: (1) for a person to launch a launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, in the United States. (2) for a citizen of the United States (as defined in section 50902(1) (A) or (B) of this title) to launch a

FAA/AST distinguishes between *licences* (for expendable or reusable launch vehicles and for launch sites), experimental *permits* (for reusable sub-orbital rockets) and safety *approvals* (for commercial launch operations).[17]

From a space law point of view, three of the above-mentioned operators and operations deserve some additional attention: the (former) Space Shuttle, 'multinational' company Sea Launch and OSC Pegasus.

The NASA-developed Space Shuttle was the first space vehicle that gave rise to debate among space lawyers and air lawyers about its legal status because of its *modus operandi*. This had to do with a combination of the absence of a clear definition of 'space object' in the respective space treaties and the definition of aircraft as used in air law: 'any machine that can derive support in the atmosphere from the reactions of the air'.[18] As the Space Shuttle, in its landing phase, used its wings to glide back to earth, it could, at least during that phase, be considered an

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launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, outside the United States. (3) for a citizen of the United States (as defined in section 50902(1) (C) of this title) to launch a launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, outside the United States and outside the territory of a foreign country unless there is an agreement between the United States Government and the government of the foreign country providing that the government of the foreign country has jurisdiction over the launch or operation or reentry. (4) for a citizen of the United States (as defined in section 50902(1) (C) of this title) to launch a launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, in the territory of a foreign country if there is an agreement between the United States Government and the government of the foreign country providing that the United States Government has jurisdiction over the launch or operation or reentry.'

[17] See www.faa.gov/about/offic_org/headquarters_offices/ast/licenses_permits/, last accessed 23 January 2013. A further distinction is made between a 'launch-or reentry-specific licence' and an 'operator licence': the former licenses only a specific launch or re-entry activity whereas the latter will allow an operator to perform multiple launches or re-entries of the same or similar type. Launch or re-entry vehicles are also referred to as 'Expendable' and 'Reusable' vehicles. The steps in the licensing application process are for all categories: pre-application consultation, policy review and approval, safety review and approval, payload review and determination, financial responsibility determination, environmental review and compliance monitoring post-issuance of licence.

[18] See Convention on International Civil Aviation (hereafter Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300; Annex 2, Rules of the Air, Chapter 1 Definitions. The definition continues with 'other than the reactions of the air against the earth's surface' to exclude hovercraft from its scope.

aircraft, thus in principle falling under national and international rules of air law, for example in the field of liability. Since the United States treated the Shuttle for regulatory purposes as a governmental *sui generis* space object and no case arose which could have challenged that position, it remained a theoretical discussion. But it highlighted the possibility of gaps in, or conflicts between, air and space law, caused *inter alia* by a lack of legal clarity in space law about the objects it regulates. As such, the Space Shuttle discussion was a precursor of the debate on the legal status of, and the law to be applied to, 'aerospace objects',[19] including, at a later stage, sub-orbital vehicles such as Virgin Galactic's SpaceShipOne.[20] The latter's flight characteristics and intended temporary destination – slightly above 100 km – resulted both in a renewed interest in the question of definition/delimitation of outer space and in issues of air and space traffic management.[21]

As for Sea Launch, from a US licensing point of view[22] it is interesting to note that originally the company was incorporated in the Cayman Islands, making in principle the United Kingdom responsible for its behaviour by virtue of Article VI of the Outer Space Treaty. However, in view of the important Boeing interest – both in shares (40 per cent) and in launch-related work – in the company, the United States, after consultation with the United Kingdom, decided that it would be in its national interest to apply its own laws and policies to the company and that applicable US regulations allowed for this national oversight.[23] Sea

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19 In UN COPUOS, the discussion on aerospace objects and the national views thereon, collected through a Questionnaire, is closely linked to the question of definition and delimitation of outer space; see e.g. UN Doc. A/AC.105/865 and Add.11, and A/AC.105/889/Add.10 as referred to in Report of the Legal Sub-Committee on its fifty-first Session, Vienna, 19–30 March 2012, UN Doc. A.AC.105/1003 of 10 April 2012, at 12–15.

20 *Cf.* e.g. further *infra*, §§ 12.3.2, 12.3.3.

21 See further *infra*, § 7.4.

22 See further *infra*, § 7.2.3, for the legal challenges posed by the launches from a platform on the high seas by Sea Launch and by the air launch of OSC/Pegasus, in view of the applicability of the Liability Convention (Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971)) depending *i.a.* on a national sovereign *territory or facility* being used for launch.

23 See *i.a.* DOT FAA docket No. 29208 *Proposed Finding of No Significant Impact* (re Environmental assessment of Sea Launch): 'The FAA determined that [Sea Launch] is a foreign entity controlled by a U.S. Citizen … Because it

Launch later transferred its incorporation to the United States, but after Chapter 11-reorganization in 2010, the company became a majority (95 per cent) Russian owned company incorporated in Berne, Switzerland. Although, by virtue of Article VI of the Outer Space Treaty, Switzerland could in principle (also) claim 'responsibility' or be held responsible for this national space activity, in fact the FAA continues to license Sea Launch operations, arguing that US company Energia Logistics Ltd., a subsidiary of the Russian owner, is the launch operator receiving the licence.

Though Sea Launch, after its resurrection, is again an attractive alternative for satellite owners in search of a launch provider, the company is out of bounds for launches for the US government because of its non-US ownership and incorporation and the use of the Ukrainian launch vehicle: US space laws and policies forbid launches of governmental payloads by foreign launch companies or on foreign launch vehicles.[24]

7.2.1.2 Europe

In Europe, for its own space endeavours in the early 1960s basically dependent on launch contracts with NASA, separate efforts of the United Kingdom and France to develop their own national launch vehicles (based on ballistic missile technology) soon gave way to a multinational initiative, the European Launcher Development Organisation (ELDO),[25] an intergovernmental organization that would later 'merge' with its space

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proposes to launch in international waters, outside the territory of the [United States] or a foreign country, [Sea Launch] must obtain an FAA license to launch', see F.R. Vol. 63, No. 78 (20240–20243), April 23, 1998. See also the licence requirements as per Sec. 50904(a), Commercial Space Launch Act, as quoted *supra* n. 10, *sub* (3) which refer to the definition of 'citizen of the United States' in Sec. 50902(1): '(A) an individual who is a citizen of the United States; (B) an entity organized or existing under the laws of the United States or a State; or (C) an entity organized or existing under the laws of a foreign country if the controlling interest (*as defined by the Secretary of Transportation*) is held by an individual or entity described in (A) or (B)' (emphasis added).

[24] See *infra*, § 7.5.3.1.

[25] Established by way of the Convention for the Establishment of a European Organisation for the Development and Construction of Space Vehicle Launchers (ELDO Convention), London, done 29 March 1962, entered into force 29 February 1964, expired 30 October 1980; 507 UNTS 177; UKTS 1964 No. 30; Cmnd. 2391; ATS 1964 No. 6. See further *supra*, § 4.2.1.

research sister, the European Space Research Organisation (ESRO)[26] into what is now the intergovernmental European Space Agency (ESA).[27]

In 1973 ESA member states decided to 'go it alone', that is secure independent access to space, and develop the Ariane launch vehicle for that purpose. The first launch of this new launch vehicle took place in 1979. In 1980 the company Arianespace was formed to provide ESA and the individual member states with a European launcher and to acquire launch contracts on the international satellite launch market.[28]

A number of agreements and contracts address the sharing of tasks and responsibilities among the parties concerned with respect to all aspects of the exploitation of the Ariane, Vega (the 'ESA-developed' launchers) and Soyuz launchers operated from the French-European Guiana Space Centre, that is ESA, Arianespace, the French government and Russia; this includes matters of liability – and payment of compensation – for damage caused by a launch.[29]

In 1985, Ariane launch operations, in competition with the US Space Shuttle and private operators, already represented 50 per cent of the

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[26] Established by way of the Convention for the Establishment of a European Space Research Organisation (ESRO Convention), Paris, done 14 June 1962, entered into force 20 March 1964, expired 30 October 1980; 158 UNTS 35: UKTS 1964 No. 56; Cmnd. 2489. See further *supra*, § 4.2.1.

[27] The European Space Agency is established on the basis of the Convention for the Establishment of a European Space Agency (ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1. See further *supra*, §§ 4.2.2–4.2.5.

[28] *Cf.* Declaration by Certain European Governments Relating to the Ariane Launcher Production Phase (hereafter Arianespace Declaration), done 14 January 1980, entered into force 15 October 1981; 6 *Annals of Air and Space Law* (1981), 723. Renewal done 4 October 1990, entered into force 21 May 1992. Arianespace shareholders include the French space agency CNES, Astrium and all European space companies, representing ten European states; see www.arianespace.com, last accessed 14 January 2014. See further e.g. K. Iserland, Ten Years of Arianespace, 6 *Space Policy* (1990), 341–3; V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001), 134 ff.

[29] See e.g. Arianespace Declaration, *supra* n. 28, and its successor since 2009, Declaration by certain European Governments on the Launchers Exploitation Phase of Ariane, Vega, and Soyuz from the Guiana Space Centre (hereafter Launchers Exploitation Declaration), with Final Document, Paris, 30 March 2007, § I.8; see www.official-documents.gov.uk/document/cm80/8049/8049.pdf, last accessed 26 June 2013; for further details on the various arrangements, see *supra*, § 4.2.6.1 and § 3.3.3.1; see also *infra*, § 7.2.3, on spaceports.

international communications satellite launch market. Arianespace, incorporated in France, has until today remained the only major European launch company offering services into Geostationary Transfer Orbit (GTO) and lower orbits with a launcher family composed of the heavy-lift Ariane-5, the medium-lift Russian-built Soyuz and the light-lift Vega.[30]

7.2.1.3 The Russian Federation

In the former Soviet Union, all aspects of the launch, from R&D to manufacturing and to launching were in government(-controlled) hands. In today's Russia, of the two largest launch vehicle and rocket engine manufacturers Khrunichev and Energia, the former is 100 per cent state owned, whereas Energia is a limited liability company, with 38.2 per cent of the shares in the hands of the Russian Federation.[31] These and other Russian companies provide launch services to their own government and to foreign launch clients with a wide variety of light to heavy-lift launch vehicles.[32]

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[30] According to Arianespace, Ariane-5 is capable of putting 10 metric tons into GTO and up to 20 tons into LEO; the Russian Soyuz, operated from the French-European Guiana launch site since 2011, carries up to 3,150 kg to GTO and 4,900 kg to SSO, whereas Vega is able to put 1,500 kg into a 700 km circular polar orbit. Other European companies selling launch services (on foreign-built vehicles): Eurockot of Bremen, Germany, co-owned by EADS Astrium (51%) and Russian Khrunichev Space Center (49%), which uses the small Russian Rockot vehicle (derived from the Russian SS-19 ICBM) for launches of up to 2-ton payloads from the Northern Russian Plesetsk Cosmodrome into LEO; and Arianespace subsidiary Starsem (France), in joint venture partnership with Astrium, Roscosmos and Samara Space Center, offering Soyuz launches from the Russian Baikonur Cosmodrome. Of the 74 launches performed worldwide in 2010, 6 (all commercial) were European Ariane 5 launches. The figures for 2011 were: 84 in total, of which 7 (4 commercial, 3 non-commercial) European launches from French Guyana: 5 Ariane launches and 2 Soyuz; the figures for 2012 were: 78 launches, of which 10 European: 7 Ariane, 2 Soyuz and 1 Vega launch, see FAA/AST *Year in Review documents*, *supra* n. 12.

[31] For info on S.P. Korolev Rocket and Space Public Corporation Energia, or, for short, RSC Energia, date of incorporation 6 June 1994, see its Annual Report for the year 2011, at www.energia.ru, last accessed 14 January 2014. Today's Khrunichev State Research and Production Space Center or, for short, the Khrunichev Space Center, with a history going back to 1916, was turned into a Federal State Unitary Enterprise by Federal Decree of 1993.

[32] The following main Russian launch companies and launch vehicles can be distinguished:

Where, traditionally, Russian launch activities were for government use only, in 1993, following the conclusion of a 'launch trade agreement' with the United States, the above Russian launch operators entered the international commercial launch market.[33] This entry was facilitated by a joint venture with Lockheed, with the resulting US-based company Lockheed Khrunichev Energia International (LKEI) selling the Russian Proton launch vehicle to international customers, thus setting a trend of international cooperation in the marketing and sales of Russian launch products.[34]

- International Space Company (ISC) Kosmotras, a joint stock company established in 1997 to commercialize the SS-18 ICBM-based Dnepr, a light launch vehicle. The company is 50% owned by 7 Russian companies and 50% by 2 Ukrainian firms, see www.kosmotras.ru/en/, last accessed 28 May 2013.
- International Launch Services (ILS), formerly Lockheed Khrunichev Energia International (LKEI), selling the heavy-lift Proton launcher, subsequently, after the 1995 merger of Lockheed with Martin Marietta (MM), renamed ILS, marketing both the Proton and the MM Atlas rocket. In 2006 MM sold its interest in ILS to Space Transport Inc. and in May 2008 Khrunichev became the majority shareholder of ILS, headquartered in Reston, Virginia, United States; see www.ilslaunch.com, last accessed 28 May 2013; www.khrunichev.ru, last accessed 28 May 2013.
- State Research and Production Space Rocket Center (TsSKB-Progres) of Samara, Russia, a 100% state-owned Federal State Unitary Enterprise, produces the versatile Soyuz launch vehicle, see www.samspace.ru, last accessed 28 May 2013. The Soyuz rocket is sold outside the Russian Federation to foreign users through Arianespace and its subsidiary Starsem, see also *supra*, n. 30.
- The Rockot vehicle is marketed by Bremen, Germany-based Eurockot Launch Services GmbH, a joint venture of EADS Astrium (51%) and Khrunichev Space Center (49%); its maiden launch took place in 2000; see also *supra*, n. 30. Up to May 2013 it had performed 16 launches, 14 of which were successful, see www.eurockot.com, last accessed 23 May 2013; see also *supra*, (text at) n. 30.

Of the 74 launches performed worldwide in 2010, 31 (13 commercial, 18 non-commercial) were performed by Russia. In 2011, of the 84 launches performed, 31 (10 commercial, 21 non-commercial) were Russian launches; the figures for 2012 were: a total of 78 launches worldwide, of which 24 Russian (12 Soyuz, of which 8 dedicated ISS missions, 11 Proton and 1 Rockot launch), see FAA/AST *Year in Review* documents, *supra* n. 12.

[33] See also further *infra*, § 7.5.4.2.

[34] For more details on this cooperation and the related US-Russian politico-strategic framework, see Van Fenema, *supra* n. 3, 240–51.

With the Russian Law on Space Activities of 1993 the Russian Federation implements its obligations under Article VI of the Space Treaty.[35] That law requires a licence for a broad range of space activities, including launching, performed by organizations and citizens of the Russian Federation or space activities of foreign organizations and citizens under the jurisdiction of the Russian Federation.

7.2.1.4 China

China's first 'official' launch took place in 1970.[36] The government firmly controlled all space-related activities. This is still the situation today. China Great Wall Industry Corporation (CGWIC), the official state company, offers the Long March rocket for national and foreign satellite launches. Where, traditionally, Chinese launch activities were for domestic government use only, post-Challenger disaster pressure from US satellite manufacturers, desperate for launch capacity, lead to the conclusion of a US–Chinese launch trade agreement of 1989 which opened up, albeit temporarily and with a number of strings attached, the international commercial launch market of US satellites and satellite components to China.[37]

There exists a wide variety of Long March launch vehicles for operations from three different launch sites into Low Earth Orbit (LEO) or GTO.[38] CGWIC is eager to sell its launch services to foreign clients,

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[35] Law of the Russian Federation on Space Activities (hereafter Russian Law on Space Activities), No. 5663-1, 20 August 1993, effective 6 October 1993; *National Space Legislation of the World*, Vol. I (2001), at 101; see further *supra*, § 3.3.1.2. Detailed licensing requirements will be found in the Statute on Licensing of Space Activities of 2006; Statute on Licensing Space Operations, 2 February 1996. It is noted that private sector participation in Russian space activities is possible but not yet addressed in more detail.

[36] See www.cgwic.com/LaunchServices/LaunchRecord/LongMarch.html, last accessed June 2013.

[37] See further *infra*, § 7.5.4.1 (on the launch trade agreement) and § 7.5.2.3 (on US satellite export controls).

[38] Long March 2D, 3A, 3B, 3C, 4B, 4C, with the 3B as the heavy-lift champion. Of the 74 launches performed worldwide in 2010, 15, all non-commercial, were launched by China. In 2011, the respective figures were: out of a worldwide total of 84, China performed 19 launches (17 non-commercial, 2 commercial); figures for 2012 were: total launches 78, Chinese share 19 (17 non-commercial, 2 commercial), using 8 different types of Long March rockets, ranging from the light Long March 2C (3,200 kg to LEO/1000 kg to GTO) to the 3B (13,562 kg to LEO/4,491 kg to GTO); see FAA/AST *Year in Review* documents, *supra* n. 12; also www.cgwic.com/LaunchServices/LaunchRecord/LongMarch.html, last accessed June 2013.

but China's complicated relations with the United States have, for many years, limited the marketing and commercial use of its launch services to those clients whose satellites were not US built and did not contain any components which are subject to US export laws and policies.[39]

A number of laws and regulations apply to Chinese space activities; licensing of launches, the registration of space objects and other important matters have so far been dealt with by administrative measures, but may be regulated by a comprehensive space act in the near future.[40]

7.2.1.5 Japan

As a country with precious little post-Second World War missile expertise, its decision, in the early 1980s, to stop relying on imported US Delta launcher hardware and technology and build its own vehicle, meant for Japan the start of ten years of 'gruelling efforts', culminating, in 1994, in the first launch of the indigenously built H-2 launch vehicle.[41] Since then, it has continued to further develop this and other launch vehicles, mostly used for its domestic satellite launch needs, but also for transport of cargo to the International Space Station (ISS). In the international launch market its success has so far been limited by the competitive offer – both in frequency, reliability and prices – of its main foreign competitors. The Japan Aerospace Exploration Agency (JAXA) is the 'independent administrative institution' in charge of all Japanese space missions.[42]

The Basic Space Law of Japan lays down the guiding principles applicable to Japanese space activities, but detailed licensing regulations applicable to (private) launches have not yet been formulated; this is work in progress.[43]

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39 The effects of these and other national and international export controls on the international trade in launch services will be discussed *infra*, §§ 7.5.1 and 7.5.2.

40 *Cf.* further *supra*, § 3.3.5.

41 See Van Fenema, *supra* n. 3, 29. The Japanese launch record shows the following recent figures: 2010: 2 H-IIA non-commercial launches (of a global total of 74); 2011: 2 H-IIA and 1 H-IIB non-commercial launches (of a global total of 84); the figures for 2012 were: global total 78, Japanese share: 2 launches (1 H-IIA (capacity 11,730 kg to LEO/5,800 kg to GTO) and 1 H-IIB (capacity 19,000 kg to LEO/8,000 kg to GTO)), see FAA/AST *Year in Review* documents, *supra* n. 12.

42 See www.jaxa.jp, last accessed 29 May 2013; the Epsilon-1 launch vehicle is the newest addition to the Japanese launch vehicle family.

43 *Cf.* also *supra*, § 3.3.6.

7.2.1.6 India

The Indian Space Research Organization (ISRO), a government agency, is in charge of the Indian space launch activities, performed primarily for domestic use but also marketed internationally. India performed its first successful launch in 1980 and with that became the seventh member of the exclusive club of space launch nations.[44] India operates two launch vehicles, the Polar Satellite Launch Vehicle (PSLV) and the Geostationary Satellite Launch Vehicle (GSLV).[45]

Though a number of space activities have been regulated, also to take care of private Indian satellite operations and ownership, there is no comprehensive space act and no regulation on the licensing of (private) launch services.[46]

7.2.1.7 Other states

Apart from the above 'launch nations', a number of other countries have been able to perform one or more successful launches, such as Israel, Iran, South Korea and North Korea.[47] Brazil attempted to introduce its *veículo lançador de satélites*, but a number of launch failures reduced their prospects to join the club. Brazil now offers its launch facilities at Alcantara to foreign launch providers.[48]

It is important to note already at this stage that the launch or space transport industry – unlike other modes of transport such as the international air transport industry and international civil aviation – does not speak with one voice internationally, either on an industry level in the form of a trade organization or through an intergovernmental organization. This is partly due to the limited number of players/countries operating in the international market (primarily the United States, Europe and Russia), partly because the activity does not involve the – horizontal – crossing of national borders, and partly a consequence of the sensitive

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[44] See http://isro.org, last accessed June 2013.

[45] The ISRO performed 3 non-commercial launches in 2010 (of a global total of 74), two with the GSLV (both launches failed), and one with the PSLV. In 2011 three non-commercial PSLV launches (of a global total of 84) were performed; the figures for 2012 were: 2 PSLV non-commercial launches (of a worldwide total of 78), putting 2 remote sensing satellites into SSO; the capacity of the PSLV CA is 2,100 kg into LEO, the PSLV XL carries 1,800 kg into LEO and 1,140 kg into GTO, see FAA/AST *Year in Review* documents, *supra* n. 12.

[46] *Cf.* further *supra*, § 3.3.5.

[47] For recent launch activities of these countries, see FAA/AST *Year in Review* documents, *supra* n. 12; see also *infra* Appendix.

[48] See *infra* (text at) n. 67; for the national regulation of space launches in Brazil further *supra*, § 3.3.6.

nature of the (missile) technology used.[49] Without an international forum or agreed common goals, for example in the field of safety management or licensing criteria, the 'players' concerned largely follow their own rules.

7.2.2 Launch Customers

A wide variety of customers made use of the services of the above launch providers. Two categories should be distinguished: governmental (read states), since the advent of space launches the most stable customer base, and private clients.[50]

This distinction is relevant for the application of, in particular, two of the five space treaties, namely the Liability Convention[51] and the Registration Convention.[52] Both treaties apply to 'launching States', defined as the state which launches a space object, the state which procures the launching of a space object and the state from whose territory or facility a space object is launched.[53] The 'launching State' has to register its space object in a national registry and report thereon to the UN Secretary-General for international registration purposes,[54] and the 'launching State' may be held liable if the space object concerned causes damage.[55] The system is based on *states* being the prime actors in space.

A state (organ) that concludes a launch contract with a foreign governmental launch provider *procures* the launch and thus becomes a 'launching State' (next to the state that actually performed the launch).[56] Discussion on the term 'procurement' concerns both the literal or most appropriate meaning of the word in different languages and the consequences of the selected meaning for the interpretation of the concept of the 'launching State', in particular when private companies 'procure' the

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[49] See for a discussion of the latter aspects further *infra*, §§ 7.5.1, 7.5.2.

[50] For lists of public and private customers, including international organizations, see FAA/AST *Year in Review* documents, *supra* n. 12; also *infra* Appendix.

[51] Liability Convention, *supra* n. 22.

[52] Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

[53] See, respectively, Art. I(c), Liability Convention, *supra* n. 22; Art. I(a), Registration Convention, *supra* n. 52.

[54] *Cf.* Arts. II–IV, Registration Convention, *supra* n. 52.

[55] See Arts. II–V, Liability Convention, *supra* n. 22.

[56] *Cf.* esp. Art. I(c), *sub* (i), Liability Convention, *supra* n. 22.

launch. Procuring in English/American legal language means 'acquiring/ purchasing goods and services', in other words 'buying' a launch service. In French 'procures the launch' is translated with 'fait procéder au lancement' (roughly: 'has the launching performed or makes the launching happen'), in Dutch with 'doen lanceren' (with a meaning very similar to the French clause), in German with 'veranlasst' (roughly: 'initiates'), in Russian with 'organizuyet' (roughly: 'organizes', 'arranges for'), in Spanish with 'promueva el lanzamiento' (roughly: 'promotes the launching'), in Chinese with 'cù shî' (roughly: 'promotes' or 'prompts'). The authentic languages of the Liability Convention are Chinese, English, French, Russian and Spanish, and these should therefore be the primary sources for understanding and interpreting the meaning of the term, but that does not conclusively settle the matter.

A private satellite operator like SES Astra concluding such a contract cannot be regarded as a state procuring the launch. Can it give the state where it is incorporated, further to Article VI of the Outer Space Treaty,[57] that is Luxembourg, the status of launch-procuring state? The two earlier mentioned Conventions do not provide a convincing basis for that interpretation. And a state party to these Conventions which is not also a party to the Outer Space Treaty may have an extra reason for not accepting the automatism 'Luxemburg licensed SES Astra, therefore the state Luxemburg "procured the launch" of the SES Astra satellite'. In the space law community there is no consensus on this interpretation.[58] And what if SES Astra concludes a launch contract with private company Sea Launch, performing its launches from the Pacific Ocean? On the face of it, none of the three categories of launching State would come into play.[59]

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57 Outer Space Treaty, *supra* n. 14.

58 *Cf.* e.g. A. Kerrest de Rozavel, Launching Spacecraft from the Sea and the Outer Space Treaty: the Sea Launch Project, 23 *Air & Space Law* (1998), 18: 'in accordance with OST Articles VII and VI, activities carried out by private entities are deemed to be carried out by the liable [*sic*] State. This State is not only responsible, *i.e.* obliged to authorise and control any space activity conducted by a non-governmental entity having its nationality, but also the launching State is, as such directly liable for any damage caused by the space object as if it were launching it itself … From the rule mentioned before, the nationality of the juridical person (in this situation the Sea Launch Co.), renders the State of such nationality the "launching State".'

59 *Cf.* e.g. Kerrest de Rozavel, *supra* n. 58, 19, stating 'taking into account the commercial purpose of Sea Launch, the entity procuring the launch may be either a State or a private company qualifying its national State as a launching State'. These two, somewhat confusing, texts quoted *supra* in n. 58 and *supra* together indicate that Kerrest de Rozavel expands the definition of 'launching

A partial way out of this problem, perceived as a lacuna in the liability regime created by the Liability Convention's formal terminology, is the policy of some states to voluntarily adopt the position of 'launching State' in relation to any company which, by virtue of national legislation based on Article VI of the Outer Space Treaty, received that state's licence to engage in space activities and procured a launch that resulted in damage to third parties. The United Kingdom, for instance, appears to take that position.[60]

State' in the Liability Convention, *supra* n. 22, with two additional categories of states, the state of the company for which it is responsible under Art. VI, Outer Space Treaty, *supra* n. 14, in case that company (1) launches or (2) procures the launch of a space object. Another author appears to read the latter interpretation directly in the text of the Convention: 'The convention defines "launching State" to mean either the State from whose territory the object was launched or the State which procured its launch (*or whose nationals did*)'; R.J. Tremayne-Smith, U.K. Registration Policy & Practices, in *Proceedings of the Project 2001 Plus Workshop: Current Issues in the Registration of Space Objects* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) (2005), 59 (emphasis added). The Netherlands' position appears to be that procurement of the launch by a national company does not turn the Netherlands into a 'launching State'; see Dutch Space Activities Act 2008, Explanatory Memorandum to the Bill, Parliamentary Papers II 2005/06, 30609, no. 3, 5–7 (explanation of the term 'launching State': 'The Netherlands could be qualified as launching State, if the Netherlands itself takes care of the launch or commissions (procures) the launch.'); see also the Netherlands' registration practice and accompanying statements, e.g. UN Doc. A/AC.105/963, of 21 April 2010, and A.AC.105/1002, of 22 November 2010 (re. Technical University Delft's Delfi C3 satellite launched by India).

[60] An – indirect – indication of the UK position may be found in its registration policies and practices: in a *Note Verbale* dated 16 March 2001 the United Kingdom furnished information to the Secretary-General of the United Nations in conformity with the Registration Convention, *supra* n. 52. In view of the fact that, by virtue of that Convention, only a 'launching State' may become 'State of registry' of a specific satellite, the UK government clarified the registration information on a satellite owned/operated by a Gibraltar company, which it had previously 'accepted on the [U.K.] Register of Space Objects' as follows: 'The Gibraltar incorporated company … did not procure the launch of the space object and thus the United Kingdom is not the "State of registry."' Conversely, if that company *had* procured the launch the United Kingdom would have accepted the status of 'launching State' (necessary to become 'State of registry'): it licensed, and therefore, in its view, 'procured' the launch, see UN Doc. ST/SG/SER.E/389, of 28 March 2001, referring to ST/SG/SER.E/378. Note that Gibraltar is a British Overseas Territory (a status disputed by Spain). See also *supra*, nn. 58 and 59. The United Kingdom does *not* consider itself the 'launching State' with respect to satellites in orbit, the launch of which has been procured by a private operator *prior* to that company becoming a UK company,

The launch customer, so far mainly a state or private company 'procuring' the launch of its satellite, may in the foreseeable future also be a passenger who pays for his own ride: as in air or sea transport, the payload may then consist of passengers and/or cargo. The individuals who, on board the Russian Soyuz, travelled to the International Space Station (and back) were *de facto* paying passengers, and the launch would also have taken place without their booking. But the situation may be different in cases where paying passengers are the *raison d'être* of the flight: the passengers, without whom the launch of, say, a Virgin Galactic flight would not take place, may be seen as procuring the flight, alternatively their 'tour operator', that is the company that booked the flight to sell seats thereon to individual passengers, may be seen as such.

In this connection the distinction made in aviation between scheduled and non-scheduled (or charter) services[61] may be illustrative: passengers buying a ticket for a seat on a scheduled service/flight conclude a contract of carriage with the airline, but neither the individual passenger nor the totality of all passengers on that specific flight could be seen as 'procuring' the flight as the essential feature of a scheduled service is the fact that, in principle, the flight is operated irrespective of individual bookings. A *non-scheduled* operation, often taking the form of a tour

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and the Netherlands takes the same position; see, respectively, UK registration information provided to the UN Secretary-General, UN Doc. ST/SG/SER.E/417/ Rev. 1, of 3 December 2001, re Inmarsat satellites; and Netherlands' *Note Verbale* to the UN Secretary-General, UN Doc. A/AC.105/824, of 16 March 2004, re NSS/Intelsat-513. The United Kingdom has routinely provided information on Inmarsat satellites as 'State of registry' ever since Inmarsat became a UK-incorporated company, procuring launches, subject to UK licensing; see e.g. UK registration information provided to the UN Secretary-General, UN Doc. ST/SG/SER.E/555.

[61] The Chicago Convention, *supra* n. 18, distinguishes between 'scheduled air services' (Art. 6) and 'right of non-scheduled flight' (Art. 5). The Convention itself does not provide a definition of scheduled air service, but through a series of General Assembly Resolutions on the matter (and through practice) the following description has developed: 'an air service open to use by the general public and operated according to a published timetable or with such a regular frequency that it constitutes an easily recognizable systematic series of flights'. Conversely, any air service that is performed other than as a scheduled air service is regarded as a non-scheduled operation, including but not limited to charter operations. Note that 'non-scheduled' is a public law term, whereas 'charter' is a private law term pertaining to the contract between an air carrier and a charterer, e.g. a tour operator; however, the terms have now come to be used interchangeably; see *Manual on the Regulation of International Air Transport*, ICAO Doc. 9626, 2nd edn. (2004), Chapter 5.3 Air Services.

operator buying – the total capacity of – an aircraft for a specific flight to be sold to a group of individuals (mostly in combination with hotel accommodation), could be seen as the 'procurement' of a flight because the latter would simply not take place without the charter contract between the tour operator and the airline concerned, and with a sufficient number of individual customers actually buying the tour from the tour operator: the latter will, if unsuccessful in selling his product to the individual customers, simply cancel the tour and 'return' the unused flight to the airline, which will, as a consequence thereof, not be operated at all.

7.2.3 Launch Facilities and Spaceports

The above two Conventions' definition of the 'launching State' includes the state 'from whose territory or facility' the object was launched.[62] This was basically a satisfactory and undisputed 'catch-all' provision (launches traditionally always taking place from a national territory) until the advent of sea- and air-based launches. Two prominent examples of the latter are Sea Launch and US Pegasus launches.

The refurbished Norwegian oilrig, which became the Odyssey launch platform, located in the Pacific Ocean, from which private company Sea Launch operates, is neither the territory nor the facility of a state. It is, like the assembly and mobile launch control ship Sea Launch Commander, private property registered in Liberia, a non-party to both Conventions.[63]

US company OSC developed the air-launched Pegasus launch vehicle. Attached to an aircraft in flight until it takes off using its own rocket engine, Pegasus' 'state territory' would only be known if the launcher aircraft at the moment of launch flew in sovereign airspace of a specific state. If that is not the case, one could think of the aircraft as being a launch *facility*, though it is highly debatable whether a privately owned aircraft registered in the United States may be called a US *state* facility. The distinction, made in the United States, between federal launch sites and state and/or private launch sites or spaceports has no relevance in this

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[62] Art. I(c), *sub* (ii), Liability Convention, *supra* n. 22.

[63] See www.shipspotting.com/gallery/photo.php (Odyssey-IMO 8753196), last accessed 14 April 2014; and www.fleetmon.com/en/vessels/Sea_Launch_Commander_55110, last accessed 14 April 2014; also Los Angeles Times, 2 June 1999 (Dispute over ship registry targets satellite firm); for parties to the UN space treaties, see UN Doc. A/AC.105/C.2/2013/CRP.5, *Status of International Agreements relating to activities in outer space as at 1 January 2013*, 8.

discussion, as US 'territory' is the common denominator determining the legal consequences under space law, not the status of the launch site within that territory.

Russia makes use mainly of two launch complexes, Plesetsk, in Russia, and Baikonur, the launch facility situated in Kazakhstan. The use of Baikonur by Russia, on the basis of a Kazakh–Russian lease agreement, would qualify the respective launches as both Russian ('facility') and Kazakh ('territory') for the purpose of the application of the two Conventions.

The Guiana Space Centre, the French-European spaceport in Kourou, French Guyana, from which Arianespace operates, is located in French territory: it is an 'overseas department' or 'overseas region' of France.[64] Given ESA's sizable support of and (financial) contribution to this spaceport, one could qualify it as an ESA facility. This is relevant for the potential application of the Liability Convention, since ESA, through a declaration, became subject to the provisions of that Convention.[65]

A separate Soyuz launch complex, built by Russia at Kourou, is used both by Arianespace for commercial Soyuz launches and by the Russian Soyuz operator for 'national' launches. It may also be regarded as a Russian launch facility for the purpose of the application of the Conventions.[66]

Brazil developed the Alcantara launch base, like Kourou conveniently close to the equator, and offers these launch facilities to foreign launch vehicle operators. So far, actual foreign launches have not materialized, at least partly because of US interference – based on missile proliferation concerns – with Brazil's international marketing efforts.[67]

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[64] See http://europa.eu/abc/maps/regions/france/mer_en.htm, last accessed 7 June 2013.

[65] Declaration of 23 September 1976; *International Organisations and Space Law* (1999), 33; *Space Law – Basic Legal Documents*, A.III.2, at 1; further *supra*, § 2.3.3.8.

[66] For an overview of national spaceports and launch facilities of all (other) spacefaring nations, including the United States, Japan, China, India, Israel and Brazil, see FAA/AST *Year in Review* documents, *supra* n. 12.

[67] A 2000 Brazil–US Technology Safeguard Agreement permitted, subject to strict conditions, US launches and launches of US satellites from Alcantara. Because of the severity of the clauses, the Brazilian National Congress refused to approve the agreement, thereby effectively ruling out any US participation in the use of the spaceport; see J. Monserrat & V. Leister, Brazil–USA Agreement on Alcantara Launching Center, in *Proceedings of the Forty-Third Colloquium on the Law of Outer Space* (2001), 328 ff.; J. Monserrat & V. Leister, The Discussion in the Brazilian National Congress of the Brazil–USA Agreement on

7.3 THE EXISTING REGULATORY FRAMEWORK

In the above, attention has already been paid to some of the treaties that apply to (some aspects of) space launches. As in other chapters these space treaties have been dealt with *in extenso*, including analyses of provisions on space activities, launching and space transportation, for purposes of avoiding duplication relevant provisions thereof as they would specifically deal with the launch and transportation aspects will not be discussed here.[68] Suffice to state here that the historical reality of state/government space activities is reflected in the space norms and treaties developed in the period of the late 1950s until the end of the 1970s. As a result, most provisions dealing with space (launch) activities deal with state rights and state obligations.[69]

A crucial – and therefore hotly debated – provision is Article VI of the Outer Space Treaty confirming state responsibility for national space activities and creating the necessity of national rules to regulate these activities: a national launch or the foreign launch of a national satellite has to be dealt with through national legislation.[70] Launching is a dangerous activity: the concept of 'launching State' described in Article VII (on liability) of the Outer Space Treaty and defined in both the Liability Convention and the Registration Convention,[71] firmly and without exception links all launches to a state and forces all such states to

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Technology Safeguards Relating to the Use of Alcantara Spaceport, *Proceedings of the Forty-Fourth Colloquium on the Law of Outer Space* (2002), 377 ff.

[68] See e.g. for the five UN space treaties in general *supra*, § 2.3.

[69] E.g., Art. III, Outer Space Treaty, *supra* n. 14, obliging states, when engaging in space activities, to act in conformity with international law, including the UN Charter (Charter of the United Nations, San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1); Art. IV, Outer Space Treaty, forbidding states to orbit weapons of mass destruction in outer space or 'militarize' the moon; Art. V, Outer Space Treaty, obliging states to render assistance to astronauts in case of accidents; Art. VI, Outer Space Treaty, making states responsible for private national space activities; Art. VII, Outer Space Treaty, creating liability for damage caused by launching states; Art. VIII, Outer Space Treaty, creating the obligation to register; and the cooperation and consultation duties *ex* Arts. VIII and IX, Outer Space Treaty.

[70] Art. VI, Outer Space Treaty, *supra* n. 14, specifically calls for 'authorization and continuing supervision' of 'activities of non-governmental entities in outer space'.

[71] See again Art. I(c), Liability Convention, *supra* n. 22 and Art. I(a), Registration Convention, *supra* n. 52 respectively.

accept liability and assume full responsibility for taking the necessary national regulatory (licensing) measures.

None of the relevant states had either theoretical or practical problems with this approach until the advent of non-governmental launch companies, as pioneered in the United States, and private satellite operators. This brought discussions on treaty interpretation and the necessity to regulate on a national level those matters that needed clarification. *Which* national space laws – separately – deal with launches and how they do so is dealt with elsewhere.[72] Suffice to say that, based on, for instance, Articles VI, VII, VIII and IX of the Outer Space Treaty, and the respective other Conventions, launch aspects dealt with in national space legislation cover such issues as:

- operational and safety requirements (usually handled through licences);[73]
- market access and competition issues, including export control (handled through a variety of legal instruments);[74]
- liability and insurance (also usually handled primarily through licences), as based on Article VII of the Outer Space Treaty and the Liability Convention;[75]
- debris mitigation (increasingly handled through licences), as based on the Space Debris Mitigation Guidelines;[76] and
- registration in a national register, as based on Article VIII of the Outer Space Treaty and the Registration Convention.[77]

Still, a number of relationships in the field of manufacturing and launching of satellites are mainly governed by contract:

- sale of a satellite (involving satellite manufacturer and buyer/operator);
- launch of a satellite (involving satellite owner/operator and launch company);
- sale of satellite *plus* launch, also known as 'on-orbit delivery' (involving satellite manufacturer and buyer/operator plus satellite manufacturer and launch company);

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72 See in particular *supra*, § 3.3.
73 See further *infra*, § 7.4; *cf.* also *supra*, § 3.2.1.
74 See further *infra*, § 7.5.
75 See on these issues further *infra*, §§ 2.3.1.1, 2.3.3, 3.2.3 and 3.3.
76 See further *infra*, §§ 13.3.2.1, 13.3.2.2.
77 See on these issues further *infra*, §§ 2.3.1.1 and 2, 2.3.4, 3.2.2 and 3.3.

- insurance of launch and of in-orbit operations (involving insurance company and (some of) the above parties);
- use of a satellite (involving satellite owner/operator and user); and
- financing of satellites (involving satellite buyer/operator and manufacturer/bank).

In general, in the above contractual relationships, the parties concerned are only in some cases/on some issues dependent on provisions of space law, and then only indirectly, that is through the licence requirements and conditions of the states authorizing the activity.

7.4 LEGAL ASPECTS OF LAUNCH SAFETY AND SPACE TRAFFIC MANAGEMENT

Launch-related issues that have become increasingly important in the past years but are *not* dealt with in the present body of positive space law and are thus left to either separate international arrangements or to national laws and policies, are launch safety and space traffic management.

The absence of international space traffic management rules can at least partially be explained by the fact that there is neither an intergovernmental organization or specialized agency, nor a trade association that feels responsible for the creation of international 'rules of the road'. And because 'national' space launches usually do not involve entry into foreign airspace, spacefaring nations take care of their own national safety, including navigation standards, and apply these to their own – governmental and/or private – launch activities. The need for international coordination, let alone harmonization, of these national rules and policies was not felt until quite recently.

Thanks to a number of high-profile incidents, including the Chinese ASAT test[78] and (near) accidents, including the Cosmos–Iridium collision[79] and debris-originating threats to the ISS, states and space agencies

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[78] On 11 January 2007, the People's Liberation Army of China conducted its first anti-satellite (ASAT) weapons test, destroying, with a ballistic missile, one of its own weather satellites in space, at about 530 miles in LEO. The explosion created a debris cloud of thousands of metal particles creating collision risks for some 700 spacecraft orbiting in LEO; see *China's Anti-Satellite Weapon Test*, CRS Report for Congress, RS 22652, of 23 April 2007.

[79] On 10 February 2009, an inactive Russian communications satellite, Cosmos-2251, collided with an active commercial communications satellite, Iridium-33, operated by US-based Iridium Satellite LLC. at about 500 miles

now pay increasing attention to space situational awareness, mitigation of space debris and the question of whether national measures are sufficient to cope with the increasing risks of collisions, interference and other threats to the safe and sustained use of orbits.

A distinction should be made here between space *transportation*, that is the launching/delivery in orbit of satellites on the one hand and the (orbital) *operation* of the satellites concerned on the other hand.[80] This distinction is important partly as it is also reflected in the type and cost of insurances given by the insurance companies, as dealt with further in the chapter on insurance.[81] Normally one insurance covers the launch phase, while another, when issued, deals with liability during the operation of the satellite.

Rules of the road have to address the different dangers/risks involved in both stages of the space activity concerned. It has to be realized that often different entities are involved (for example the owner/operator of the satellite does not perform the launch), and that responsibility for (the safety/performance of) each stage may therefore be in different hands. This may require different regimes, depending on the stage/moment of operation.

The parties concerned always treat the launch phase as the most risky part of the space activity.

7.4.1 The Outer Space Treaty and Safe and Responsible Behaviour in Launching

The Outer Space Treaty contains a number of articles that may be relied on to demand safe and responsible behaviour on the part of the

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altitude in LEO; the collision also resulted in a sizeable increase in debris orbiting the earth, at least some 2,000 trackable pieces of debris (10 cm or larger); see Secure World Foundation report *Space Sustainability – a practical guide* (2012), 8, http://swfound.org/media/100822/SWF_Space_Sustainability_booklet_updated_2012_web.pdf, last accessed June 2013.

[80] Note that the responsibilities of DOT's Office of Commercial Space Transportation are limited to regulating the launch and return of the vehicle and do not encompass the operational phase of the payload (satellite) that was carried into space. 'Space traffic management' has been defined as 'the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to earth free from physical or radio-frequency interference'; see *Cosmic Study on Space Traffic Management*, International Academy of Astronautics (IAA) (2006), 10.

[81] On the space insurers' point of view, see e.g. Swiss Re, *Space Debris: On Collision Course for Insurers?* (2011); see further *infra*, Chapter 17.

spacefaring states. Relevant principles are those that reflect the freedom of exploration and use, that forbid national appropriation and require due regard to the corresponding interests of all parties and consultations in case of planned space activities that may cause potentially harmful interference with the activities of other states.[82] And Article VI requires states to make sure that private companies, which fall under their responsibility, behave accordingly. The freedom of one state to engage in exploration and use of outer space is limited by the freedom of other states to do likewise.

If the launch of an object into outer space causes damage to others, compensation is called for in accordance with the rules of the Liability Convention.[83] That 'launching States' have to pay when things have gone wrong is both an added incentive for the state concerned to take proper precautions and a comforting idea for the (potential) victims, but the real issue is to obtain such safe and responsible behaviour of all stakeholders that the chances of things going wrong are minimized. The space treaties do not give any specific rules in this regard. An IAA study of 2006 lists the gaps in the space treaties, most of which concern the lack of rules pertaining to in-orbit behaviour.[84]

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82 *Cf.* Arts. I, II, IX, Outer Space Treaty, *supra* n. 14.

83 Liability Convention, *supra* n. 22; see further *supra*, § 2.3.3.2.

84 The absence of harmonized licensing requirements, pre- and post-launch information exchange, measures to prevent collisions between satellites (though the ITU has rules to prevent radio frequency interference), binding space debris prevention and mitigation rules, identification/separation of areas subject to air traffic and/or space traffic control, etc.; see *Cosmic Study on Space Traffic Management*, *supra* n. 80, *passim*. Note that the Liability Convention, *supra* n. 22, in recital 3 of the Preamble, observes 'that notwithstanding the precautionary measures to be taken by States and international intergovernmental organizations involved in the launching of space objects, damage may on occasion be caused by such objects'; but the Convention does not prescribe any such measures. The Registration Convention, *supra* n. 52, partly created to assist states that are the victim of space-originating damage to identify the 'launching State', does not require states to provide pre-launch information. The Hague Code of Conduct, see *infra*, § 7.5.1.6, could in principle, at least to some extent, fill that gap, but does not have binding force. Moreover, the states concerned see part of this information as national-security relevant and are therefore hesitant to share or distribute the data freely. Neither the international launch industry nor the satellite operators have come to an effective data exchange arrangement so far.

7.4.2 Traffic Management in the Launch Phase

It is necessary at this stage to make a clear distinction (again) between the operations of satellites in orbit and beyond and, on the other hand, the *transportation* of these satellites (or other payload) into orbit/space and the possible return of the space vehicle concerned. The latter two pose different challenges from a traffic management point of view: where in-orbit operations may harmfully interfere with other such space activities, the launch and return phases of such activities bring about the use of airspace, possible interference with aircraft in flight, whose operations are regulated under international and national air law, and/or possible involvement of national air traffic management agencies, an international specialized agency ICAO[85] or, in Europe, EASA (for aviation safety)[86] and Eurocontrol (for air navigation).[87]

Before addressing the legalities of spacecraft–aircraft interference it is useful to question the urgency of the matter. Whereas there is clear evidence of orbital operations being increasingly threatened by space

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[85] ICAO was established by the Chicago Convention, *supra* n. 18, notably Part II, Arts. 43–66, The International Civil Aviation Organization. See esp. Annexes 17, Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference; Annex 9, Facilitation; Annex 11, Air Traffic Services.

[86] EASA was established by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, No. 1592/2002/EC, of 15 July 2002; OJ L 240/1 (2002); later superseded by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, No. 216/2008/EC, of 20 February 2008; OJ L 79/1 (2008). See further e.g. J.B. Marciacq *et al.*, Accommodating Sub-Orbital Flights into the EASA Regulatory System, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2011), 188, 209.

[87] Eurocontrol was established by the Convention Relating to Co-operation for the Safety of Air Navigation (hereafter Eurocontrol Convention), Brussels, done 13 December 1960, entered into force 1 March 1963; 523 UNTS 117; UKTS 1963 No. 39; Cmnd. 2114; later amended *inter alia* by the Protocol Amending the Eurocontrol International Convention Relating to Co-operation for the Safety of Air Navigation of 13 December 1960, Brussels, done 12 February 1981, entered into force 1 January 1986; 430 UNTS 279; Cmnd. 8662; and the Protocol consolidating the Eurocontrol International Convention Relating to Co-operation for the Safety of Air Navigation of 13 December 1960, as variously amended, Brussels, done 27 June 1997, not yet entered into force; Eurocontrol Revised Convention, Sept. 1997 edition at Eurocontrol. See further e.g. I.H.P. Diederiks-Verschoor, *An Introduction to Air Law* (8th edn., 2006), 57 ff.

debris, and debris mitigation is therefore rightfully considered a 'hot topic', there are no known cases of incidents involving launch vehicles or returning space vehicles and aircraft in flight. One should distinguish, moreover, controlled returns from space debris surviving atmospheric drag and crashing on earth.

Another reason to be hesitant about discussing possible international approaches to the issue is the fact that launches primarily take place from launch sites based on national territory, involving the use of national airspace and creating the need for national coordination between the aviation and space authorities of the state concerned. In the United States, NASA and the private launch companies interact with the FAA[88] whenever a launch takes place and, depending on the location of the launch site, air traffic will be forewarned and safeguarded.

The number of states that actually engage in – or license private companies to perform – launches (from their territory) is still very limited: taking Europe for calculation purposes as one launching 'State' and assigning the multinational company Sea Launch to the United States and its subsidiary Land Launch to Russia, one arrives at a total of 12 launching states. Together, in the past 16 years, they have created hundreds of thousands of pieces of dangerous space debris in orbits around the earth. To produce that abysmal result, they needed only a total of 1,146 launches creating, in the launch phase, an annual average of, in theory, 72 potential interferences with aircraft (the total figure of 1,146 includes the 33 launches performed by Sea Launch from its floating launch platform in the Pacific Ocean, at a comfortable distance from the nearest airports or aircraft movements).

7.4.3 Launches Subject to Air Traffic Management?

Aircraft operated in national airspace by an individual, or by a national or foreign airline, have to abide by strict and detailed rules. All operators know these rules; they are, at least in principle, identical in all 191 member states of ICAO. This has been accomplished through the adoption of so-called ICAO Standards and Recommended Practices (SARPs), laid down in Annexes to the Chicago Convention, to which all member states have to adhere to the greatest extent possible and which they apply to all flights in their air space and to their own aircraft through

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[88] See for the role of the FAA in regulating US commercial space launches further *supra*, § 3.3.1.1; *cf.* also *infra*, § 12.3.4.2.

national implementing legislation.[89] Military aircraft are not automatically subject to this regime of international *civil* aviation,[90] but in practice, through close coordination between military and civil air traffic control agencies, they abide by the same 'safety first' standards. The result is that international civil aviation has an outstanding safety record.[91]

The launch vehicle, a relatively dangerous newcomer in airspace, may threaten this safety record if left unregulated: neither aircraft commanders nor air traffic management are accustomed to or have procedures in place to address – possible – interference with aircraft operations by space objects manoeuvring in airspace. States bear responsibility for keeping their airspace safe for the use of aircraft.[92] However, the aviation rules do not automatically apply to space vehicles: they apply to aircraft, defined as 'any machine that can derive support in the atmosphere from the reactions of the air'.[93] Launch vehicles use rocket propulsion, do not derive support in the atmosphere from the reactions of the air and are therefore not regarded as aircraft; this results in two – legally – different machines using the same air space.

One can think of two ways to address this issue, a practical and a legal one. The practical approach focuses on (continued) coordination between the two national authorities concerned, whereas the legal one would work

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89 Cf. Art. 12, Chicago Convention, *supra* n. 18 ('Rules of the air'): 'Each contracting State undertakes to adopt measures to insure that every aircraft flying over or maneuvering within its territory and every aircraft carrying its nationality mark, wherever such aircraft may be, shall comply with the rules and regulations relating to the flight and maneuver of aircraft there in force. Each contracting State undertakes to keep its own regulations in these respects uniform, to the greatest possible extent, with those established from time to time under this Convention. Over the high seas, the rules in force shall be those established under this Convention. Each contracting State undertakes to insure the prosecution of all persons violating the regulations applicable.' The air traffic rules (SARPs) concerned are detailed in Annex 2, Rules of the air, and Annex 11, Air Traffic Services. On SARPs in general see also Arts. 37–38, Chicago Convention.

90 *Cf.* Art. 3(a), (b), Chicago Convention, *supra* n. 18.

91 In 2011 one accident (of Western-built aircraft) occurred per 2.7 million flights, in 2012 this figure has gone down to one accident per 5 million flights; see Tony Tyler's State of the Industry Speech, 3 June 2013, fn. 2, at www.iata.org/pressroom/speeches/Pages/2013-06-03-02.aspx, last accessed 28 June 2013.

92 *Cf.* also Art. 28, Chicago Convention, *supra* n. 18.

93 For the complete definition, to be found in a number of Annexes (e.g. 2 and 8, in the Definitions section) to the Chicago Convention, *supra* n. 18, see *ibid.*

towards amendment of the definition of aircraft to include the launch vehicle or expand the responsibilities of the aviation authorities to include launch vehicle operations. As long as the number of spacefaring nations and actual launches grows at the present modest pace, the practical approach is probably the best one for years to come. The legal solution comes into the picture when the growth of air and space traffic has made the coordination model less effective and/or when problems of governance in the coordination process ('who is the boss?') threaten the safety of air space for national and foreign users.

On the *international* intergovernmental (ICAO) level one should not expect much support for the legal approach, in view of the vast consequences of such an important change, the very few potential beneficiaries of this measure, and the ensuing lack of urgency on the part of the member states. In 2005 the ICAO Council discussed, on the basis of a working paper prepared for that occasion, the potential involvement of the organization in the regulation of sub-orbital flights, but no follow-up actions were taken.[94] When asked by the Legal Subcommittee of UN COPUOS, in the framework of the Subcommittee's discussion on the definition and delimitation of outer space, to make a 'comprehensive presentation on current and foreseeable civil aviation operations, with particular emphasis on the upper limit of those operations' for consideration at its 2010 session, the ICAO Secretariat limited itself to referring to the above working paper.[95]

On a *national* level it is, in principle, much easier to expand the competence of the civil aviation authorities to include launch vehicle operations. And, with the prospect of increasing – private, commercial – space flight, it is also eminently logical. The German Aviation Code formally adopts that approach. It provides simply: 'Space vehicles,

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[94] The ICAO Secretariat study, prepared for the Council's 175th session, entitled 'Concept of sub-orbital flights', concluded *i.a.*: '6.3 The Chicago Convention applies to international air navigation but current commercial activities envisage sub-orbital flights departing from and landing at the same place, which may not entail the crossing of foreign air spaces. Should however foreign air space(s) be traversed, and should it be eventually determined that sub-orbital flights would be subject to international air law, pertinent Annexes to the Chicago Convention would in principle be amenable to their regulation'; ICAO Working Paper C-WP/12436 of 30/05/05, reprinted in H.P. van Fenema, Suborbital Flights and ICAO, 30 *Air & Space Law* (2005) 404–11. See also R. Abeyratne, 'ICAO's Involvement in Outer Space Affairs – A Need for Closer Scrutiny', 30 *Journal of Space Law* (2004), 185–202.

[95] See UN Doc. A/AC.105/C.2/2010/CRP.9, of 19 March 2010.

rockets and similar flight objects are treated as aircraft as long as they are in air space.'[96]

A 2001 Study prepared by the FAA Office of Commercial Space Transportation translates this into an integration model: 'From a [National Airspace System] service provider perspective, space and aviation operations must be seamlessly integrated in order to continue to provide efficient service to all NAS users.'[97] The concept document provides the following rationale for this approach:

> Historically, commercial launch operations have occurred at coastal federal ranges utilizing only ELVs. As a result, these space operations have had minimal impact on NAS operations due to their infrequent occurrence and offshore trajectories. However, the expected increase in frequency of commercial launches and reentries, from a broad range of locations, in the U.S., will contribute substantially to competition for airspace amongst NAS users. Therefore, the FAA must now consider a 'Space and Air Traffic Management System' (SATMS) that equitably supports both the evolving commercial space transportation industry and the mature and continuously growing aviation industry in a systematic, integrated manner.[98]

If the national authorities of the other spacefaring nations concerned act in a similar way, there appears to be little need, for some time to come, for amended international air law or new space law to address questions of safety in air space created by the joint use thereof by launch vehicles and aircraft. That will probably only change when space operations involving the planned and actual crossing of national airspace borders (promise to) become routine.

7.4.4 From Air Traffic Management to Space Traffic Management

While thus having made an effort to put the threats to aviation posed by launch vehicles – and therefore the urgency of addressing those threats through international regulation – in perspective, it is nevertheless useful

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[96] I.e. 'Raumfahrzeuge, Raketen und ähnliche Flugkörper gelten als Luftfahrzeuge, solange sie sich im Luftraum befinden': German Aviation Code (*Luftverkehrsgesetz*), Chapter 1, Subch. VI, *Arten von Luftfahrzeugen* ('types of aircraft'), www.gesetze-im-internet.de/luftvg/index.html, last accessed 14 April 2014.

[97] *Concept of Operations for commercial space transportation in the National Airspace System*, Version 2.0, of 11 May 2001, FAA – Office of the Associate Administrator for Commercial Space Transportation, at 1.0 (Introduction).

[98] *Ibid.*, 1.

to briefly consider the regulatory aspects thereof in relation to space traffic management of *orbital* activities.

Air traffic management can play a role in the safety of aviation and space flight, but, literally, 'up to a point'. That point could, and probably would, have been the exact border between airspace and outer space. Unfortunately, no such border legally exists.[99] This is a problem of space law and space lawyers, dominated by considerations of national security and defence. It is not an issue that concerned air lawyers when in 1944 at the Chicago Conference allied states got together to create rules for post-war international civil aviation. The concept of sovereignty over national airspace was unanimously endorsed to make sure that states would remain masters in and over their own airspace, for defence, safety and economic/commercial reasons.[100] It enabled them to say 'no trespassing' to any foreign aircraft that for whatever reason and irrespective of altitude planned to cross the *vertical* border that extends upward from the national territory including the territorial sea. Within those borders they maintain order and safety in airspace for the benefit of all aircraft operators permitted to use it.

7.4.4.1 Launches through national airspace

Following this rationale, the potential interest of states to supervise the behaviour of launch vehicles in their own national airspace progressively diminishes with every mile that the vehicle puts between itself and the cruising altitude of the aircraft operating in the vicinity. And its *ability* to do so will also diminish. Put differently, where aircraft cannot fly and chances of interference have thus become remote, responsibility for the management of the space vehicle can be transferred from national air traffic management to national space traffic management authorities. The altitude at which this switch takes place may be substantially lower than the tentative border of 100 or 110 km that is suggested in space law literature to define/delimit outer space.[101]

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[99] *Cf.* also *supra*, § 2.3.1.3.

[100] See Art. 1, Chicago Convention, *supra* n. 18, which repeated (and replaced) Art. 1, Convention Relating to the Regulation of Aerial Navigation (Paris Convention), Paris, done 13 October 1919, entered into force 11 July 1922; 11 LNTS 173; UKTS 1922 No. 2; ATS 1922 No. 6.

[101] See in general *supra*, § 2.3.1.3; also discussion in F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 163–72, referring to the USSR proposal (on 110 km) and the Belgian proposal (on 100 km) made in the UN COPUOS Legal Sub-Committee of 1979 and 1976 respectively. See e.g. UN Doc. A/AC.105/889/Add.10 ('Questions on the definition and delimitation of outer space: replies

For example, the US NAS has an upper limit of 60,000 feet or 18.3 kilometres (the maximum cruising altitude of today's passenger aircraft is around 37,000 feet or 11.3 kilometres).[102] Or, when returning from space, a US space vehicle enters supervised and controlled US air space at an altitude of approximately 18 kilometres. But in order to be able to give timely instructions to aircraft operating in the vicinity the appropriate traffic management centre needs speed and trajectory data of the returning space vehicle at a much earlier stage of descent. This information has to be provided by a space traffic manager and the space vehicle operator.

Characteristics of the space vehicle affecting its manoeuvrability, both at the launch and at the re-entry phase, determine whether and to what extent its operation can be managed: in other words whether it will be able to comply with air traffic control (ATC) clearance instructions. The

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from member States', at 5 (Russian Federation)). See also Australian Space Activities Act (An act about space activities, and for related purposes, No. 123 of 1998, assented to 21 December 1998; *National Space Legislation of the World*, Vol. I (2001), at 197) of 1998 as amended in 2002, which applies only to space activities that occur or are intended to occur above 100 km in altitude (Australia emphasized, however, that identifying the 100 km altitude in the Act was not an attempt on Australia's part to define or limit 'outer space'); see UN Doc. A/AC.105/865/Add.1, of 20 March 2006 ('National legislation and practice relating to definition and delimitation of outer space – replies received from member States', at 2–4 (Australia)). See, for more analyses and national views, 'Documents relating to the work of the Working Group on the Definition and Delimitation of Outer Space of the [UN COPUOS Legal Sub-Committee]', at www.oosa.unvienna.org/oosa/en/COPUOS/Legal/wg-ddos/index.html, last accessed 13 June 2013. It is interesting to note that the multilateral Wassenaar Arrangement, *infra* n. 119, on export controls for conventional arms and dual-use goods and technologies, contains the following definition of products or items that are 'space-qualified': 'Products designed, manufactured and tested to meet the special electrical, mechanical or environmental requirements for use in the launch and deployment of satellites or high altitude flight systems operating at altitudes of 100 km or higher'; see *infra*, § 7.5.2.1. The EU Regulation implementing the Wassenaar Arrangement, Council Regulation setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, No. 428/2009/EC, of 5 May 2009; OJ L 134/1 (2009), contains identical language, *binding* the EU member states; see *infra*, § 7.5.2.2.

[102] The U-2 high altitude reconnaissance aircraft 'Dragon Lady', operated by the US Air Force, reaches an altitude of 70,000 ft or 21.3 km. For comparison's sake: the lowest satellite perigee was/is around 100 miles or 160 km, compared with 1957's Sputnik 1 at 140 miles or 224 km and the International Space Station at 205 miles or 330 km. Sounding rockets go to an altitude as low as 30 miles or 48 km or as high as 800 miles or 1,280 km or more (all approximates). See however further *supra*, § 2.3.1.3.

FAA 2001 document makes a distinction between launch and transition to space, where a horizontal (aircraft-type) take-off provides time and opportunity for ATC clearance, and a vertical launch does not; and re-entry and return to a landing site, where only a powered flight provides sufficient time and opportunity for ATC clearance, and an unpowered flight or ballistic return does not.[103]

Where ATC instructions cannot be followed by the space vehicle concerned, the only way to keep it at a safe distance from aircraft is to create a reserved airspace or 'no fly zone'.[104] However, this may cause a serious disruption of air traffic at busy airports nearby.

In the Space Shuttle era, calculation of the effects of pre-emptive airspace closure along a re-entry airspace corridor showed that a significant amount of traffic would be affected. Accordingly, the FAA determined that the airspace below a re-entering Shuttle should remain open for normal air traffic operations, provided that an operational plan was in place to notify airspace users in advance and provide air traffic controllers with the necessary information to appropriately address a potential accident.[105] To that end, the FAA chose to issue Notices to Airmen (NOTAMs), which, on the basis of trajectory data provided by NASA, would notify airspace users which part of airspace 25 nautical miles to either side of the nominal re-entry trajectory would be vulnerable to Shuttle debris in case of an accident. A similar approach can be taken vis-à-vis commercial space operations irrespective of the spaceports/landing sites used.

7.4.4.2 Launches through international airspace

So far the focus has been on the management of air traffic and space traffic in and above national airspace; yet international airspace, that is mostly airspace above the high seas, is also extensively used by airlines operating international flights. Launch vehicles operating from national territory may leave national airspace and transit international airspace

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[103] See *Concept of Operations for commercial space transportation in the National Airspace System*, *supra* n. 97, 10 (Fig. 3).

[104] According to Art. 9, Chicago Convention, *supra* n. 18, '[e]ach contracting State reserves also the right, in exceptional circumstances or during a period of emergency, or in the interest of public safety, and with immediate effect, temporarily to restrict or prohibit flying over the whole or any part of its territory, on condition that such restriction or prohibition shall be applicable without distinction of nationality to aircraft of all other States.'

[105] See D.P. Murray & M. Mitchell, *Lessons Learned in Operational Space and Air Traffic Management*, FAA, AIAA 2010-1349, 4.

before entering outer space. Launches may also use international air space only, for example in the case of Sea Launch operations from its launch platform on the high seas or launches from an aircraft flying in the skies above, like the aircraft-launched Pegasus.

International air space is a *res communis omnium* like outer space, and territorial jurisdiction is absent. But air traffic management rules do apply and states have to ensure that 'every aircraft carrying its nationality mark, *wherever such aircraft may be*, shall comply with the rules and regulations relating to the flight and manoeuver of aircraft there in force'.[106] Thus, a uniform set of rules on matters like flight plans, cruising levels, right of way, position reports, communications and other collision-avoidance measures applies to, and is adhered to by, all aircraft operating above the high seas. Also here the launch vehicle may be seen as an intruder, potentially disturbing a safe aviation environment – albeit, so far and for the time being, on an extremely limited scale.

In the absence of territorial jurisdiction a state's personal jurisdiction by virtue of Articles VI and VIII of the Outer Space Treaty[107] may be invoked vis-à-vis the state concerned to ensure that the launch activity does not interfere with international aviation. In other words, the licensing state's space agency has the duty to warn, through its national civil aviation/air traffic management authorities, all users of this part of international air space about the danger for aircraft to operate in or near the launch area at the time of the launch. But the creation, for the above aviation safety purposes, of 'no fly zones' in *international* air space above the launch area would create a conflict with the principle of 'freedom of overflight' over the high seas prevalent in the law of the sea,[108] a matter that would therefore have to be dealt with primarily by ICAO.

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[106] Art. 12, Chicago Convention, *supra* n. 18 (emphasis added). The clause further states: 'Over the high seas, the rules in force shall be those established under this Convention'. The ICAO Council has determined on a number of occasions that the 'Rules of the air' of Annex 2 are standards, i.e. they apply without exception to the airspace above the high seas, and it is the responsibility of the 191 ICAO member states that the aircraft commanders piloting the aircraft of their national airlines adhere strictly to these rules. See more extensively on these aspects chs. 2.2.5 ('provisions of air law') and 2.3.1 ('air traffic'), IAA, *Cosmic Study on Space Traffic Management* (2006).

[107] See *supra*, § 2.3.1.1, also § 2.3.4.

[108] *Cf.* Art. 87(1), United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 and 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39: 'Freedom of the high

Another way of creating a legal basis for national air traffic management controls in international air space for the purpose of regulating its joint use by aircraft and spacecraft alike, would be the establishment of a so-called 'regional air navigation agreement'. On the basis thereof, a state will accept responsibility for providing national air traffic services in specific portions of airspace over the high seas. The Council of ICAO is the body that has to approve this type of arrangement.[109]

7.5 LEGAL ASPECTS OF MARKET ACCESS AND COMPETITION ISSUES

The other major area of launching and space transportation dealt with by a specifically developed body of law and policy concerns market access and competition issues, which in turn include export controls, government procurement, and other trade- and competition-related aspects. International space law does not provide rules on doing business or market access matters. There do exist provisions in the Outer Space Treaty on *cooperation* between the spacefaring states.[110] In fact, cooperation is seen as one of the guiding principles underlying the free use of outer space. Cooperative space projects such as the historical US–Soviet Apollo-Soyuz link-up in July 1975, joint scientific missions and, more recently, the ISS show that space nations, for ideological/political, scientific and financial reasons, have found ways to join forces in the exploration and use of outer space.

However, cooperation in the field of the development or operation of launch vehicles is much more complicated because of the sensitive military technology involved. In fact, international non-proliferation guidelines and (inter-)national export control regulations *de facto* discourage such cooperation for fear that the technology thus shared will be used for the development of missiles capable of carrying weapons of mass destruction. Other unintended consequences of this concern are, for example, that (the results of) post-accident investigations will thus remain in national hands and foreign space insurance companies face difficulties in independently establishing the cause of a malfunction that resulted in damage covered (or not) by the insurance policy. And rocket engineers

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seas … comprises, *inter alia* … (b) freedom of overflight'. For 'no fly zones' in *national* air space, see *supra* text at n. 104.

[109] See further *Cosmic Study on Space Traffic Management*, *supra* n. 106.

[110] Examples are Arts. I, III, IX, X, Outer Space Treaty, *supra* n. 14.

may face serious legal problems if they engage in shoptalk with their foreign colleagues, either bilaterally or in a conference setting.

Competition between launch companies operating in the international launch market is also hampered by these same guidelines and by national legislation and policy that employs both national security, foreign policy and economic-commercial language to justify limitations to free competition in this field.

7.5.1 Export Controls: Missile Export Controls Affecting the Sale of Launch Vehicles and the Relevant Technologies

7.5.1.1 The Missile Technology Control Regime

The Missile Technology Control Regime (MTCR) is an informal and voluntary association of countries which share the goals of non-proliferation of unmanned delivery systems (other than manned aircraft) capable of delivering weapons of mass destruction.[111] The members or partners seek to coordinate national export licensing efforts aimed at preventing missiles and missile technology being acquired by aspiring countries and, after the 9/11 attacks, terrorist groups/individuals. The regime was formed in 1987 by the G-7 industrialized countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States), and has grown since to a group of 34 members/partners.[112] The trade in rockets *among* the partners falls in principle under the same export restrictions.[113] The Regime established a common export policy in

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[111] See Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles (hereafter MTCR Agreement), done 16 April 1987; 26 ILM 599 (1987); as amended by the Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles as Amended, effective 7 January 1993; 32 ILM 1298 (1993).

[112] These comprise Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Korea, Russian Federation, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, and United States; see *The Missile Technology Control Regime, Frequently asked questions (FAQs)*, www.mtcr.info/english/FAQ-E.html, last accessed 20 June 2012.

[113] See *Guidelines for Sensitive Missile-Related Transfers*, para. 1, www.mtcr.info/english/guidetext.htm, last accessed 15 January 2014: 'These Guidelines, including the attached Annex, form the basis for controlling transfers *to any destination* beyond the Government's jurisdiction or control [of the controlled items]' (emphasis added); also MTCR FAQs, Question 14 'Are exports to Partners treated differently than exports to non Partners?' Answer: 'The

the form of the so-called MTCR Guidelines which are applied to a list of controlled items, the MTCR equipment, software and technology Annex. The Annex is divided in two parts, containing Category I and Category II items.

Category I items include

> complete rocket and unmanned aerial vehicle systems (including ballistic missiles, *space launch vehicles*, sounding rockets, cruise missiles, target drones, and reconnaissance drones), capable of delivering a payload of at least 500 kg to a range of at least 300 km, their major complete subsystems (such as rocket stages, engines, guidance sets, and re-entry vehicles) and related software and technology, as well as specially designed production facilities for these items.[114]

Pursuant to the MTCR Guidelines, exports of these items are subject to an unconditional strong presumption of denial regardless of the purpose of the export and are licensed for export only on rare occasions. Additionally, exports of production facilities for the manufacture of these items are prohibited absolutely.[115]

Category II items include other less-sensitive and dual-use missile-related components: '[t]he Guidelines are not designed to impede national space programs or international cooperation in such programs as long as such programs could not contribute to delivery systems for weapons of mass destruction.'[116] These words would seem to make a distinction between international cooperation in the field of missiles and missile R&D (strongly discouraged) and cooperation in the field of civil-governmental or commercial ELVs (permitted cooperation in the peaceful uses of outer space). But the reality is that the technology employed in both cases makes it virtually impossible to guarantee that 'such cooperation *could not* contribute to' weapons of mass destruction-delivery systems. The MTCR and the national export controls based

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MTCR Guidelines do not distinguish between exports to Partners and exports to non-Partners. Moreover, the MTCR Partners have explicitly affirmed that membership in the Regime provides no entitlement to obtain technology from another Partner and no obligation to supply it'; see *The Missile Technology Control Regime, Frequently asked questions (FAQs)*, *supra* n. 112.

[114] Emphasis added; see MTCR Guidelines and the Equipment, Software and Technology Annex, www.mtcr.info/english/guidelines.html, last accessed 13 June 2013.

[115] See *The Missile Technology Control Regime, Frequently asked questions (FAQs)*, *supra* n. 112.

[116] See *Guidelines for Sensitive Missile-Relevant Transfers*, *supra* n. 113, para. 1.

thereon have therefore been credited not only with the slowing down or reduction of international missile proliferation but also of the spread of launch vehicle hardware and know-how.[117] From an international security point of view this should be applauded. But when looking at the effect on the number and quality of launch service providers worldwide and the current price of space transportation, one could argue that space transportation and hence space exploration and use have *not* been helped by this regime.[118]

7.5.1.2 The Wassenaar Arrangement

The Wassenaar Arrangement on export controls for conventional arms and dual-use goods and technologies of 1995,[119] a non-binding multilateral export control regime, aims at enhancing cooperation among the adhering states to prevent the acquisition of armaments and sensitive dual-use items for military end-uses, if the situation in a region or the behaviour of a state is, or becomes, a cause for serious concern to the

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[117] See, for examples, B.G. Chow, *Emerging National Space Launch Programs – Economics and Safeguards*, National Defense Research Institute, RAND, USA (1993), mentioning e.g. South Africa, Brazil, Argentina and India, as referred to in Van Fenema, *supra* n. 3, ch. 2, n. 273; for discussion of the effects of MTCR controls on launch vehicle/missile development aspirations of other countries, see 147–58.

[118] A 2005 article written for the Arms Control Association listed the following shortcomings of the Regime: (1) it lacks the right members ('it preaches to the choir; others try to ignore it'): e.g. China, North Korea, Iran and Pakistan have so far stayed outside; (2) the MTCR targeted the key advanced technologies of the time; by 1989 that job was largely completed, but the technologies available today (at the low end, 'ubiquitous' Scud technology, at the high end solid fuel technology and modern rocket guidance systems) are much more difficult to restrain; and (3) members try to protect their own preferred export activities (France, United Kingdom: cruise missiles, United States: transfer of ballistic missile defence capabilities to allies); this weakens the credibility of the Regime; see A. Karp, *Going Ballistic? Reversing Missile Proliferation*, Arms Control Association, www.armscontrol.org/act/2005_06/Karp, last accessed 22 June 2012.

[119] Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies, Wassenaar, done 19 December 1995, effective 12 July 1996, www.wassenaar.org/, last accessed 15 January 2014. The Wassenaar Arrangement is the successor of the 1950 Coordinating Committee for multilateral export controls (COCOM), a Cold War cooperative arrangement to prevent the socialist/communist states from obtaining Western-manufactured sensitive and military-relevant goods and technologies. When it came to specific national exports, each of the COCOM members had veto power. It ceased to exist in 1994.

participating states. Through the exchange of information on national exports the Wassenaar Arrangement aims at (more) responsible behaviour among its members when exporting weapons or dual-use goods and technologies to 'states of concern'.

The Wassenaar Arrangement works with two lists of controlled items, one on conventional arms, the Munitions List and one on dual-use goods and technologies, the Dual-Use List; the latter has nine categories of controlled goods and technologies on, for instance, computers, electronics, sensors and lasers, including Category 9 entitled 'Aerospace and propulsion', and two annexes containing a 'sensitive list' and a 'very sensitive list', with concomitant obligations imposed on the participating states as to the level of vigilance applied to their exports. Category 9 contains the sub-category 'space launch vehicles and spacecraft', listing various rocket propulsion systems and components as controlled items.[120]

In principle, the Wassenaar Arrangement should not control items for export purposes that are already controlled by, for example, MTCR, but there are exceptions to that rule.[121] It may be noted furthermore in this respect that there is a large, but not complete, overlap between states members of the Wassenaar Arrangement[122] and states members of the MTCR regime.

7.5.1.3 The European Union

In the European Union a distinction should be made between national security and defence matters, which remain firmly in the hands of the

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[120] See Dual-Use List – Category 9 – aerospace and propulsion, sub-categories 9.A.4–9.A.10, Wassenaar Arrangement, *supra* n. 119, WA-LIST (12) 1 of 12-12-2012, see www.wassenaar.org/controllists/, last accessed 14 April 2014.

[121] See 'Criteria for the selection of dual-use items', n. 3: 'An item which is controlled by another regime should not normally qualify to be controlled by the Wassenaar Arrangement unless additional coverage proves to be necessary according to the purposes of the Wassenaar Arrangement, or when concerns and objectives are not identical'; see www.wassenaar.org/controllists/2005/Criteria_as_updated_at_the_December_2005_PLM.pdf, last accessed 15 January 2014.

[122] Currently, the following states are members of the Wassenaar Arrangement: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and United States; see www.wassenaar.org/, last accessed 15 January 2014. For states members to the MTCR Agreement see *supra*, n. 112.

individual member states, and trade matters which fall within the competence of the Union. As far as export controls are concerned, this distinction is reflected in two different regimes: a Code of Conduct on Arms Exports of 1998 updated in 2008[123] and a Council Regulation of 2009,[124] which is basically an update of Regulation 1334/2000[125] which presented the first thorough European effort at handling the export of dual-use technology.

Under the Code of Conduct and its successor of 2008 the baseline agreement is reflected by Criterion I: 'An export licence should be refused if approval would be inconsistent with, inter alia: … their commitments in the frameworks of … the [MTCR] and the Wassenaar Arrangement.'[126] The Code of Conduct reminds the member states of the European Union of their commitments under the various multilateral regimes and arrangements, but cannot be regarded as hard law: the export of arms including missiles remains, therefore, a matter for the national governments' interpretation of their commitments under the above regimes. The European Union as a body does not deal with these matters.

Items that, for export purposes, the member states do not regard as arms, may be treated as dual-use goods and technologies under Council Regulation 428/2009/EC 'setting up a Community regime for the control of exports, transfer, brokering and transit of *dual-use items*'.[127] The principle of the Regulation is that items listed cannot leave the EU

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[123] European Union Code of Conduct on Arms Exports, EU Council 8675/2/98, Brussels, 5 June 1998 (OR.en); see http://ec.europa.eu/external_relations/cfsp/sanctions/codeofconduct.pdf, last accessed 15 January 2014. This Code of Conduct was updated and upgraded by Council Common Position 2008/944/CFSP of 8 December 2008 defining common rules governing control of exports of military technology and equipment, see http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1414437765226&uri=CELEX:32008E0944.

[124] Regulation 428/2009, *supra* n. 101.

[125] Council Regulation setting up a Community regime for the control of exports of dual-use items and technology, No. 1334/2000/EC, of 22 June 2000; OJ L 159/1 (2000). See *infra*, n. 127, for later versions.

[126] MTCR Agreement, *supra*, n. 112, and Wassenaar Arrangement, *supra* n. 119.

[127] Regulation 428/2009, *supra* n. 101; the list of controlled items has been updated most recently by Regulation of the European Parliament and of the Council amending Council Regulation (EC) No 428/2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, No. 388/2012/EU, of 19 April 2012, OJ L 129/12 (2012). Art. 2(1), Regulation 428/2009, defines dual-use items as 'items, including software and technology, which can be used for both civil and military purposes, and shall

custom territory without an export authorization granted by the competent authorities of the member states:

> Annex I of the above Regulation 428/2009 establishes the common list of dual-use items referred to in article 3 of that Regulation, which implements internationally agreed dual-use controls. These controls were undertaken within the context of participation in the Australia Group, the [MTCR], the Nuclear Suppliers Group, the Wassenaar Arrangement and the Chemical Weapons Convention.[128]

The list of Annex I is divided into ten categories of items controlled. Category 9 labelled 'aerospace and propulsion' lists space launch vehicles and spacecraft, various rocket propulsion systems and engines, sounding rockets 'capable of a range of at least 300 km', re-entry vehicles, launch support equipment, and components and technology.[129] The list has to be updated regularly to take account of changes agreed within the above groups/regimes to which the member states have committed themselves.

Within the European Union there are in principle no trade barriers preventing (companies of) member states from selling/buying among themselves dual-use goods. An exception is made for a list of highly sensitive items (in Annex IV), which cannot be transferred to other

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include all goods which can be used for both non-explosive uses and assisting in any way in the manufacture of nuclear weapons or other nuclear explosive devices'.

128 This concerns *i.a.* the Australia Group, an informal forum of countries, which has sought, since 1985, to ensure that exports do not contribute to the development of chemical or biological weapons; coordination and harmonization of national export control measures assist the 41 participants, including the European Commission, to fulfil their obligations under the Chemical Weapons Convention (Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction, New York, done 3 September 1992, entered into force 29 April 1997; 1974 UNTS 45; S. Treaty Doc. No. 103-21) and the Biological Weapons Convention (Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, London/Moscow/Washington, done 10 April 1972, entered into force 26 March 1975; 26 UST 583; 11 UKTS, Cmd. 6397), see www.australiagroup.net/en/index.html, last accessed 4 June 2013; and the Nuclear Suppliers Group of 1975 (47 participating countries), which contributes to the non-proliferation of nuclear weapons through the implementation of two sets of Guidelines for nuclear exports and nuclear-related exports, see www.nuclearsuppliersgroup.org/, last accessed 4 June 2013.

129 See Regulation 388/2012, *supra* n. 127, Annex I, Category 9, subcategories 9A004–9A120.

member states without authorization: these include in particular MTCR items taken from the above Category 9 list (launch vehicles, sounding rockets and such like, including components and technology).[130]

This Council Regulation is 'hard law', applicable in and between all member states and enforced by the European Commission. In other words, through the respective Annexes of the Regulation, it implements the export controls on dual-use items of the above international regimes, and turns those non-binding arrangements into binding law applicable in the 28 EU member states. The combination of the Code of Conduct on Arms Exports and the Regulation in its latest manifestation create a strong bias against the export of missiles, propulsion systems, space launch vehicles and the relevant technology.

7.5.1.4 The United States

Under the US Arms Export Control Act[131] and its International Traffic in Arms Regulations (ITARs) the State Department controls the export of arms, that is defence articles and defence services. ITARs include the so-called United States Munitions List (USML)[132] which, in its Category IV, lists 'launch vehicles and rockets' as being subject to strict export

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[130] According to Art. 22(1), Regulation 428/2009, *supra* n. 101, '[a]n authorization shall be required for intra-Community transfers of dual-use items listed in Annex IV'. Annex IV, Part I, uses distance/weight criteria to identify those Category 9 MTCR sub-categories that need export controls for transfers *within* the European Union, e.g. '[s]pace launch vehicles, capable of delivering at least a 500 kg payload to a range of at least 300 km' (9A004) and '[s]ounding rockets, capable of delivering at least a 500 kg payload to a range of at least 300 km' (9A104). Transfers between ESA and member states' space agencies and amongst those space agencies are exempted from the above Annex IV controls, see Annex IV, Part I, 'Exemptions'.

[131] See Arms Export Control Act of 1976, 22 U.S.C. 2751. On the military aspects of export controls, see also *supra*, § 6.6; more in general P. Vorwig, Regulation of Private Launch Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 416–9; M.J. Kleiman, J.K. Lamie & M.V. Carminati, *The Laws of Spaceflight* (2012), 141 ff.

[132] For the ITARs, see www.pmddtc.state.gov/regulations_laws/documents/official_itar/2013/ITAR_Part_120.pdf, last accessed 14 April 2014; United States Munitions List (USML), 22 C.F.R. 121, last revised 1 April 2008.

controls.[133] 'Export' includes the disclosing or transferring of technical data to a foreign person.[134]

Under the US Export Administration Act[135] and its Export Administrative Regulations (EARs), the Department of Commerce controls the export of 'dual-use' items. EARs include the so-called Commerce Control List[136] which, in its Category 9, lists propulsion (including components) as being subject to export controls.[137]

7.5.1.5 Other states

The MTCR Guidelines and control lists are enforced, through national export controls, by all 34 MTCR partners. MTCR members claim that, increasingly, also non-members adhere to this international export control standard and adopt corresponding legislation or policy.[138] Together, all these national acts and implementing regulations and policies create a strong bias against the export of launch vehicles and relevant technologies and know-how.

7.5.1.6 The Hague Code of Conduct

The Hague Code of Conduct against Ballistic Missile Proliferation (HCOC)[139] is meant to supplement the export control regime of the

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[133] See USML, *supra* n. 132, at 121.1, 'General. The United States Munitions List, Category IV – Launch vehicles, guided missiles, ballistic missiles, rockets, torpedoes, bombs and mines'.

[134] 'Export means: … (4) disclosing (including oral or visual disclosure) or transferring of technical data to a foreign person, whether in the United States or abroad'; see ITARs, *supra* n. 132, at 120.17, 'Export'.

[135] See Export Administration Act of 1979; Public Law 96-72, 96th Congress; 50 U.S.C. 2401; 93 Stat. 503.

[136] Commerce Control List (CCL), 15 C.F.R. 774, last revised 1 January 2008.

[137] Category 9 'Aerospace and propulsion'; for the subcategories space launch vehicles and 'spacecraft' in 9A004 and sounding rockets in 9A104, the CCL refers to State Department controls under ITAR/USML; some components and other items falling under this category are controlled by the Department of Commerce; see CCL, *supra* n. 136, Cat. 9.

[138] See Plenary meeting of the MTCR, Buenos Aires, Argentina, 13–15 April 2011, press release of 20 April 2011; www.mtcr.info/english/Press%20Release%20April%202011.html, last accessed 14 April 2014. E.g. China is not a member of MTCR but has MTCR-inspired national export controls on missiles through its Regulations of the People's Republic of China on Export Control of Missiles and Missile-related Items and Technologies of 2002.

[139] Hague Code of Conduct against Ballistic Missile Proliferation; for text and general information, see www.hcoc.at, last accessed 15 January 2014.

MTCR by having the 'subscribing states' commit themselves to maximum restraint in the developing, testing and deployment of ballistic missiles capable of delivering weapons of mass destruction. Rather than discouraging export of missiles, it establishes moral norms or behavioural standards for all states on how to deal with, or rather combat, the spread of ballistic missiles. It does not forbid countries to possess these missiles but establishes rules of the road, *inter alia* to build mutual trust through transparency and confidence building measures.

One of the ways in which the Code attempts to accomplish this is by making a clear distinction between missiles and launch vehicles and by asking the states concerned to be transparent as to which is which, as discussed further below. The thinking behind the measures states will implement in this regard is laid down in a number of Principles:

> (e) Confirmation of their commitment to the [UN Space Benefits Declaration of December 1996[140]];
>
> …
>
> (f) Recognition that states should not be excluded from utilizing the benefits of space for peaceful purposes, but that, in reaping such benefits and conducting related cooperation, they must not contribute to the proliferation of Ballistic Missiles capable of delivering weapons of mass destruction;
> (g) Recognition that Space Launch Vehicle programmes should not be used to conceal Ballistic Missile programmes; [and]
> (h) Recognition of the necessity of appropriate transparency measures on Ballistic Missile programmes and Space Launch Vehicle programmes in order to increase confidence and to promote non-proliferation of Ballistic Missiles and Ballistic Missile technology.[141]

The – now 135 – subscribing states[142] are required to curb and prevent the proliferation of ballistic missiles, 'exercise maximum possible restraint in the development, testing and deployment of ballistic missiles' and 'exercise the necessary vigilance in the consideration of assistance to Space Launch Vehicle programmes in any other country so as to prevent

[140] Reference is made to Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries, UNGA Res. 51/122, of 13 December 1996; UN Doc. A/RES/51/122.

[141] Hague Code of Conduct, *supra* n. 139, para. 2.

[142] See www.hcoc.at, last accessed 15 January 2014.

contributing to delivery systems for weapons of mass destruction, considering that such programmes may be used to conceal Ballistic Missile programmes'.[143]

They also agree to implement two sets of 'transparency measures': to make annual declarations about their ballistic missile and space launch vehicle programmes, including information on the launches of missiles and launch vehicles actually launched; and to exchange pre-launch notifications (PLNs) on their ballistic missile and space launch vehicle launches and test flights.[144]

The MTCR and the HCOC are non-binding arrangements. National implementing legislation and policy measures may differ both in scope and effectiveness. And political priorities in bilateral relations may differ or change. The extent to which the countries concerned actually abide by the respective guidelines and norms in the light of their strategic and economic relations with recipient states is therefore a matter of debate.[145]

In this connection, the Code's PLN requirement deserves special attention. PLN may be seen as a valuable transparency measure. But it may also be regarded as a useful complement to the registration obligations as laid down in the Registration Convention. As is well known, that Convention obliges the launching State 'when a space object is launched' to register that object in its national registry and to furnish information to the UN Secretary-General on such registered space objects 'as soon as practicable'.[146]

In practice, this requirement has resulted in *ex post facto* reporting, sometimes months after the event,[147] rendering it, from a space traffic management point of view, a tool unfit for identifying risks during or shortly after launch. PLN promised to remedy this situation if the launch-capable subscribers to the Code all faithfully adhered to their notification commitments. But this has not been the case. In fact, right

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143 Hague Code of Conduct, *supra* n. 139, para. 3(c) & (d) respectively.

144 See *ibid.*, para. 4(a).

145 D. Gormley, Making the Hague Code of Conduct Relevant, www.nti.org/analysis/articles/making-code-conduct-relevant/, last accessed 21 June 2012, mentions three problems undermining the effectiveness of the Code: the absence of North Korea, Iran, India and Pakistan from its signatories; the fact that the United States and Russia have not implemented the reporting requirements (annual declarations and pre-launch notifications), thus setting a bad example for the other signatories, and the absence of cruise missiles from the Code's remit. *Cf.* however *infra*, n. 149, on the new US policy announced in 2010.

146 Arts. II(1), & IV(1) respectively, Registration Convention, *supra* n. 52.

147 *Cf.* e.g. Y. Lee, Registration of Space Objects: ESA Member States' Practice, 22 *Space Policy* (2006), 42–51.

from the start of the HCOC in 2002, the United States never supplied PLN through the Code, but chose instead to exchange such information only with the Russian Federation under a separate bilateral arrangement. Russia, *inter alia* for that reason, halted its own notifications in 2008.[148] France, Japan, Norway, Ukraine and the United Kingdom did make notifications, but the failure of the two main missile and launch vehicle operators to comply with the Code has seriously undermined general discipline (and the effectiveness) of its transparency and identification goals.[149]

It is not the aim of this review to draw conclusions as to the effectiveness of these two instruments in curbing missile proliferation, but the wariness that underlies both MTCR and HCOC and which stems from the fact that the technologies of missiles and launch vehicles are interchangeable, has created a climate in which the exchange of know-how, let alone international cooperation in the field of development and/or operation of launch services, meets serious hurdles. And it also limits increase of competition among present and future launch service providers.

7.5.2 Export Controls: Satellite (Technology) Export Controls

The export control regimes discussed above not only address launch vehicles because of the sensitive, military-relevant nature of the technology used, but also satellites, as the latter, even if used for civil purposes, may also have military applications. Export of, for example, commercial communications satellites and related technology is therefore also subject to national restrictions largely based on the above international regimes.

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[148] See W. Boese, *Russia Halts Missile Launch Notices*, Arms Control Association, March 2008, www.armscontrol.org/print/2773, last accessed 25 June 2012.

[149] In the June 2010 issue of its News Briefs, the Arms Control Association reported that the US State Department in a May 28 interview had reviewed its policy on PLN and had decided to issue such notifications of commercial and NASA space launches, as well as 'the majority' of its intercontinental and submarine-launched ballistic missile launches using the HCOC process. 'On rare occasions' the United States would withhold launch information on certain ballistic missiles or space launch vehicles. As the HCOC meetings are confidential it is not clear whether the United States has given practical follow-up to this announcement and/or whether the Russian Federation has followed suit.

7.5.2.1 The Wassenaar Arrangement

As discussed above, the Wassenaar Arrangement[150] works with two lists of controlled items, one of conventional arms, the Munitions List, and one of dual-use items and technologies, the Dual-Use List.[151] 'Spacecraft', defined as 'active and passive satellites and space probes' (and thus in principle including all commercial communications satellites), come under the Dual-Use List,[152] and participating countries are therefore discouraged from exporting these satellites to 'countries of concern'. However there is no consensus among the Wassenaar Arrangement's member states on which countries fall under that category.

7.5.2.2 The European Union

The Wassenaar Arrangement's Dual-Use List is being enforced within the European Union through Council Regulation 428/2009 as regularly amended,[153] which requires the member states to control the export to countries outside the European Union of all items specified therein, taking into account the Wassenaar Arrangement, the MTCR and other applicable international regimes. Compliance with the Regulation rests with the individual member states concerned, but the European Commission is in charge of enforcement of the Regulation and may investigate suspected infringements thereof. The Regulation uses identical terminology and definitions as the above Wassenaar Arrangement's Dual-Use List, resulting in legally binding controls on the export of satellites and satellite components by EU member states.[154]

7.5.2.3 The United States

Until the late 1980s, US export regulations distinguished between communications satellites built for military, defence and national security purposes and satellites destined for civil and/or commercial use, with concomitant strict national security (ITAR) or more industry-oriented (EAR) dual-use export controls. Under which category – and export

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150 See *supra*, § 7.5.1.2.

151 See further also *supra*, § 6.6.2.

152 Category 9.A.4. 'Space launch vehicles and "spacecraft"'; the definition of spacecraft will be found under 'Definitions of terms used in these lists' at the end of the Dual-Use List of the Wassenaar Arrangement, *supra* n. 119.

153 Regulation 428/2009, *supra* n. 101; Regulation 388/2012, *supra* n. 127; further *supra*, § 7.5.1.3.

154 The control lists in Annexes to the EU Regulation refer to categories of controlled goods; Category 9A004 refers to 'Space launch vehicles and "spacecraft"'; see Regulation 428/2009, *supra* n. 101.

regime – a specific type of satellite would fall was a matter for the executive branch of the US government to decide upon.

Tensions in US relations with China changed that situation. In 1989 the United States and China concluded a launch trade agreement, which allowed China to launch a limited number of US-built satellites under strict conditions and subject to US export controls.[155] Later in the same year, the Tiananmen 'incident' led to an immediate suspension of three licences for the export of US satellites to China for their planned Long March launch, and, more significantly, to the adoption by Congress of trade sanctions against China. These took the form of a ban on all exports to China of defence articles ('arms') and services as listed in the ITARs and of a measure specifically banning Chinese launches of US-manufactured commercial communications satellites (unless exempted by the US President).[156] Exemptions were routinely granted in the years thereafter because of 'national interest' (read: interest of the US satellite manufacturers who demanded (cheap) Chinese launch options for their clients).[157]

This changed in 1998 when a Chinese launch of a US-built communications satellite failed and post-accident contacts between US manufacturer Loral and the Long March operators had purportedly led to transfer of sensitive US satellite–launch vehicle interface technology to the Chinese counterparts, thus contributing to increased missile-relevant knowledge of the People's Liberation Army.[158] A Congressional Report

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155 On this United States–China launch trade agreement, see *infra* § 7.5.4.1.

156 Departments of Commerce, Justice, and State, the Judiciary and Related Agencies Appropriations Act, Fiscal Year 1990; Public Law No. 101-162, 610; 103 Stat. 988, 1038; of 21 November 1989: 'No moneys, appropriated by this Act may be used to reinstate, or approve any export license applications for the launch of United States-built satellites on Soviet – or Chinese – built launch vehicles unless the President makes a report under subsection (b) or (c) of this section [610].' Subsection (b) required a report *i.a.* on the lifting of martial law, the halting of executions and release of political prisoners by the Chinese; subsection (c) asked the President to declare that 'it is in the national interest of the United States'. The prohibition was reintroduced in 1990 through the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991; 22 U.S.C. 2151; Public Law 101-246 para. 902; of 16 February 1990; and again in years thereafter.

157 Thus, in December 1989 the President reported that approval of an export licence for three US-built satellites for launch by the Chinese was in the national interest of the United States; see Van Fenema, *supra* n. 3, ch. 3, n. 80.

158 On 7 June 1998 the *Washington Post* reported that already in March 1997 the USAF's National Air Intelligence Center (NAIC) had concluded in a classified report that Loral and Hughes provided expertise that helped China to

(the 'Cox Report'), rightly or wrongly,[159] supported this allegation and Congress swiftly adopted draconic legislation which attached so many conditions to exports of US satellites to China that these became virtually impossible. This Strom Thurmond Act[160] added an extra layer of restrictions on communications satellite exports to China, in two forms.

Firstly, the Act did so by considering that

> due to the military sensitivity of the technologies involved, it is in the national security interest of the United States that United States satellites and related items be subject to the same export controls that apply under United States law and practices to *munitions* … all satellites and related items that are on the Commerce Control List of dual-use items in the Export Administration Regulations (15 CFR part 730 et seq.) on the date of the enactment of this Act shall be transferred to the United States Munitions List and controlled under section 38 of the Arms Export Control Act (22 U.S.C. 2778).[161]

All communications satellites without exception thus became munitions or arms for export purposes, automatically falling under State Department-enforced export controls based on the ITARs and also falling under any ban(s) on export of defence articles and services such as the above Tiananmen-related sanction imposed on China in 1989 and still in force ten years later.

The letter and spirit of the Strom Thurmond Act not only affected export of satellites to China, but to any other country as well. The 'national security controls on satellite export licensing'[162] of the Act involved technology control transfer plans approved by the Secretary of

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improve the guidance systems on its ballistic missiles and that US national security was damaged; see Van Fenema, *supra* n. 3, para. 4.1.2.4, at n. 41.

159 For a Stanford University Report challenging the findings of the Congressional Cox Commission Report, see M.C. Mineiro, *An Inconvenient Regulatory Truth: Divergence in US and EU Satellite Export Control Policies on China*, online 3 November 2011, (text to) n. 13.

160 See Secs. 1511–1516, Strom Thurmond National Defense Authorization Act for Fiscal Year 1999; 22 U.S.C. 2778; Public Law 105-261 (1998). The Act reversed a measure, prepared, after intense lobbying on the part of the US satellite manufacturing industry, by the Bush Administration but formally taken by Clinton in November 2006, to transfer the licensing of commercial communications satellites from the State Department to the Department of Commerce. The 'China Affair' led in fact to a highly partisan debate with a Democratic President being accused by Republican opponents of squandering US national security interests in return for – dubious – short-term economic gains.

161 Secs. 1511 & 1513 respectively, Strom Thurmond Act, *supra* n. 160 (emphasis added).

162 Sec. 1514, Strom Thurmond Act, *supra* n. 161.

Defense, mandatory monitoring by the same Department in case of a foreign launch, covering *inter alia* technical discussions, satellite processing, launch preparation, testing, activities relating to launch failure or delay and post-launch failure investigations, and mandatory State Department licences for launch failure investigations. Though NATO member states and major non-NATO allies of the United States were exempted from the above controls of Section 1514, also these countries in practice were confronted with the extreme caution with which the US satellite industry proceeded when facing foreign clients. And even today that industry feels the competitive effects of foreign clients' concerns about the cost and time involved in all ITAR-related aspects of deals or even talks with US satellite manufacturers.

Secondly, under the heading 'Report on export of satellites for launch by People's Republic of China',[163] the Act added a large number of conditions to a possible waiver of the Tiananmen restrictions on satellite exports to China. These additional conditions, to be addressed in detail in Reports to Congress, not only deal with US national security concerns ('Why is the proposed satellite launch by China in the national security interest of the United States?'), but also with such matters as:

- the impact of the proposed export on employment in the United States;
- the number of existing US jobs that would be lost if the export licence is not granted;
- the impact of the proposed export on the balance of trade between the United States and the People's Republic of China and on reducing the current US trade deficit with the People's Republic of China; and
- the impact of the proposed export on the transition of the People's Republic of China from a non-market economy to a market economy and the long-term economic benefit to the United States, and on the willingness of the People's Republic of China to reduce formal and informal trade barriers.[164]

These additional requirements made any re-entry of the Chinese launch industry into the international launch market illusory, *albeit only to the extent that US satellites, satellite components and/or satellite technology are involved.*

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163 See Sec. 1515, Strom Thurmond Act, *supra* n. 161.

164 See Sec. 1515(a), Strom Thurmond Act, *supra* n. 161.

The latter aspect deserves some further consideration. Even in the late 1990s, the United States was by far the biggest exporter of communications satellites, and European- and Asian-built satellites routinely contained vital US-manufactured satellite components that brought the satellite *in toto* under US export controls. For almost ten years this effectively excluded the Chinese Long March Company from obtaining launch contracts in the international commercial launch market. The last such launch took place in 1999 and it was only in 2009 that China would return to that market and launch a *European* (Thales Alenia Space)-built communications satellite for Indonesia.[165]

In the meantime the European satellite manufacturers had become increasingly aware of their dependence on US components and, thus, on the Strom Thurmond Act's export controls, which they saw as mainly motivated by political and trade-protectionist considerations rather than by real national security concerns. As a result the European industry had started to design-out (of their communications satellites) all US components falling under the ITAR export controls, trying to make their satellites 'ITAR-free'.[166]

Since the relevant EU Regulations, based on MTCR and the Wassenaar Arrangement, treat communications satellites, for export purposes, as dual-use items (and not as weapons/arms) this has freed the European manufacturers from the ITAR straitjacket and has given them a competitive advantage over their US competitors vis-à-vis all foreign clients buying their satellites and including those clients who are attracted by Chinese launch prices: in the absence of any legislation comparable to the above two US Acts, nothing prevents European manufacturers from either selling commercial communications satellites to China or exporting these satellites to China for launch on Chinese launch vehicles.

After the – only partially successful – commercial Chinese launch for Indonesia of 2009, the year 2011 saw China again performing two

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165 See *Commercial Space Transportation: 2009 Year in Review*, Federal Aviation Administration, Office of Commercial Space Transportation (FAA/AST), January 2010, at 8, 25; also UN Doc. ST/SG/SER.E/602, of 12 October 2010 (Chinese registration info to the UN Secretary-General), at 12.

166 That 'designing-out' would be a logical and predictable reaction on the part of the non-US satellite manufacturers affected by the new rules was recognized almost immediately after the adoption of the Strom Thurmond Act, both by the European and US satellite industry and by the US Administration; see Van Fenema, *supra* n. 3, para. 4.1.2.4, (text at) nn. 76 and 77.

commercial launches, one of which was an ITAR-free communications satellite for Eutelsat.[167]

That brings the discussion to the unsatisfactory situation (particularly for the US industry) that there is no international agreement, either multilateral or with the European Union or ESA alone, that creates a common stand vis-à-vis countries of concern. And the US Administration has lost its ability to adapt their export policies vis-à-vis China or other countries, so as to take into account the availability of purely European communications satellites and Chinese launches thereof: since the Strom Thurmond Act, it no longer has discretion to determine whether or not communication satellites are best regulated as defence articles or dual-use items. Succinctly stated: 'This is an exceptional removal of executive discretionary authority.'[168] These tightened controls have affected the US satellite industry's competitive position. According to the US Satellite Industry Association (SIA):

> [o]ne U.S. government study reported that the value of contracts lost due to ITAR between 2003 and 2006 was $2.35 billion … In 1995, U.S. satellite manufacturers enjoyed a 75 percent share of the global market; ten years later, this has dropped to 41 percent, and has hovered between 35 and 50 percent since then. ITAR has become a market differentiator for our competitors … Since … April 2009, the number of European 'ITAR-free' satellites has jumped from six to thirteen and another seven are sold or under construction.[169]

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[167] See *Commercial Space Transportation: 2011 Year in Review*, *supra* n. 12, at 14, 24–5. The other commercial Chinese launch in that year involved a communications satellite built by CAST, the Chinese satellite manufacturer for Nigerian Communication Satellite Inc. In 2010 China performed 15 launches, all of a non-commercial nature. In 2012 China again performed two commercial launches, showing again that there are ITAR-free satellites available in the international market, see *Commercial Space Transportation: 2012 Year in Review*, *supra* n. 12, at 17, 29 and 32.

[168] Mineiro, *supra* n. 159, para. 2.2. As the US Satellite Industry Association (SIA), at a Congressional Hearing in February 2012, stated: 'Satellites are the only category of products mandated by Congress for blanket treatment as munitions under the U.S. Munitions List (USML). Every item in USML Category XV – "Spacecraft systems and Associated Equipment" – is legally required to be regulated as a munition, no matter how outmoded or how widely-traded the item. The most mundane bolts are regulated with the same controls as the most sensitive imaging technology'; Written Testimony for Patricia A. Cooper, President SIA before the House Foreign Affairs Committee Hearing on export controls, arms sales, and reform: balancing U.S. interests (Part II), of 7 February 2012 (hereafter SIA testimony 2012).

[169] SIA testimony 2012, *supra* n. 168.

The US industry for years asked to restore the executive branch's authority to differentiate, for export control purposes, between commonly available items and sensitive satellite items/technologies – as they do with respect to any other US technology; in other words to get rid of this over-regulation of satellite-related exports. A number of Bills to that effect were introduced in Congress.[170]

The United States, observed a State and Defense Departments' report of 2012 to Congress, is still the only spacefaring nation that controls all commercial satellites and related items, including technology, as munitions items and 'this control is not effective in protecting U.S. national security because some dual-use satellites and related technologies equivalent to those originating in the U.S. are available from non-U.S. providers'. The Report concluded that authority to determine the appropriate export control status of satellites and space-related items should be returned to the President.[171]

The Report helped to finally pave the way for the adoption in December 2012 of NDAA 2013, an Act that indeed restores the above executive power, thereby making it possible for the President to return more 'innocent' items, such as most commercial communications and certain remote sensing satellites and components, to Department of Commerce controls as applied to dual-use goods and technologies.[172]

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[170] In 2011, H.R. 3288, the 'Safeguarding United States Satellite Leadership and Security Act of 2011', was introduced. It would, according to SIA, correct the historical over-regulation of satellite exports while retaining protections on critical technologies. But first, the US Administration, as requested in Sec. 1248, National Defense Authorization Act for Fiscal Year 2010 (Public Law 111-84), had to produce a full report on the national security risks of taking satellites and related items off the USML (Category XV) list. That Final Report to Congress, 'Risk assessment of United States space export control policy', prepared by the Departments of Defense and State, was released on 18 April 2012. It supported in general the above findings and criticism of SIA and recommended that authority to determine the appropriate export control status of satellites and space-related items be returned to the President. It also concluded that most communication and lower-performing remote sensing satellites and related components could be moved from the USML to the CCL without harm to national security; see DOD News Release No. 268-12, of 18 April 2012.

[171] Final Report, *supra* n. 170, 1, see also (iii).

[172] See the National Defense Authorization Act for Fiscal Year 2013 (H.R. 4310 as approved by the US Senate on 17 December 2012) (hereafter NDAA 2013), TITLE XII, Subtitle E labelled 'Authority to remove satellites and related components and technology from the United States Munitions List', Secs. 1261–1267. The Bill became Public Law No. 112-239 on 2 January 2013 (date of Pres. Signature); 126 Stat. 1633, www.gpo.gov/fdsys/pkg/PLAW-112publ239/

That legislation, when followed up by further executive action, will result in the US satellite manufacturing industry being more on a par with its international competitors whose exports are already regulated by dual-use type of controls. There is one important competitive difference: export of US-made commercial satellites and related items to China, whether to be owned or to be launched by Chinese entities, is still prohibited.[173] But the new legislation, once implemented, is bound to change the existing perception of international clients that export controls make the buying or launching of US satellites time-consuming, costly and risky; that will contribute to levelling the playing field for the United States and its satellite and launch industries, and their international competitors.[174]

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pdf/PLAW-112publ239.pdf, last accessed 15 January 2014. Entry into force of actual changes is foreseen for November 2014.

[173] *Cf.* Sec. 1261(1), NDAA 2013, *supra* n. 172: 'IN GENERAL. – Subject to paragraph (3), no satellites or related items that are made subject to the Export Administration Regulations (15 CFR part 730 et seq.) as a result of the enactment of subsection (a) of this section, whether or not enumerated on the Commerce Control List – (A) may be exported, re-exported, or transferred, directly or indirectly, to – (i) any government of a country described in paragraph (2); or (ii) any entity or person in or acting for or on behalf of such government, entity, or person; or (B) may be launched in a country described in paragraph (2) or as part of a launch vehicle owned, operated, or manufactured by the government of such country or any entity or person in or acting for or on behalf of such government, entity, or person. (2) COUNTRIES DESCRIBED. – The countries referred to in paragraph (1) are the following: (A) The People's Republic of China. (B) North Korea. (C) Any country that is a state sponsor of terrorism. (3) WAIVER. – The President may waive the prohibition in paragraph (1) on a case-by-case basis if not later than 30 days before doing so the President – (A) determines that it is in the national interest of the United States to do so; and (B) notifies the appropriate congressional committees of such determination.'

[174] In the absence of new implementing rules and policies, problems concerning the export of satellite components may still influence the market: Thales Alenia Space has been embroiled in a dispute with the State Department since early 2012, because the satellite it built for Turkmenistan's state-run communications system and to be launched by China is believed to contain components covered by ITARs, while the company maintains that the satellite is completely ITAR-free. The company finally, on 22 June 2013, decided to choose a non-Chinese launch provider and selected US company SpaceX and its launch vehicle Falcon-9 to do the job; see *SpaceX to launch Turkmenistan's first satellite*, www.forbes.com/sites/alexknapp/2013/06/22/spacex-to-launch-turkmenistan-satellite-originally-to-be-launched-by-china/, last accessed 25 June 2013. In recent months, the State Department is believed to have added new components previously not listed to the USML, thereby making it virtually impossible, in the short term, for Thales Alenia Space to produce

7.5.3 Government Procurement of Launch Services

7.5.3.1 'Fly US'

Since the late 1980s, it has been consistent US Presidential policy to promote the use, by civil government agencies, of domestic commercial launch industry services. Though the underlying reason seemed to be at first to free these launch companies from competition on the part of the Space Shuttle, further regulations and policies made clear that these measures were also meant to assist the national launch industry in competing with *foreign* launch entities.

The President's Commercial Space Launch Policy of 1990 ordered as one of its implementing actions: 'U.S. Government satellites will be launched on U.S.-manufactured launch vehicles unless specifically exempted by the President.'[175] Congress, in the same year, formalized the preference for US commercial launch services through the Launch Services Purchase Act, which provided: 'Except as otherwise provided in this section, [NASA] shall purchase launch services for its primary payloads from commercial providers whenever such services are required in the course of its activities.'[176] Where the Act also reiterated the ban on Space Shuttle launches of commercial payloads, it served the dual purpose of NASA henceforth using *commercial* launch services instead of its own vehicle or DOD launchers, and using *domestic* instead of foreign services.

Clinton's 1994 National Space Transportation Policy Guidelines confirmed this 'fly US' policy as follows:

> U.S. Government agencies shall purchase commercially available U.S. space transportation products and services to the fullest extent feasible that meet mission requirements and shall not conduct activities with commercial applications that preclude or deter commercial space activities, except for national security or public safety reasons. … For the foreseeable future, United States Government payloads will be launched on space launch

ITAR-free satellites; see *Space News*, 24 June 2013, at 6; www.spacenews.com, last accessed 26 June 2013.

[175] Office of the Press Secretary, NSPD-2 'Commercial Space Launch Policy', Presidential Directive, NASA Historical Reference Collection (File: 12605), 5 September 1990.

[176] Launch Services Purchase Act, Secs. 201–205; Public Law 101-611 (NASA Authorization Act 1991); of 16 November 1990), at Sec. 204(a)–(b).

> vehicles manufactured in the United States, unless exempted by the President or his designated representative.[177]

While G.W. Bush, in his 2006 Space Policy, kept silent on this specific issue,[178] the Obama Administration confirmed the 'US-built launch vehicle' condition both in his 2010 National Space Policy and in his 2013 National Space Transportation Policy.[179]

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[177] See *National space transportation policy*, Fact Sheet, The White House, Office of Science and Technology Policy, of 5 August 1994), paras. IV ('Commercial space transportation guidelines') and VI ('Use of foreign launch vehicles, components and technologies').

[178] The Bush Policy did contain the requirement that US Departments and agencies use US commercial space capabilities and services to the maximum practical extent; see 7. Commercial Space Guidelines, U.S. National Space Policy, of 31 August 2006, www.au.af.mil/au/awc/awcgate/whitehouse/ostp_space_policy06.pdf, last accessed 15 January 2014.

[179] I.e. 'United States Government payloads shall be launched on vehicles manufactured in the United States unless exempted by the National Security Advisor and the Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy'; National Space Policy of the United States of America, of 28 June 2010, *Intersector guidelines – Foundational activities and capabilities: enhance capabilities for assured access to space*. The National Space Transportation Policy of 21 November 2013 uses, under the heading 'International Collaboration', virtually identical language. For this reason, neither Sea Launch with its Ukrainian/Russian launch vehicle, nor ILS (Proton!), nor Arianespace would qualify. A special provision in the latter Policy permits US government use of foreign launch vehicles in case of cooperative government-to-government agreements, launches of secondary technology demonstrator or scientific payloads for which no US launch service is available and hosted payload arrangements on spacecraft not owned by the US government. An example of the application of this – existing – policy can be found in a US DOD/Department of State Report to Congress, under Finding 4, Export of space-related items to our allies and closest partners presents a low risk to national security and should be subject to fewer restrictions than exports to other countries: 'Recently, Europe's Arianespace carried the first *commercially* hosted payload for the U.S. Air Force into geostationary transfer orbit'; see Sec. 1248, National Defense Authorization Act for Fiscal Year 2010 (Public Law 111-84) – *Risk assessment of United States space export control policy*, Departments of Defense and State, Report to Congress, at 3–4. The 2013 Policy also permits the use of foreign components or technologies on a case-by-case basis. This allows, until further notice, Lockheed Martin and ULA (see *supra* n. 13) to use the Atlas launch vehicle for US DOD launches notwithstanding the fact that its first stage is powered by an RD-180 rocket engine built by Russian

As for the legislative part of the 'Fly US' policy, the Commercial Space Act of 1998[180] amended the above Launch Services Purchase Act of 1990 by extending the requirement that NASA purchase launch services from US commercial providers to the federal government as a whole, thereby also including DOD/USAF, which, for national security reasons, so far had been allowed to use its own launch vehicles. In other words, the *law* requires the federal government to use US commercial launch providers, whereas Presidential *policy* dictates the use of US-built launch vehicles.

National security considerations may provide an understandable argument for keeping the launch of certain categories of satellites in national hands, for example satellites that perform military or national security-related tasks. The national security argument for restricting the launch of NASA or NOAA (National Oceanic and Atmospheric Administration) civil payloads to national launch companies is much weaker. Here the idea is rather to protect the US launch industry against foreign competitors. The US companies, at a 1993 Congressional hearing on 'international competition in launch services', were quite adamant that it should be kept that way: 'In order to assure our country's access to space for critical missions, we should continue the current policy which requires that U.S. government payloads, whether military or civil, be launched aboard U.S. launch vehicles. In this way, a sufficient and predictable business base will ensure the viability of our domestic launch industry.'[181] And frequently, at the hearing, reference was made to the foreign (European, Russian, Chinese, Japanese) practice of reserving government payloads to national launchers:

> There is no question that this is the only practical policy to assure a reasonable chance of survival against the highly subsidized international competition … . This is the standard by all international launch system players in the world. We cannot force the Europeans to require U.S. access to European government missions. The same applies to Japan, PRC, and the

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Energomash; similarly, OSC (see *supra* n. 13) may, on this basis, continue to use the NK-33 engines sold by Russian Kuznetsov for its Taurus-II/Antares launch vehicle.

[180] See Commercial Space Act, Public Law 105-303, 105th Congress, H.R. 1702, 27 January 1998; 42 U.S.C. 14731, at Title 11, 'Federal acquisition of space transportation services', Secs. 201–206.

[181] See 'International competition in launch services', Hearing before the Subcommittee on Space, House Committee on Space, Science and Technology, 103rd Cong., 1st Sess., 19 May 1993 (hereafter Launch Hearing), at 34 (Martin Marietta Space Group statement).

> Russians. The Europeans have a policy of flying government satellites only on Ariane.[182]

And, similarly: 'Every other country in the world with launch capability restricts their government payloads to their launch vehicles whose development they have previously funded. The Arianespace Board of Trustees has requested recently that the European countries be required to use Ariane for all European satellites – both government and commercial.'[183]

What *is* the European side of the story?

7.5.3.2 'Fly Europe' – or the Ariane preference declaration

In Europe, the situation is not as clear-cut as in the United States as, first, a distinction should be made between ESA and the individual member states.

ESA, the international intergovernmental organization, promotes and supports independent European access to space as an inevitable prerequisite to its space applications and research programmes.[184] It makes investments to improve existing launchers and to develop new launcher systems and regards continued commercial success in world markets as crucial to ensure continued affordability of launches for its own space projects.

The international market for Ariane launches includes (1) ESA as an organization and (2) the individual member states, for example for the launch of a domestic communications or weather satellite. In this regard, in the European Space Policy of 2007, a joint EU/ESA document, the observation is made that 'a relatively small and open domestic institutional market exposes the European launcher sector to severe peaks and slumps in the commercial market, putting the industry at risk'.[185] This comment reflects two facts: (1) the launch needs of the individual member states, whether military or civil, are very modest, and (2) the states concerned are not obliged to use a European launch provider or launch vehicle.

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[182] See Launch Hearing, *supra* n. 181, at 157 (McDonnell Douglas statement).

[183] See *ibid.*, at 173 (General Dynamics statement).

[184] See further on ESA *supra*, §§ 4.2.2–4.2.5.

[185] European Space Policy, Communication from the Commission to the Council and the European Parliament, COM (2007) 212 final, Brussels, 26 April 2007, para. 4.3, 'Access to space'.

As for ESA, in 2005, the ESA Council established a launch service procurement policy for ESA missions, which required that any future ESA satellites or missions be conceived so as to be compatible with the use of at least one of the ESA-developed launchers or with the Soyuz launcher operated from the *Centre Spatial Guyanais* (CSG), within the range of their respective performances, unless this is not feasible in respect of reliability or mission suitability.[186]

To that obligation imposed on the Director General of ESA was added the requirement that, in case of such ESA missions,

> preference shall be granted to launchers … in the following order of priority:
>
> - ESA developed launchers;
> - The Soyuz launcher operated from the CSG, when comparing the options to launch ESA missions by non ESA-developed launchers;
> - Other launchers.[187]

The rule to only use Ariane for ESA missions has generally been followed, though there were, in the past, a number of occasions where budgetary constraints, the simple absence of a suitable Ariane vehicle at the planned launch date or a foreign launch forming part of an international cooperative space project made ESA choose a non-European launcher.[188] In this connection it should be noted that the United States also makes exceptions to its 'Fly US' policy for the sake of international cooperative space projects.

As for *national* launch needs, since the very start of the Ariane project in the early 1980s, the freedom of ESA member states who participated in the Ariane programme to shop around for the best launch deal was qualified by – what was then called – the 'Ariane preference declaration'. The most recent version thereof, the Launchers Exploitation Declaration, reads as follows:

> The Parties hereto will take the ESA developed launchers and the Soyuz launcher operated from the CSG into account when defining and executing

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[186] Resolution on the Evolution of the European Launcher Sector – ESA/C-M/CLXXXV/Res.3 (Final), of 6 December 2005, ESA Bulletin 125 (February 2006), 59–65, para. IV, 'Launch-service procurement policy for ESA missions', subpara. 23; see www.esa.int/esapub/bulletin/bulletin125/bul125a_council.pdf, last accessed 26 June 2013.

[187] Resolution on the Evolution of the European Launcher Sector, *supra* n. 186.

[188] For examples, see Van Fenema, *supra* n. 3, at 275, (text at) n. 209.

> their national programmes as well as the European and other international programmes in which they are involved, except where such use compared to the use of other launchers or space transport means available at the envisaged time presents an unreasonable disadvantage with regard to cost, reliability or mission suitability.
>
> Preference to their utilization shall be granted by the Parties in the following order of priority:
>
> - ESA developed launchers,
> - The Soyuz launcher operated from the CSG when comparing the options to launch missions by non ESA-developed launchers, [and]
> - Other launchers.[189]

Member states in the past did from time to time use the exceptions in the Declaration and its predecessors, and opted for non-European launch vehicles where the Ariane could have been used. The last such case was the 2009 Sea Launch Zenith 3SL launch into GTO of the Sicral 1B, an Italian military communications satellite.[190] This 'preference' paragraph is followed by a provision touching upon international competition: 'The Parties hereto agree to support collectively the setting-up of a framework governing the procurement of launch services for European institutional programmes and *ensuring a level playing field for Europe on the worldwide market for launch services*.'[191] The latter part of this

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[189] Declaration by certain European Governments on the Launchers Exploitation Phase of Ariane, Vega, and Soyuz from the Guiana Space Centre with Final Document, Paris, 30 March 2007, § I.8, www.official-documents.gov.uk/document/cm80/8049/8049.pdf, last accessed 26 June 2013. This Launchers Exploitation Declaration applies since January 2009. A very large majority of ESA member states have since that date notified their acceptance of the Declaration to the ESA Director General. Previous versions had comparable language. In the first one, included in the Ariane Production Declaration of 1980, the states participating in Ariane agreed 'to take the Ariane launcher into account when defining and executing their national programmes *and to grant preference to its utilization*, except where such use [compared to the use of other launchers or space transport means available at the envisaged time presents an unreasonable disadvantage]' (emphasis added).

[190] For earlier examples (e.g. Deutsche Telekom's Kopernikus in 1991, the UK Defence Ministry's Skynet in 1990) and for independent Eutelsat and EUMETSAT launch procurement policies/practices; see Van Fenema, *supra* n. 3, 270–5. In October 2011 the Chinese launched Eutelsat's Thales Alenia Space-built 'ITAR-free' Eutelsat W3C communications satellite into GEO.

[191] Ariane Production Declaration, *supra* n. 189, § I.9 (emphasis added).

Declaration clearly refers to the more strict 'national launcher' laws and policies of other states, which, in ESA eyes, distort competition.[192]

A look at the launch figures through the years may explain why Arianespace and its shareholders feel at a competitive disadvantage: in the period 1997 to 2012 its two main competitors, the (launch companies of the) United States and Russia, performed a substantial number of launches of government payloads, so-called 'non-commercial launches', with Arianespace in that respect seriously lagging behind. As regards the United States, out of a total of 345 launches, 253 were non-commercial and 92 were commercial launches; for Russia out of a total of 426 launches, 287 were non-commercial and 139 were commercial launches; and for Arianespace out of a total of 124 launches, 19 were non-commercial and 105 were commercial launches.[193] A reciprocal opening of protected governmental launch markets would thus clearly be an attractive proposition for the European launch company!

7.5.4 Other Trade and Competition-Related Aspects: Bilateral Launch Trade Relations

To date the trade in launch services has lacked international regulation: there is no multilateral agreement in force that provides states or private launch companies with 'rules of the road' applicable to their – cooperative or competitive – launch activities. There is neither an international intergovernmental organization addressing the rights and obligations of the states concerned nor an international trade association promoting the interests of the industry.

'Launching States' like the United States and the Russian Federation resisted efforts aimed at bringing this activity under the trade in services rules of the WTO/GATS,[194] citing national security reasons and also considering the competitive challenges to their launch providers if trade in these services were liberalized and, as a consequence, protection of

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[192] For ESA and EU efforts to arrive at an agreement with *i.a.* the United States on this issue, see *infra*, § 7.5.4.3.

[193] See *infra*, Appendix, Launch Record 1997–2012.

[194] The World Trade Organization (WTO) was established by Agreement Establishing the World Trade Organization (hereafter WTO Agreement), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1867 UNTS; UKTS 1996 No. 57; ATS 1995 No. 8; 33 ILM 1125, 1144 (1994); see also the General Agreement on Trade in Services (GATS), Marrakesh, done 15 April 1994, entered into force 1 January 1995; UKTS 1996 No. 58; Cm. 3276; ATS 1995 No. 8.

their national launch industry came under attack.[195] These reasons, largely stemming from the military-strategic relevance of rocket technology, are sufficiently strong to dampen any hope of a near-to-mid-term future change in position of these states. Only large-scale scheduled commercial passenger operations with dedicated space vehicles could change perceptions and result, as a first step, in these vehicles being brought under dual-use export controls as opposed to the present missile-related controls. This has left possible (de-)regulation of the market to national initiatives only. The only example so far of bilateral arrangements in this field comes from the United States and goes back to the late 1980s and early 1990s, with China, Russia and Ukraine as the United States' bilateral partners.

7.5.4.1 United States–China

Faced with a post-Challenger accident (1986–1988) shortage of launch facilities for US-manufactured satellites, the US Administration negotiated an agreement with the Chinese government that would, for the first time, allow Chinese Long March launches of 'Western' satellites. As these satellites and components, largely manufactured in the United States, and the relevant technology would in most cases fall under ITAR restrictions, the export thereof to China for launch from Chinese territory required an export licence from the State Department; without such a licence a Chinese launch of the satellite simply could not take place.[196]

The resulting launch trade agreement of 1989 contained two important restrictions that were to protect the interests of the deeply concerned US commercial launch industry (which already faced tough competition from Arianespace), namely on (1) capacity (to prevent the Chinese from flooding the launch market with large numbers of Long March rockets), and (2) price (to prevent this 'non-market economy' from price dumping and seriously undercutting 'Western' launch prices).[197]

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195 See further *infra*, § 15.2.2.4.

196 The question of Chinese launches was triggered by the sale of communications satellites built by US company Hughes Aircraft Corporation to Aussat of Australia, and UK-, Chinese- and Hong Kong-owned Asiasat. The requirement for an export licence provided the necessary US negotiating leverage for a broader deal on Chinese entry into the international launch market.

197 During the period of the agreement, i.e. from 16 March 1989 until 31 December 1994, the People's Republic of China could not launch more than 9 communications satellites for international customers (including the 2 Aussat and one Asiasat satellites) and such launch commitments had to be proportionally distributed over the period concerned. As for pricing, Chinese launch contracts

The Agreement, concluded by the US Trade Representative on behalf of the President, as an Executive Agreement could not, and was not meant to, set aside US export control laws and regulations. On the contrary, it was emphasized in the Agreement and in separate communications that with each and every possible launch by China, the ITAR criteria and procedures for export of the US satellite or satellite component concerned would be applied in full.[198] That, and the complicated and often thorny relations between the two countries through the years, resulted in a series of grants of export licences, and suspensions, withdrawals or refusals thereof, as sanctions for Chinese human rights

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had to contain prices, terms and conditions 'which are on a par with those prices, terms and conditions prevailing in the international market for comparable commercial launch services'; Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding International Trade in Commercial Launch Services, Washington, done 26 January 1989, entered into force 16 March 1989; 28 ILM 599 (1989). The guidelines for the implementation of the MOA, issued by the Office of the United States Trade Representative (USTR), appear in 54 Fed. Reg. No. 19, of 31 January 1989, 4931–3. This MOA was accompanied by and linked to two other bilateral MOAs already signed in December 1988: a Satellite Technology Safeguards Agreement (Memorandum of Agreement on Satellite Technology Safeguards Between the Governments of the United States of America and the People's Republic of China, Washington, done 17 December 1988, entered into force 16 March 1989; 28 ILM 604 (1989)) and a Launch Liability Agreement (Memorandum of Agreement on Liability for Satellite Launches Between the Government of the United States of America and the Government of the People's Republic of China (hereafter Memorandum on Liability), Washington, done 17 December 1988, entered into force 16 March 1989; 28 ILM 609 (1989)). See, on this and two other launch trade agreements (with Russia and Ukraine), Van Fenema, *supra* n. 3, ch. 3, 183–301. Further e.g. L.F. Martinez, The Future Dimensions of East-West Space Markets, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 4 ff.; W.B. Wirin, Policy Considerations of Launching U.S. Origin Satellites in the People's Republic of China, in *Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space* (1995), 173 ff.

198 *Cf.* Art. V(2), Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding International Trade in Commercial Launch Services, *supra* n. 197: 'With regard to export licenses, any application for a U.S. export license will be reviewed on a case-by-case basis consistent with U.S. laws and regulations. Nothing in this Agreement shall be construed to mean that the U.S. is constrained from taking any appropriate action with respect to any U.S. export license, consistent with U.S. laws and regulations.'

violations or arms/missile proliferation activities.[199] After the adoption of the Strom Thurmond Act in 1999, this limited and 'bumpy' access to the international commercial launch market came to an end, and a period of ten years began during which China was effectively barred from offering its launch services to international customers. As discussed earlier, the recently adopted NDAA 2013 legislation on satellite export controls maintains the ban on export of US satellites and related items to China. As a result, and given the US industry's continued dominance of the market for satellite components unless and until 'designing out' efforts have become the rule, China will for the foreseeable future play a severely limited role in the international commercial launch market.

7.5.4.2 United States–Russia and United States–Ukraine

The United States–Russia launch trade agreement of September 1993[200] and the United States–Ukraine agreement of February 1996[201] contained

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[199] In 1995 the parties concluded a new 7-year agreement, based on similar quantity and price conditions, but also containing language that created prospects for the Chinese to get access to the LEO launch market, where planned Iridium and Globalstar satellite constellations would require a substantial number of launches; the Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding the International Trade in Commercial Launch Services, done 27 January 1995, entered into force 13 March 1995; 1998 BDIEL AD LEXIS 12,www.jaxa.jp/library/space_law/chapter_4/4-2-2-13/index_e.html, last accessed 27 June 2013. That agreement lapsed in 2001. Notwithstanding the post-Tiananmen Square sanction legislation, waivers of the export restrictions contained therein, based on 'national interest', were routinely granted until 1998 (13 waivers in all for some 20 satellite projects). The 1998 Strom Thurmond Act put an end to that practice and Chinese launches of US satellites and components became a thing of the past. The last such launch took place in 1999. This situation lasted until 2009, when China re-entered the commercial launch market with the launch of a Thales Alenia Space-manufactured Indonesian Palapa communications satellite – built without U.S.-controlled components. See further *supra* n. 190, for a similar commercial launch in 2011. *Cf.* also on the 1995 Agreement e.g. D.J. Burnett & D. Lihani, Developments in US Bilateral Launch Service Agreements – An Update, 21 *Air & Space Law* (1996), 101.

[200] Agreement between the Government of the United States of America and the Government of the Russian Federation regarding international trade in commercial space launch services, Washington, done 2 September 1993, entered into force 2 September 1993; Treaties in Force 1994, US Dept. of State. See further S. Gorove, *United States Space Law*, *national and international regulation*, at I.A.4 (a-2). *Cf.* also Burnett & Lihani, *supra* n. 199, 101–2.

[201] Agreement Between the Government of the United States of America and the Government of Ukraine Regarding International Trade in Commercial Space

conditions comparable to those of their Chinese predecessor. Though the geopolitical considerations and specificities of the respective bilateral relations differed,[202] the idea of a gradual and controlled entry into the international commercial launch market of the respective non-Western launch providers was the same. The newcomers meant competition for

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Launch Services, done 21 February 1996, entered into force 21 February 1996; 24 *Journal of Space Law* (1996), 187; www.jaxa.jp/library/space_law/chapter_4/4-2-2-15/index_e.html, last accessed 27 June 2013.

[202] In the case of Russia, the dissolution of the Soviet Union created concerns in the United States that advanced Soviet space and launch and missile technology, if left unused, would end up in 'countries of concern'. And Russia was already selling missiles plus technology to India. Its commitment to abide by MTCR standards and halt delivery of the technology to India helped bring about the agreement. The fact that Lockheed in the meantime had formed a joint venture with Russian companies Khrunichev and Energia to market the Russian Proton launch vehicle gave the Russians a powerful ally within the United States. The agreement was amended, with an increased launch allotment, on 30 January 1996; Agreement Between the Government of the United States of America and the Government of the Russian Federation to amend the 'Agreement Between the Government of the United States of America and the Government of the Russian Federation Regarding International Trade in Commercial Space Launch Services', Washington, done 30 January 1996, entered into force 30 January 1996; see 24 *Journal of Space Law* (1996) at 183; for text www.jaxa.jp/library/space_law/chapter_4/4-2-2-14/index_e.html, last accessed 27 June 2013. *Cf.* also Burnett & Lihani, *supra* n. 199, 102–3.

In the case of Ukraine, see *supra* n. 201, apart from similar missile proliferation concerns, an important role was played by the new multinational launch company Sea Launch, in which *i.a.* Boeing and the Ukrainian firm Yuznoye, builder of the Zenith 3SL rocket would cooperate. The Agreement gave the Ukraine an expanded launch allowance (11 satellites on top of the 5 allotted to them) on condition that launches would be performed by this company; see Art. V(1)(a) and (b). Subpara. (b) provides: 'In addition, Ukrainian space launch services providers may supply during the term of this Agreement, space launch vehicles to an *integrated space launch services provider* for the launch of 11 principal payloads to [GSO] or [GTO]' (emphasis added). The emphasized entity was defined as 'a joint venture that includes Ukrainian and U.S. companies and provides commercial space launch services or commercial space launch vehicles'. Additional conditions attached to this venture were *i.a.* that '(a) the venture receives a commercial launch license issued by the U.S. Department of Transportation; (b) the U.S. partner maintains a significant equity interest in, and control in fact of, the joint venture and the United States is the source of a significant share of the goods and services employed by the joint venture in any space launch'. In a Protocol to the Agreement, the parties concluded that Sea Launch met those conditions.

the US launch industry and its European counterpart Arianespace and more choice for the satellite manufacturers and their customers.

The – promised – advent of a number of ambitious multi-satellite LEO satellite constellations in the mid-1990s, such as Iridium and Globalstar, and the perceived threat of a shortage of capable launch vehicle operators convinced the US government to ease the quantitative restrictions imposed on China through a 1995 amendment of the agreement.[203] Both the Russian and the Ukrainian agreements reflected this new approach.

The Agreement with Russia expired on 31 December 2000. The Clinton Administration terminated the Ukrainian agreement, set to expire at the end of 2001, in June 2000 as a reward for Ukraine's non-proliferation record.[204] The Agreement with China expired at the end of 2001.

7.5.4.3 United States–Europe

The United States and its other competitors, Japan, India and, in particular Europe, never agreed on rules of the road to be applied to their competitive behaviour in the international market of commercial launch services. Between roughly 1982 and 1986 the United States made the governmental Space Shuttle available for national as well as foreign launch clients[205] and, in the latter activity, had it compete with Arianespace. In that same period, US private launch companies made determined efforts to enter the same international launch market, thus competing with both Arianespace and with the Space Shuttle, an increasingly awkward situation domestically. Though the Reagan Administration preached a pro-private launch industry gospel and Congress adopted

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203 See *supra*, n. 199.

204 The press release read: 'Statement of the President – I am pleased to announce that today the United States has terminated the commercial space launch trade agreement with Ukraine. This decision eliminates launch quotas and gives U.S. firms greater opportunity to enter into commercial space launch joint ventures with Ukrainian partners without limit and reflects Ukraine's steadfast commitment to international non-proliferation norms.'; The White House, Office of the Press Secretary (Kiev, Ukraine), 5 June 2000. Ukraine became an MTCR partner in 1998.

205 *Cf.* National Space Policy, Presidential Directive/NSC-42, 18 Weekly Comp. Pres. Docs 894–898 (1982): 'The first priority of the STS program is to make the system fully operational and cost-effective in providing routine access to space … Expendable launch vehicle operations will be continued by the [US] Government until the capabilities of the STS are sufficient to meet its needs and obligations.'

legislation, the Commercial Space Launch Act of 1984,[206] which would provide legal certainty to this new DOT-supervised service industry, a Shuttle pricing policy was maintained, which confirmed the primary role of the Space Shuttle and gave precious little room for the newcomers to 'take off'.[207]

In that same year US prospective launch company TCI accused Arianespace before the United States Trade Representative (USTR) of being subsidized by ESA member states and, in particular, France, and of dumping launch services in the US market to the detriment of the infant US launch industry.[208] After a lengthy and thorough investigation, it was concluded that, since there were no international standards of reasonableness for launch services, USTR had no choice but to compare ESA practices to US practice and to reasonable commercial practices. As ESA practices were not sufficiently different from those of the United States (vis-à-vis in particular the Space Shuttle), 'they did not require affirmative U.S. action at this time'.[209]

The Presidential Determination added: 'But because of my decision to commercialize expendable launch services in the United States … it may become appropriate for the [United States] to approach other interested nations to reach an international understanding on guidelines for commercial satellite launch services at some point in the future.'[210]

Talks between the United States and Europe on this issue did materialize. But the aims of the parties diverged: ESA challenged the US policy to reserve the sizeable government (civil and military) satellite launch market to US companies, which it saw as an indirect subsidy, whereas the

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[206] Commercial Space Launch Act, *supra* n. 16.

[207] See 'Shuttle pricing for foreign and commercial users' (NSDD 181 of 30 July 1985, Fact Sheet (1 August 1985)); for an account of the awkward political and competitive battle between the Space Shuttle 'commercialized' by NASA and the ELV industry supported by the FAA Office of Commercial Space Transportation; see Van Fenema, *supra* n. 3, 73–7.

[208] For a more thorough discussion of this case and its outcome; see Van Fenema, *supra* n. 3, 79–86.

[209] Determination under Section 301 of the Trade Act of 1974, The President, Memorandum for the [USTR] of 17 July 1985, 50 Fed. Reg. 29631, of 22 July 1985.

[210] Determination under Sec. 301 of the Trade Act of 1974, *supra* n. 209. In testimony at a Congressional launch hearing in 1993, USTR's Allgeier would note: 'Nevertheless, the determination did not endorse European practices and did take note of the lack of international standards for government conduct in the launch services market and the problems which that absence caused'; see Van Fenema, *supra* n. 3, 281, n. 214.

US side continued to focus on the ‘unfair’ subsidies given to Arianespace and on more general fair trade principles comparable to the ones they would later include in the launch trade agreements with China, Russia and Ukraine.

Informal, exploratory, discussions started in 1987; they were meant to find a common basis for negotiations on a common code of conduct. The discussion broadened in 1988 when the United States informed ESA about its plan to permit China – controlled – entry into the launch market. ESA disagreed with the United States on both the proposed capacity clause (too generous) and the pricing formula (too vague), but in the 1990 ARABSAT case realized that the United States followed its own priorities.[211] Talks in 1990 and 1991 did not bring the parties any closer to ‘rules of the road’ or a code of conduct.[212]

The prospect of yet another player, Russia, entering the launch market on conditions to be set by the United States made the European side react eagerly to a US invitation in 1992 to turn the negotiations with Russia into a tripartite exercise and create a multilateral agreement. Irreconcilable differences in approach between the European and the US side, revealed during preparatory bilateral discussions, prevented the trilateral from materializing. The US side noted later, in 1993, that there was:

> insufficient interest on [Europe’s] part in reaching an agreement that would address our central goal of establishing standards for government support during the various phases of launch activity – development, production and operations. The Europeans also linked agreement on ‘rules of the road’ to access to government launch procurements in the U.S. … any interest Europe may have in a multilateral agreement is focused on strictly limiting Russian access to the market.
>
> With regard to the general market principles of importance to us in any agreement with the EC and ESA, the Europeans urged us to eliminate those elements of our proposal to the Russians addressing the limitation of subsidies and adoption of other market-oriented disciplines as unacceptable to them. I

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211 See *infra*, § 7.5.4.4.

212 The USTR representative reported: ‘A major effort to reach agreement on standards for government involvement in the commercial space launch market, begun in the summer and fall of 1990, faltered at the end of 1991 when [ESA] and the European Community Commission were unable to resolve internal European differences over the responsibilities of these organizations for policies on commercial space launch’; see Van Fenema, *supra* n. 3, 283.

> regret to say that there does not appear to be any near term prospect for a significant shift in this European position.[213]

The European Commission, in its 1996 Communication 'The European Union and Space', took up this matter and, voicing concern about the destabilizing increase in launch capacity offered by China, Russia and Ukraine at sometimes extremely low prices, identified as crucial to the European launch industry that:

> A fundamental condition for the maintenance and development of European space launch services is a degree of market access similar to that offered in the EU and the existence of fair trade conditions. … negotiations [on rules of the road] should include the U.S., whose industry benefits at an extraordinary and unequalled level of governmental support and military programmes, as well as emerging suppliers like Russia, Ukraine and China.[214]

In the absence of a workable negotiating mandate from the member states on these issues, the Commission's ambitions could not materialize. The European Space Policy of 2007 mentioned the following launch-related action plan: 'During 2007, the Commission will evaluate the benefits of negotiating reciprocal opening of public sector markets in its dialogues with major space partners.' To date, nothing seems to have happened in this respect.[215]

Two issues therefore continue to 'hang over' the launch trade relationship between the United States and Europe: (unfair) direct or indirect subsidization of the respective industries and the nationality conditions attached to space launch services provided to governmental entities (government procurement of national launch services). There is no quick and easy solution in sight for either problem.

7.5.4.4 Europe–Russia

Arianespace and ESA were unhappy with the United States–China launch trade agreement of 1989 and actually protested to the USTR when

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[213] See Van Fenema, *supra* n. 3, 285; this concerned The European Union and Space: Fostering applications, markets and industrial competitiveness, Communication from the Commission to the Council and the European Parliament, COM (96) 617 final, of 4 December 1996.

[214] According to the Commission, '[l]aunch systems and propulsion also benefit from important spillovers between the military and civilian sectors. The U.S. industry has long benefited from such spillovers in the commercial markets, thanks to a military space budget which is over forty times Europe's'; see further Van Fenema, *supra* n. 3, n. 231.

[215] European Space Policy, *supra* n. 185, Annex I, 'Key actions', at 8.

the Chinese launch company – in fierce competition with Arianespace – obtained a contract for the launch of an ARABSAT satellite at a price that Arianespace considered in violation of the 'on a par' pricing provision of that agreement. The US government's uncooperative reaction to that complaint and the announced US agreement with Russia increased European concern that these two 'non-market economies' would be left free to pose unfair competition to Arianespace in the only market available to the company, the international commercial launch market. For that reason the ESA Council, in 1992, recommended that agreements be concluded with the governments of other spacefaring nations 'to ensure fair conditions in the launcher market'.[216]

ESA, as a follow-up, requested the European Commission to negotiate a launch trade agreement with the Russians, containing strict capacity and pricing conditions, to thus contain the Russian competitive threat independent from US efforts. The EU Trade Commissioner did conclude an agreement with Russia, but, for political and legal reasons, the Council of Trade Ministers did not take action on the proposal and the agreement never entered into force.[217]

7.6 CONCLUSION

The development of launch services into regular international trade comparable to international air transport continues to be stymied by the military origin and national security relevance of the 'high-tech' vehicles and sensitive technologies used for that purpose. Those aspects, and the resulting small number of states and private enterprises playing a role in the provision of those services – and the fact that most of the operations concerned do not involve the crossing of national borders – also stand in the way of the creation of an international intergovernmental organization dealing with regulatory, in particular safety- and sustainability-related,

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[216] See Resolution on the implementation of the European long-term space plan and programmes, Chapter V ('European Launcher Policy'), ESA Council Meeting at Ministerial level, Granada, 10 November 1992.

[217] Commission Proposal for a Council Decision concerning the conclusion of an Agreement between the [EEC] and the Russian Federation on Space Launch Services, COM (93) 355 final, of 22 July 1993. The legal argument was based on doubts as to the so-called 'exclusive competence' of the Commission to conclude agreements concerning trade in services. In December 1994, the European Court of Justice determined that this competence was not exclusive, but one shared with the member states; see Opinion 1/94 re. the Uruguay Round Treaties (1995), 1 CMLR 205.

aspects, and has so far prevented the industry from speaking with one voice in fora like the UN Outer Space Committee and its Legal Subcommittee.

For some time to come, regulatory developments in this field will primarily come from national governments, in the form of national legislation, policies and practices, and bilateral arrangements, influenced to some extent by elements of soft law (and vice versa). This situation will probably not change until routine passenger space transportation and enlightened self-interest (space debris!), separately and in combination, force the industry and the governments concerned to get their act together.

APPENDIX

Table 7A.1 Launch record 1997–2012 (=16 years)

	Year 2007		Year 2008		Year 2009		Year 2010		Year 2011		Year 2012		1997–2012 Total	
	Comm.	(non-c)	Comm.	(non-c)	Comm.	(non-c)	Comm.	(non-c)	Comm.	(non-c)	Comm.	(non-c)	Comm.	(non-c)
US	**3**	(16)	**6**	(9)	**4**	(20)	**4**	(11)	–	(18)	**2**	(11)	**92**	(253)
Europe	**6**	–	**5**	(1)	**5**	(2)	**6**	–	**4**	(3)	**6**	(4)	**105**	(19)
Russia	**12**	(14)	**11**	(15)	**10**	(19)	**13**	(18)	**10**	(21)	**7**	(17)	**139**	(287)
Ukraine	–	–	–	–	–	–	–	–	–	–	–	–	**1**	–
China	–	(10)	–	(11)	**1**	(5)	–	(15)	**2**	(17)	**2**	(17)	**13**	(120)
Japan	–	(2)	–	(1)	–	(3)	–	(2)	–	(3)	–	(2)	–	(34)
Int'l (Sea Launch)	**1**	–	**6**	–	–	–	–	–	**1**	–	**3**	–	**33**	(1)
Int'l (Land Launch)	–	–	**1**	–	**3**	–	–	–	**1**	–	–	–	**5**	–
Israel	–	(1)	–	–	–	–	–	**(1)**	–	–	–	–	–	(5)
Brazil	–	–	–	–	–	–	–	–	–	–	–	–	–	(2)
India	**1**	(2)	–	(3)	–	(2)	–	(3)	–	(3)	–	(2)	**1**	(25)
Iran	–	–	–	–	–	(1)	–	–	–	(1)	–	(3)	–	(6)
N-Korea	–	–	–	(1)	–	(1)	–	–	–	–	–	(2)	–	(3)
South Korea	–	–	–	–	–	(1)	–	**(1)**	–	–	–	–	–	(2)
Total launches	**23**	(45)	**28**	(41)	**24**	(54)	**23**	(51)	**18**	(66)	**20**	(58)	**389**	(757)
Total comm. + non-c	68		69		78		74		84		78		1.146	
Failures	**3**		**2**		**3**		**4***		**6°**		**5⁺**		**60 = 5,2%**	
Revenue comm.	$ 1,55 billion		$ 1,97 billion		$ 2,49 billion		$ 2,45 billion		$ 1,9 billion		$ 2,4 billion		$ 30,86 billion	
Total payloads	117		106		111		110		133		139		1.804	
Commercial	30		24		26		33		35		27		732	

* GSLV–2	º Rockot	+ Proton M
KSLV–1	Taurus–XL	Proton M (partial)
Proton–M	Proton–M	Safir (2x)
GSLV–2	Long March –2C	Unha 3
= 5,4%	Soyuz–U	
	Soyuz–Z	
	=7,1%	

Notes: comm. = commercial = open to international competition

non–c = non–commercial = governmental, reserved for national launch companies

Source: www.faa.gov (Annual Launch Reports, FAA Office of Commercial Space Transportation), accessed on 26 June 2013.

8. Legal aspects of satellite communications

Frans von der Dunk

8.1 INTRODUCTION: THE DEFINITIONAL ISSUES

As of today, satellite communications still represents the largest and most commercialized space sector with downstream terrestrial applications – by far.[1] Traditionally, '(tele)communications' would refer to two fundamentally different concepts from an operational perspective; though as both require the usage of radio waves (or in the alternative, not relevant obviously for satellite communications, cables and wires[2]) the technical/operational boundary between the two is often blurred as a consequence of which they are not always readily perceived as being different in nature: two-way point-to-point communications (traditionally telephone, fax, telegraph, e-mail and suchlike) and one-way, point-to-multipoint communications ('broadcasting', encompassing at least radio and television) respectively.[3] In particular the latter is subject in a number of

[1] See e.g. C. Venet, The Economic Dimension, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 55 ff.; N. Frischauf, Satellite Telecommunication, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 134–46; further R.T. McNutt, The Future of Satellite Communication, in *Heaven and Earth: Civilian Uses of Near-Earth Space* (Eds. D.G. Dallmeyer & K. Tsipis) (1997), 117 ff.; P.L. Meredith & G.S. Robinson, *Space Law: A Case Study for the Practitioner* (1992), 31; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 199 ff., 245 ff., 319–23; B. Cheng, *Studies in International Space Law* (1997), 541 ff.

[2] See e.g. P.A. Salin, *Satellite Communications Regulations in the Early 21st Century* (2000), 9–10; F. Lyall, *Law and Space Telecommunications* (1989), 2–17; J.M. Smits, *Legal Aspects of Implementing International Telecommunication Links* (1991), 1–30.

[3] *Cf.* e.g. Lyall, *supra* n. 2, 381–2 (even stating: 'Strictly speaking, broadcasting satellites lie outside the scope of *simple* telecommunications, being directed towards the large-scale dissemination of information whether their signals are received by the end-user direct from the satellite or through some central point followed by cable to the customer' (emphasis added)); Salin, *supra* n. 2, 42, also ff.; McNutt, *supra* n. 1, 121.

respects to separate rules, which apply 'on top of' the more broadly applicable regimes to telecommunications *largo sensu*.[4]

Also, analysis should distinguish between satellite communications as the mere use of radio signals to communicate back and forth with *any* object in outer space – whether it concerns, for example, remote sensing satellites, deep space probes or manned spacecraft – and satellite communications as the use of specifically designed satellites as part of an infrastructure available for transmitting messages, whether two-way point-to-point or one-way point-to-multipoint. Such 'messages' also include, for instance, digital data sets involved in satellite remote sensing[5] or satellite navigation;[6] in that sense those two space applications, usually considered as activities separate from satellite communications, still fall within the scope of (major parts of) the regime applicable to the use of satellites and radio frequencies usually labelled the 'satellite communications legal regime'.

This is also, therefore, what the present chapter will address, while refraining from addressing the specific remote sensing or navigation-related aspects of those two activities. This also applies to the use of space frequencies for the guidance of launch vehicles, the telemetry, tracking and control of satellites of whatever operational nature, and communications with manned spacecraft.

Consequently, firstly, the role of the ITU and its competences, as well as the legal framework that resulted therefrom for the usage of radio frequencies for space communications, will be scrutinized. Secondly, the specific issue of direct broadcasting by satellite, including the related issue of the (by now largely historical) discussion on the geostationary orbit as addressed in the framework of the United Nations will be addressed.

Recently, with the establishment in 1997 of an Agreement on Basic Telecommunications Services under the Fourth Protocol to the GATS,[7] the WTO and its GATS regime striving for global free trade in services

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[4] *Cf.* e.g. Cheng, *supra* n. 1, 563–4; S. Courteix, International Legal Aspects of Television Broadcasting, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 102 ff.; D.I. Fisher, *Prior Consent to International Direct Satellite Broadcasting* (1990); M.L. Stewart, *To See the World* (1991); all discussing the separate (legal) aspects of broadcasting as compared to two-way communications.

[5] See further *infra*, Chapter 9.

[6] See further *infra*, Chapter 10.

[7] Fourth Protocol to the General Agreement on Trade and Services of 15 April 1994 (Fourth Protocol to the GATS), Geneva, done 15 April 1997, entered

have also started to legally impact the international satellite communications environment. The most important consequence thereof is the privatization of the main international satellite organizations; the most important multi-nation legal corollary thereof in turn is a largely synchronous development in the European Community/Union.

All these developments, however, are addressed in the respective chapters on the international trade aspects of space services,[8] international organizations in space law[9] and European space law.[10] In other words, the current chapter will focus on the international regime, highlighting technical and operational issues involved in satellite communications, as opposed to the exclusively political, economic and commercial ones.

8.2 THE ITU REGIME AND SATELLITE COMMUNICATIONS

8.2.1 The General Characteristics of Using Satellites for Communication Purposes

Following the seminal 1945 paper by Sir Arthur Clarke on extra-terrestrial relays,[11] it was realized that, at least in theory, satellites orbiting the earth could present a very interesting addition to existing wireless telecommuncation networks using radio frequencies. Here, there was an obvious trade-off between the 'geographical' place where satellites were operating, and the operational issues involved in transmitting radio signals to them ('uplinking'), having the satellite transponders change the frequencies (expressed in Hertz) and then retransmitting the signals down to a different spot on earth ('downlinking').

The orbit Sir Arthur Clarke had addressed was the so-called 'geostationary orbit', an orbit at about 35,786 km above the equator where

into force 5 February 1998; WTO Doc. S/L/20 of 30 April 1996 (96-1750); 2061 UNTS 209; ATS 1998 No. 9; 33 ILM 1167 (1994); 36 ILM 354 (1997).

8 See *infra*, Chapter 15, esp. § 15.4.

9 See *supra*, Chapter 5, esp. §§ 5.4–5.6.

10 See *supra*, Chapter 4, esp. § 4.3.2.2.

11 A. Clarke, Extra-Terrestrial Relays, *Wireless World* (Oct. 1945), 305–8. See further on this e.g. M.L. Smith, *International Regulation of Satellite Communication* (1990), 5–10; R.L. White & H.M. White, *The Law and Regulation of International Space Communication* (1988), 9; Lyall, *supra* n. 2, 322; Cheng, *supra* n. 1, 541.

satellites uniquely could remain 'stationary' from a terrestrial perspective.[12] At that altitude the balance between the earth's gravitational forces and the centrifugal forces that are required for a satellite to maintain a stable orbit is achieved at precisely the velocity that translates into the same angular velocity as that of the earth – both complete a full revolution every 24 hours. In other words, the satellite 'keeps falling around the earth', from where it is perceived to remain in the same place all the time. As a result, with respect to the geostationary orbit, satellites *de facto* are not seen as following orbits around the earth, but as occupying positions ('slots') in that orbit.

The stationary character of satellites in such slots presented an obvious advantage for satellite communications in particular, as terrestrial antennae basically could remain pointed in the same direction continuously. Also, a mere three satellites strategically placed in the geostationary orbit could cover almost the whole globe – only in the polar areas, not the most interesting ones from a general communication perspective, was the angle at which the radio waves came in too low above the horizon for feasible unfettered radio contact. On the other hand, however, the distances radio waves had to travel (at least some 70,000 km back and forth) required considerable transmitting power – and *inter alia* caused the famous time delays in Transatlantic conversations of old.

Once technology therefore advanced far enough to make it feasible to more or less continuously access the capacity offered by moving satellites and operate complete systems of satellites handing over communication traffic to each other in addition to communicating with ground stations, other orbits started to become used as well. Generically, two types of orbits are usually distinguished, although it should be pointed out that the distinctions are legally irrelevant, and even in non-legal terms

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[12] See e.g. http://en.wikipedia.org/wiki/Geostationary_orbit, last accessed 12 March 2014; further also M. Williamson, Technical Issues and Empowerment of the ITU, in *International Regulations of Space Communications* (Ed. M. Hofmann) (2013), 33; White & White, *supra* n. 11, 9–16; Lyall, *supra* n. 2, 248–50; I.B.R. Supancana, *The International Regulatory Regime Governing the Utilization of Earth-Orbits* (1998), 11–6; McNutt, *supra* n. 1, 132; Cheng, *supra* n. 1, 542. To be precise, the geostationary orbit was more of a virtual tube-like area within which these physical characteristics generally applied; once a satellite threatened to drift outside of that 'tube', small correctional manoeuvres were necessary ('station keeping') to allow the satellite to continue to benefit from the specific geostationary character of its position.

far from uniformly delineated: low earth orbits (LEOs)[13] and medium earth orbits (MEOs).[14]

LEOs, in particular, became popular for commercial satellite communications, as they could make do with relatively small power inputs and large amounts of digital data could be processed.[15] MEOs came to be occupied by a few other satellite communications systems[16] and, more notably, satellite navigations systems such as GPS and Galileo, where the trade-off between more power and fewer satellites was considered more beneficial. Finally it should be mentioned that in particular for certain remote sensing operations not only LEOs but also highly elliptical orbits (HEOs) presented an interesting option, if the operators were only really interested in parts of the globe under the low part of the orbit (a few hundred kilometres at most) and did not mind the satellite moving away as far as 40,000 km at the other end of its orbit.[17]

8.2.2 The Basics of the ITU

8.2.2.1 A very brief institutional history

The ITU is one of the oldest intergovernmental organizations, starting out in 1865 as the International *Telegraph* Union – the telegraph at the time

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[13] LEOs were generally considered to refer to orbits at altitudes of up to a few hundred, sometimes a few thousand, kilometres, whilst the lowest possible orbit was generally considered to be somewhere in the 100 kilometre range; *cf.* e.g. http://en.wikipedia.org/wiki/Low_Earth_orbit, last accessed 12 March 2014. See further e.g. Lyall, *supra* n. 2, 245–7; McNutt, *supra* n. 1, 132–3; Supancana, *supra* n. 12, 16–23.

[14] MEOs were generally considered to refer to orbits at altitudes of at least a few thousand up to some 25,000 kilometres (higher orbits than those were essentially not feasible); *cf.* e.g. http://en.wikipedia.org/wiki/Medium_Earth_orbit, last accessed 12 March 2014. See further e.g. McNutt, *supra* n. 1, 133; Lyall, *supra* n. 2, 245–7; Supancana, *supra* n. 12, 23–5.

[15] One proposed satellite system Teledesic originally intended to launch almost a thousand relatively small satellites for an 'Internet in the sky'; see http://nl.wikipedia.org/wiki/Teledesic, last accessed 12 March 2014. Other well-known major operators in LEO included Iridium (http://en.wikipedia.org/wiki/Iridium_satellite_constellation, last accessed 12 March 2014) and Globalstar (http://en.wikipedia.org/wiki/Globalstar, last accessed 12 March 2014).

[16] A famous example concerned ICO Global Communications, now Pendrell; see http://en.wikipedia.org/wiki/Pendrell_Corporation, last accessed 12 March 2014; *cf.* also *supra*, § 5.5.2.

[17] See http://en.wikipedia.org/wiki/Highly_elliptical_orbit, last accessed 12 March 2014.

being the only long-distance electronic communication instrument available.[18] Once other electronic means of communication became feasible, they were duly integrated: in 1885 telephony was added to the scope of activity,[19] and in 1906 radio communications in turn came within the domain of the ITU as well.[20] A further step recognizing the ever-changing technological environment was to re-label the ITU as the International *Telecommunication* Union in 1932,[21] which of course has remained its title ever since.

The most recent major developments in the context of the ITU took place in the 1990s. The rapid and ever continuing development of technology, as combined with the increasing number of ITU member states,[22] made the entry into force of consecutive adapted versions of the underlying telecommunication conventions increasingly fall behind. Sometimes by the time a particular convention was to enter into force it was already out of date, and work on a yet newer version had to begin immediately.[23] Consequently, in 1992 the fundamental decision was made to separate the more permanent features of the ITU structure and *modus operandi* from the more volatile, more technically oriented ones; the first largely wound up being included in the ITU Constitution,[24] the

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[18] The ITU was first established as per the International Telegraph Convention, Paris, done 17 May 1865, entered into force 1 January 1866; 130 CTS 198; 56 BFSP 295. See further e.g. F. Lyall, *International Communications – The International Telecommunication Union and Universal Postal Union* (2011), 23–8; Lyall, *supra* n. 2, 313 ff.; White & White, *supra* n. 11, 30 ff.

[19] See e.g. Lyall, *supra* n. 18, 38; White & White, *supra* n. 11, 33; Lyall, *supra* n. 2, 313–4.

[20] As per the Radio-telegraph Convention, Berlin, done 3 November 1906, entered into force 1 July 1908; 37 Stat. 15665, TS 608203 CTS 101; 99 BFSP 321; see further e.g. Lyall, *supra* n. 18, 48–56; White & White, *supra* n. 11, 33–6; Lyall, *supra* n. 2, 314–8.

[21] As per the International Telecommunication Convention, Madrid, done 9 December 1932, entered into force 1 January 1934; 151 LNTS 5; USTS 867; 61 Stat. 1180; ATS 1934 No. 10; see further e.g. Lyall, *supra* n. 18, 76–81; White & White, *supra* n. 11, 46–9; Lyall, *supra* n. 2, 319–20.

[22] The ITU is one of the few international organizations with near-universal membership; as of today it comprises 193 member states; see www.itu.int/en/about/Pages/membership.aspx, last accessed 12 March 2014.

[23] *Cf.* Lyall & Larsen, *supra* n. 1, 204–6; also Salin, *supra* n. 2, 54–5; Lyall, *supra* n. 2, 325–6; R.S. Jakhu, International Regulation of Satellite Telecommunications, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 81–2.

[24] Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July

second in the ITU Convention,[25] both entering into force (in their first iteration) in 1994.[26]

Since then, the major developments that required being taken into consideration concern the rapidly growing impact of private commercial operators in satellite communications. Whilst ITU remains a ‘classical’ intergovernmental organization in that only states at the highest level are parties to the ITU Constitution and ITU Convention,[27] some allowance had to be made for involving private operators at least in the practical decision-making and policy-setting processes.

Thus, in 1994 a first set of amendments[28] agreed to at the Kyoto Plenipotentiary Conference gave rise to allowing fundamental participation of non-governmental entities in the ITU conferences and institutional setting as ‘small-m’ members entitled to be fully informed and consulted.[29] Four years later, another step was taken in this respect at the 1998 Minneapolis Plenipotentiary Conference: the amendments agreed upon there[30] allowed for private operators to become sector members,[31]

1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1.

[25] Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71.

[26] *Cf.* also e.g. A.A.E. Noll, ITU Constitutional and Conventional Amendments, *Multi-Media und Recht* (2000), 270 ff.

[27] *Cf.* Art. 2; also Arts. 3, 8, 10, ITU Constitution, *supra* n. 24. ‘Operating agencies’, the term of art for satellite operators, if not state agencies themselves, were to be authorized by states for all purposes relevant to international radio frequency usage; *cf.* e.g. Art. 6(2), ITU Constitution.

[28] Instrument amending the Constitution of the International Telecommunication Union (Geneva, 1992), Kyoto, done 14 October 1994, entered into force 1 January 1996; Cm. 3447; ATS 1996 No. 10; Final Acts of the Plenipotentiary Conference, Kyoto, 1994 (1995), at 1; and Instrument amending the Convention of the International Telecommunication Union (Geneva, 1992), Kyoto, done 14 October 1994, entered into force 1 January 1996; Cm. 3447; ATS 1996 No. 10; Final Acts of the Plenipotentiary Conference, Kyoto, 1994 (1995), at 23.

[29] See Art. 19, ITU Convention, *supra* n. 25, as amended 1994.

[30] Respectively Instrument amending the Constitution of the International Telecommunication Union of 22 December 1992, as amended 14 October 1994, Minneapolis, done 9 November 1998, entered into force 1 January 2000; ATS 2000 No. 8; and Instrument amending the Convention of the International Telecommunication Union of 22 December 1992, as amended 14 October 1994, Minneapolis, done 9 November 1998, entered into force 1 January 2000; ATS 2000 No. 8.

and hence to participate on a par with states at the level of the three sectors in which the ITU had been divided in 1992.

8.2.2.2 The basic structure of the ITU

Following the fundamental 1992 overhaul of the institutional structure of the ITU, further to the ITU Constitution and the ITU Convention as the two highest constitutive documents of the organization, the Radio Regulations remained the third document legally binding at the highest level,[32] containing the extended details of the global arrangements to coordinate the international use of the frequency spectrum.

Two main organs comprise the pinnacle of the institutional structure of the ITU: the Council[33] and the General Secretariat.[34] The organization continues to operate chiefly by way of Plenipotentiary Conferences ('plenipots') and World Radio Conferences (WRCs). Plenipotentiary Conferences[35] such as the Kyoto and Minneapolis ones mentioned above are held roughly every four years, and deal with general institutional issues and discussion of overall aspects of ITU operations, possibly

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[31] *Cf.* Arts. 2, 3, ITU Constitution, *supra* n. 24, as amended 1998; further *infra*, 8.2.2.2. Also e.g. A.A.E. Noll, The Space Law Related Role, Activities and Contributions of the International Telecommunication Union (I.T.U.) in the Last Decade of the 20th Century, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 119–20; U.M. Bohlmann, K.U. Schrogl & I. Zilioli, Report of the 'Project 2001' Working Group on Telecommunication, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 210–2. See on the issue of the sectors further *infra*, 8.2.2.2.

[32] Radio Regulations Articles, Edition of 2012 (hereafter Radio Regulations), www.itu.int/pub/R-REG-RR-2012, last accessed 15 April 2014; see also Art. 4, ITU Constitution, *supra* n. 24. Further e.g. F. Lyall, The Role of the International Telecommunication Union, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 255–6; Lyall & Larsen, *supra* n. 1, 206–7; C. Koenig & J.D. Braun, The International Regulatory Framework of EC Telecommunications Law: The Law of the WTO and the ITU as a Yardstick for EC Law, in *EC Competition and Telecommunications Law* (2002), 24–8.

[33] See Art. 10, ITU Constitution, *supra* n. 24; Art. 4, ITU Convention, *supra* n. 25, spelled out further details of its functions. Further e.g. Lyall & Larsen, *supra* n. 1, 215–6.

[34] See Art. 11, ITU Constitution, *supra* n. 24; Art. 5, ITU Convention, *supra* n. 25, spelled out further details of its functions. Further e.g. Lyall & Larsen, *supra* n. 1, 217; Koenig & Braun, *supra* n. 32, 21.

[35] *Cf.* Arts. 8–9, ITU Constitution, *supra* n. 24; Art. 1, ITU Convention, *supra* n. 25. See further e.g. Lyall & Larsen, *supra* n. 1, 215; Supancana, *supra* n. 12, 72–8; Koenig & Braun, *supra* n. 32, 20–1.

giving rise to amendments to the ITU Constitution and/or ITU Convention. In addition, WRCs,[36] succeeding the World Administrative Radio Conferences (WARCs) operative before the 1992 institutional overhaul, are held with a roughly similar regularity to discuss and (hopefully) agree on the actual substance of coordinating the international use of frequencies.

Finally, ITU in 1992 had been subdivided into three sectors: the Radiocommunication Sector,[37] dealing with the use of the frequency spectrum and hence most important from the present perspective; the Telecom Standardization Sector[38] dealing with technical harmonization and development; and the Telecom Development Sector,[39] which took care of the ITU's task as member of the UN family of intergovernmental organizations to support the efforts of developing countries to become and/or remain integrated in the international telecommunication community.

8.2.3 ITU Coordination and Regulation of International Usage of Frequencies

8.2.3.1 The ITU and international frequency management

The ITU was, in general terms, targeted to work on the main issues involved in international telecommunications, notably including – as far as the various telecommunication modes involving radio waves were concerned – minimizing unintentional cross-border interference by various technical and legal means. The key purposes of the ITU's activities in this context were phrased as:

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[36] *Cf.* Art. 13, ITU Constitution, *supra* n. 24; Art. 7, also Art. 9, ITU Convention, *supra* n. 25. See further e.g. Lyall & Larsen, *supra* n. 1, 225–7; Supancana, *supra* n. 12, 79–104; Koenig & Braun, *supra* n. 32, 21–2.

[37] See Arts. 12–16, 44 ff., ITU Constitution, *supra* n. 24; for further details on its *modus operandi* Arts. 7–12, ITU Convention, *supra* n. 25. See further e.g. Lyall & Larsen, *supra* n. 1, 224 ff.; Lyall, *supra* n. 32, 257–8; Koenig & Braun, *supra* n. 32, 21–2.

[38] See Arts. 17–20, ITU Constitution, *supra* n. 24; for further details on its *modus operandi* Arts. 13–15, ITU Convention, *supra* n. 25. See further e.g. Lyall & Larsen, *supra* n. 1, 222–4; Lyall, *supra* n. 32, 258; Koenig & Braun, *supra* n. 32, 22.

[39] See Arts. 21–24, ITU Constitution, *supra* n. 24; for further details on its *modus operandi* Arts. 16–18, ITU Convention, *supra* n. 25. See further e.g. Lyall & Larsen, *supra* n. 1, 218–21; Lyall, *supra* n. 32, 258; Koenig & Braun, *supra* n. 32, 22.

(a) to maintain and extend international cooperation among all its Member States for the improvement and rational use of telecommunications of all kinds;

… [and]

(c) to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public.[40]

Those legal means most prominently comprised a system coordinating the use of radio frequencies which were available for wireless activities, targeted to ensure that individual duly authorized users (governmental or otherwise) would enjoy the interference-free usage of certain frequencies. Thus the ITU most notably was to:

(a) effect *allocation* of bands of the radio-frequency spectrum, the *allotment* of radio frequencies and the registration of radio-frequency *assignments* … in order to avoid harmful interference between radio stations of different countries; [and]
(b) coordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio-frequency spectrum for radiocommunication services.[41]

This clause already lays down the blue-print for an elaborate process of two alternatively three steps, involving 'allocation', 'allotment' and 'assignment' of radio frequencies to finally allow individual radio operators to use certain frequencies in an interference-free manner. The system was further elaborated in the Radio Regulations,[42] the third major legal document underlining the ITU's role and competences binding ITU member states.[43]

This system is most succinctly summarized by the Radio Regulations by way of the matrix in Table 8.1.

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[40] Art. 1(1), ITU Convention, *supra* n. 25.
[41] Art. 1(2), ITU Constitution, *supra* n. 24 (emphasis added).
[42] *Supra*, n. 32.
[43] *Cf.* again Arts. 4(3), 6, ITU Constitution, *supra* n. 24; the references to 'Administrative Regulations' refer to both the Radio Regulations and the International Telecommunication Regulations. See further on the Radio Regulations e.g. Lyall & Larsen, *supra* n. 1, 230–5.

Table 8.1 Matrix of key terminology of the Radio Regulations, Art. 5(1)

Frequency distribution to	French	English	Spanish
Services	Attribution (attribuer)	Allocation (to allocate)	Atribución (atribuir)
Areas or countries	Allotissement (allotir)	Allotment (to allot)	Adjudicación (adjudicar)
Stations	Assignation (assigner)	Assignment (to assign)	Asignación (asignar)

Source: Art. 5 – Introduction, Radio Regulations

In this context the ITU Constitution provides for the main principles to be adhered to in implementing this process:

> Member States shall bear in mind that radio frequencies … are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those … frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries.[44]

Even more specific, 'Member States shall endeavour to limit the number of frequencies and the spectrum used to the minimum essential to provide in a satisfactory manner the necessary services. To that end, they shall endeavour to apply the latest technical advances as soon as possible.'[45]

Other important principles governing international frequency management in the ITU context concern the principled obligation to avoid harmful interference with other authorized radio traffic,[46] priority for distress calls and messages,[47] formal non-applicability of the ITU

[44] Art. 44(2), ITU Constitution, *supra* n. 24.
[45] Art. 44(1), ITU Constitution, *supra* n. 24; Art. 4(1), Radio Regulations, *supra* n. 32; *cf.* also Art. 38(1), ITU Constitution.
[46] See Art. 45, ITU Constitution, *supra* n. 24.
[47] See Art. 46, ITU Constitution, *supra* n. 24.

regime to military radio installations,[48] a right to cut off private telecommunication activities which threaten national security[49] and an obligation for states to safeguard channels and operations within their jurisdiction and control.[50]

8.2.3.2 The Radio Regulations and the first step in the process: Allocation

The first step in the overall process of internationally managing frequency usage is the aforementioned 'allocation', which refers to the 'reservation' at the international level of frequency *bands* to *categories* of services using radio waves. The Radio Regulations in this respect define 'allocation (of a frequency band)' as '[e]ntry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.'[51] The Radio Regulations currently recognize no fewer than 42 specific services for the purpose of allocation.[52]

The allocation of frequency bands is usually handled by way of the WRCs, previously the WARCs, which take place usually every two or three years.[53] Here, the ITU member states 'may partially or, in

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[48] *Cf.* Art. 48(1), ITU Constitution, *supra* n. 24. Still, such military 'installations must, so far as possible, observe statutory provisions relative to giving assistance in case of distress and to the measures to be taken to prevent harmful interference, and the provisions of the Administrative Regulations concerning the types of emission and the frequencies to be used, according to the nature of the service performed by such installations' (Art. 48(2), ITU Constitution) – and in actual fact they will be very much stimulated to do so: the laws of physics dictate that also their radio traffic will turn into white noise if other, civil telecommunication installations use the very same frequencies in the same geographical area.

[49] See Art. 34(2), ITU Constitution, *supra* n. 24.

[50] See Art. 38(3) & (4), ITU Constitution, *supra* n. 24.

[51] Art. 1(16), Radio Regulations, *supra* n. 32. *Cf.* also e.g. Meredith & Robinson, *supra* n. 1, 161, Lyall & Larsen, *supra* n. 1, 231; Salin, *supra* n. 2, 48. For the Table of Frequency Allocations see further *infra*, § 8.2.3.3.

[52] See Art. 1(19)–(60), Radio Regulations, *supra* n. 32. Of those, exactly half are 'space services'; see further *infra*, § 8.2.4.2.

[53] See Art. 13(1), (2), ITU Constitution, *supra* n. 24. The *modus operandi* of the WRCs is further established by Art. 7, ITU Convention, *supra* n. 25. See also Note by Secretariat, Radio Regulations, III: 'This revision of the Radio Regulations, complementing the Constitution and the Convention of the International Telecommunication Union, incorporates the decisions of the World

exceptional cases, completely, revise the Radio Regulations'.[54] In effect, this means that, as technical, economic and other developments change the (perceived) need for certain bandwidth, at the WRCs it will be decided to 'reserve' new frequency bands for specific services and/or 'take away' certain bandwidth from others apparently not so much in need thereof – all in conformity with the need to use radio frequencies 'rationally, efficiently and economically'.[55]

Such decisions have to be prepared well in advance: 'The general scope of this agenda [of a WRC] should be established four to six years in advance, and the final agenda shall be established by the Council preferably two years before the conference, with the concurrence of a majority of the Member States.'[56] Obviously, in practice that time is also used for extended analyses, discussions and often negotiations to prepare for sufficient majorities of member states for any proposed additional allocations for certain services, or conversely taking away existing allocations.[57]

The process is considerably fine-tuned, however, to accommodate as many potential conflicting interests, priorities and preferences of ITU member states as possible.

Radio-communication Conferences of 1995 (WRC-95), 1997 (WRC-97), 2000 (WRC-2000), 2003 (WRC-03), 2007 (WRC-07) and 2012 (WRC-12). The majority of the provisions of these Regulations shall enter into force as from 1 January 2013'.

[54] Art. 13(1), ITU Constitution, *supra* n. 24; *cf.* also Art. 7(2.1.a), ITU Convention, *supra* n. 25. Art. 32, ITU Convention, provides for the voting procedure, effectively meaning that a consensus is striven for but if necessary a simple majority suffices for approving a change.

[55] Art. 44(2), ITU Constitution, *supra* n. 24. *Cf.* also Art. 59(2), Radio Regulations, *supra* n. 32, providing that 'the provisions of these Regulations, as revised by WRC-95, concerning *new or modified frequency allocations* (including any *new or modified conditions applying to existing allocations*) … apply provisionally as of 1 January 1997' (emphasis added).

[56] See Art. 7(2.2), ITU Convention, *supra* n. 25.

[57] For constitution of the agenda concurrence by a majority of member states is required, whereas a proposal to change the agenda requires a request by at least one-quarter of the member states, which has then to be agreed again by a majority; see Art. 7(2), (3), ITU Convention, *supra* n. 25. Decisions taken at a WRC with respect to the Radio Regulations, for example on changing allocations, also require a majority of member states; the Radio Regulations complementing the Constitution and Convention, the majority voting rules applying to amendments to the latter (*cf.* Art. 55, ITU Constitution, *supra* n. 24, and Art. 42, ITU Convention respectively) would apply at the WRCs as well for purposes of amending the Radio Regulations, *supra* n. 32.

Firstly, the world is divided into three main ITU regions, allowing different regions in principle to follow different approaches – as the use of a particular frequency in one region only may not cause threat of interference to the use of that same frequency in another. Noting that, as far as satellite communications is concerned, the ITU is very focused on that part of outer space which is above the equator in view of the predominant use of the geostationary orbit, this division happens to reflect at a primary level the areas which can be reached from the same section of the geostationary arc: Region 1 principally comprises Europe and Africa, Region 2 the Americas, and Region 3 Asia, Australia and the Pacific.[58] Largely for terrestrial/political reasons, however, in deviation from the above the whole territory of Russia forms part of Region 1, even if extending all the way to the Pacific.[59] More detailed subdivisions, still at a regional level, are provided for, such as the African Broadcasting Area, the European Broadcasting Area, the European Maritime Area and the Tropical Zone.[60]

Secondly, by listing various categories of services and allocations the Radio Regulations provide for yet more flexibility in allocating frequencies to certain services in certain areas only, honouring as much as possible individual sovereign interests and priorities of states. To start with, a distinction is made between 'primary services' and 'secondary services', whereby the latter

> (a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date; (b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date; [yet] (c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.[61]

Next, the possibility is offered to allocate frequency bands, through the mechanism of 'footnotes', with respect to a certain country or group of

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58 See Art. 5(2), Radio Regulations, *supra* n. 32, incl. a small explanatory map; in further detail Art. 5(3)–(9). Of course, the ITU by way of this approach targets and addresses *all* radio communications, within which satellite communications only forms a certain sub-field; see further *infra*, § 8.2.4.

59 See Art. 5(3), Radio Regulations, *supra* n. 32.

60 See Art. 5(10)–(21), Radio Regulations, supra n. 32.

61 Art. 5(29)–(31), Radio Regulations, *supra* n. 32; see also Art. 5(23)–(28).

countries only.[62] If those are 'additional allocations', they are essentially entitled to the same rights as primary services for the country or countries to which the footnote applies; if they are by contrast 'alternative allocations', they are on a par with secondary services for the country or countries at issue.[63] Finally, services may even enjoy without further ado the possibility to use certain frequencies under a strict 'no harmful interference, no protection against harmful interference' regime.[64]

8.2.3.3 The Table of Frequency Allocations

The result of actual allocations following the above process and principles as applied by the various WRCs is laid down in the Table of Frequency Allocations, incorporated in the Radio Regulations by way of Section IV of Article 5 – for a total of 136 pages.[65] Preceding it, Section III, comprising Article 5(46)–(52), provides for a brief 'Description of the Table of Frequency Allocations'.

The Table of Frequency Allocations itself encompasses all frequencies practically useful for telecommunication purposes, currently running from 8.3 kHz to 275 GHz,[66] which, largely for convenience's sake, have been subdivided into a number of frequency bands. For each of those bands the Table then indicates, per ITU Region if applicable, the service(s) enjoying primary allocations and those enjoying secondary allocations. Footnotes further provide wherever relevant for additional allocations, per state and sometimes in quite precise detail.

While the Table itself determines the frequency bands by way of their book-ending frequencies expressed in kHz, MHz and GHz, for practical reasons frequency ranges have also been combined into much broader bands and given simple numbers or acronyms for quick reference. Firstly, the Radio Regulations themselves provide for a generic, nine-fold division as shown in Table 8.2.

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[62] See Art. 5(32)–(33), Radio Regulations, *supra* n. 32.

[63] See Art. 5(34)–(41), esp. (36) & (40), Radio Regulations, *supra* n. 32.

[64] See Art. 5(43)–(43A), Radio Regulations, *supra* n. 32.

[65] See Art. 5(53)–(565), Radio Regulations, *supra* n. 32; comprising pp. 43–178.

[66] The bands below 8.3 kHz are 'not allocated', and so are those between 275 and 3,000 GHz; Radio Regulations, *supra* n. 32, 43 and 178 respectively.

Table 8.2 Nine frequency bands as per the Radio Regulations, Art. 2(1)

Band number	Symbols	Frequency range (lower limit exclusive, upper limit inclusive)	Corresponding metric subdivision	Metric abbreviations for the bands
4	VLF	3 to 30 kHz	Myriametric waves	B.Mam
5	LF	30 to 300 kHz	Kilometric waves	B.km
6	MF	300 to 3 000 kHz	Hectometric waves	B.hm
7	HF	3 to 30 MHz	Decametric waves	B.dam
8	VHF	30 to 300 MHz	Metric waves	B.m
9	UHF	300 to 3 000 MHz	Decimetric waves	B.dm
10	SHF	3 to 30 GHz	Centimetric waves	B.cm
11	EHF	30 to 300 GHz	Millimetric waves	B.mm
12		300 to 3 000 GHz	Decimillimetric waves	

Notes:
1. 'Band N' (N + band number) extends from 0.3×10^{N} Hz to 3×10^{N} Hz
2. Prefix: k = kilo (10^3), M = mega (10^6), G = giga (10^9).
3. See also http://en.wikipedia.org/wiki/Radio_spectrum, last accessed 12 March 2014, for the meaning of the acronyms and additional information on the corresponding wavelengths, as well as adding at the 'top' end four more bands (TLF, ELF, SLF and ULF) and giving band number 12 the acronym 'THF'. Further e.g. Williamson, supra n. 12, 34–5.

Source: Art. 2.1. Radio Regulations

Note that the frequency ranges 3–8.3 kHz within Band 3 and 275–3,000 GHz within Bands 11 and 12 are currently not allocated through the ITU system, but apparently expected to be potentially requiring such allocation in the future.

In addition, going back to the Second World War, frequency bands have traditionally been referred to by another set of letters; while use is sometime inconsistent the most authoritative would be the table developed by the Institute of Electrical and Electronics Engineers (IEEE), in its most recent version published 2002 (see Table 8.3).[67]

[67] IEEE Standard 521-2002: Standard Letter Designations for Radar-Frequency Bands; see http://en.wikipedia.org/wiki/Radio_spectrum, last accessed 12 March 2014.

Table 8.3 Twelve frequency bands as per IEEE Standard 521-2002

Band name	Frequency range	Origin of name
HF band	3–30 MHz	**H**igh **F**requency
VHF band	30–300 MHz	**V**ery **H**igh **F**requency
L band	1–2 GHz	**L**ong wave
S band	2–4 GHz	**S**hort wave
C band	4–8 GHz	**C**ompromise between S and X
X band	8–12 GHz	Used in World War II for fire control – **X** for crosshair
Ku band	12–18 GHz	**K**urz-**u**nder
K band	18–27 GHz	**K**urz
Ka band	27–40 GHz	**K**urz-**a**bove
V band	40–75 GHz	
W band	75–110 GHz	**W** follows V
G band	110–330 GHz	

8.2.3.4 The Radio Regulations and the second step in the process: Allotment

The second step in the process of arranging the international use of the radio-frequency spectrum effectively concerns 'allotment', which refers to the 'reservation' of specific *frequencies* to *states* for the purpose of specific telecommunication *services* intended to be provided.

The Radio Regulations define 'allotment (of a radio frequency or radio frequency channel)' as '[e]ntry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specified conditions'.[68] 'Administration' here refers to '[a]ny *governmental department or service* responsible for discharging the obligations undertaken in the Constitution of the International Telecommunication Union, in the Convention of the International Telecommunication Union and in the Administrative Regulations'.[69]

[68] Art. 1(17), Radio Regulations, *supra* n. 32. *Cf.* also e.g. Salin, *supra* n. 2, 48.

[69] Art. 1(2), Radio Regulations, supra n. 32 (emphasis added).

In order to realize allotment in a manner not interfering with other lawful international usage of the frequency spectrum within the ITU framework each time such interference-free access to a frequency or set of frequencies was requested an extended coordination process entered into operation. The key ITU organ monitoring the coordination process was the Radio Regulations Board (previously International Frequency Registration Board, IFRB), consisting of individual experts who were to 'serve, not as representing their respective Member States nor a region, but as custodians of an international public trust', and consequently were to 'refrain from intervening in decisions directly concerning the member's own administration'.[70]

The Radio Regulations Board would receive requests from states for frequency allotments on a continuing basis in between WARCs and WRCs respectively.[71] Obviously, such requests for allotment would have to fit within the legal parameters provided by the Table of Frequency Allocations, and a request for the allotment of frequencies in bands not allocated to the service for which they are intended to be used would thus *ab initio* be defeated, unless it were itself not causing any harmful interference whilst accepting any interference from duly authorized other assignments.[72] If, for instance, the proposed satellite system was intended for a radio navigation service, the specific frequencies whose allotment was requested should fit within the frequency bands allocated to that type of service.

8.2.3.5 The Radio Regulations and the third step in the process: Assignment

If indeed the radio frequencies thus allotted were to be used by the state concerned itself, read a public operator somehow part of the governmental system, the step of 'assignment' properly speaking would converge almost automatically with 'allotment' – as dictated by national rules and

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70 Art. 14(3.1), ITU Constitution, *supra* n. 24.

71 See further e.g. Lyall & Larsen, *supra* n. 1, 227 ff.; Meredith & Robinson, *supra* n. 1, 188 ff.

72 *Cf.* esp. Art. 4(4), Radio Regulations, *supra* n. 32, requiring administrations to 'not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations'. See further *infra*, § 8.2.4.4, for the actual ITU coordination process.

principles. 'Assignment' in other words concerns the 'reservation' of specific frequencies to specific *operators* for purposes of the services these intended to provide – many of the clauses discussed above with respect to allotment actually (also) already refer to assignment.[73]

If, by contrast, the actual intended operator were either an intergovernmental organization or a private operator, neither of those having independent competence to ask for 'allotment' of frequencies, 'assignment' would effectively constitute a distinct third step whereby the state to which the frequencies were allotted would formally permit that operator to use them – as the Radio Regulations state: the 'assignment (of a radio frequency or radio frequency channel)' refers to '[a]uthorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions'.[74] In the case of an intergovernmental organization, that would normally be the host state of that organization;[75] in the case of a private operator, it would likely be the state under whose (territorial) jurisdiction that operator falls.[76]

In practice the above system meant that a state could request allotment of certain frequencies either for its own purposes or for specific assignment to a private or intergovernmental operator at any one particular time. Such matters were obviously a matter for national state sovereignty, and not subject to any international obligations further to those outlined above as to the coordination process and related obligations under the ITU regime.

8.2.3.6 The Master International Frequency Register

Once following the extended coordination process further discussed below no other ITU member state could reasonably claim its communication operations to be at risk by the newly proposed system, the frequencies in question would be allotted/assigned and by way of a Notification Request included in the Master International Frequency Register, and as such be legally protected against interference by others.

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[73] See e.g. Lyall & Larsen, *supra* n. 1, 232–3; Meredith & Robinson, *supra* n. 1, e.g. 162; Salin, *supra* n. 2, 48.

[74] Art. 1(18), Radio Regulations, *supra* n. 32. The reference to 'administration' (see also *supra*, text at n. 69) makes clear that assignment thus takes place at a national level.

[75] *Cf.* on this as regards the international satellite organizations *supra*, §§ 5.4–5.8.

[76] *Cf.* also more generally on private space operators in the context of international space law, e.g. *supra*, §§ 2.1.2, 2.2.2.3, 2.3.1.1; Chapter 3.

The Master International Frequency Register records the assignments notified by the states in compliance with the coordination procedure and ITU rules as sketched above, thereby in law receiving international recognition of the right to uninhibited and interference-free usage of those frequencies for the purposes intended.[77] The Register thus constitutes a permanent but continuously updated depository of authorized frequencies for existing systems, further containing relevant technical data. As indicated, such detailed data are only entered in the Register after the coordination process has shown that no state can make a valid objection to the proposed network operations, in particular from the perspective of its own allotments being potentially threatened by interference.

8.2.4 The ITU and Satellite Communications

8.2.4.1 The ITU and space services: Frequencies, geostationary orbital slots and other orbits

The entire system discussed above in principle applied to *any* telecommunications using radio waves in an international context. Until Sputnik-1 the inclusion of a relay station in outer space as part of a telecommunication network requiring uplink and downlink radio transmissions using certain frequencies had remained science fiction or at least – as per Sir Arthur Clarke's proposal – mere theory, but the small Soviet satellite changed that radically. It became evident that telecommunications would soon start to use satellites as part of their networks, and that *inter alia* frequencies would have to be set aside for such in-space devices.

It was no more than logical that the ITU would also present the appropriate forum to discuss frequency usage and radio interference in the particular context of satellite communications, and indeed as early as 1959 at a World Administrative Radio Conference in Geneva it was fundamentally decided to add that space communications – read in particular the frequencies to be used therefore – would have to be handled by the ITU as well.[78] The Radio Regulations henceforth generically defined 'space radiocommunication' as '[a]ny radiocommunication

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77 *Cf.* Art. 11, Radio Regulations, *supra* n. 32.

78 See e.g. Lyall, *supra* n. 18, 110; Lyall, *supra* n. 2, 324; White & White, *supra* n. 11, 113–5; Meredith & Robinson, *supra* n. 1, 170–1; Smith, *supra* n. 11, 59; Supancana, *supra* n. 12, 79.

involving the use of one or more space stations or the use of one or more other reflecting satellites or other objects in space'.[79]

Satellite communications, however, not only require coordination of the frequencies like any terrestrial wireless operation; they also require some coordination of the physical position of the satellites in outer space. The ITU was not as such given formal authority by its member states to 'license' or 'authorize' the physical occupation of positions in the global commons of outer space by individual states, for example through the allocation of orbits or geostationary slots along the lines of allocation of frequencies.[80]

At the same time, there is an inherent relationship between the (interference-free) usage of frequencies by satellites and the positions they occupy: using the same frequency in neighbouring positions results in white noise for both operators, but if the satellites find themselves on opposite ends of the geostationary orbit there is no risk of interference whatsoever. Thus, almost as if through the backdoor, the ITU frequency coordination process also took into consideration the actual respectively intended satellite positions: at first only in the geostationary orbit, later as they became popular also in other orbits:

> In using frequency bands for radio services, Member States *shall bear in mind* that radio frequencies and *any associated orbits, including the geostationary-satellite orbit*, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries *may have equitable access to those orbits* and frequencies.[81]

Consequently, the ITU process discussed above as a key element in streamlining international use of radio frequencies also refers to the need to 'effect … the *registration* of radio-frequency assignments and, *for*

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[79] Art. 1(8), Radio Regulations, *supra* n. 32. 'Space stations' here does not refer to manned space stations such as the ISS, but to any transmitter station operating in outer space; see Lyall, *supra* n. 18, 110, fn. 133.

[80] Note that outer space constitutes a 'global commons' with a baseline regime of free exploration and use of outer space, only to be limited by the global community of states as such. This could have occurred using the ITU as the international vehicle, providing it with a derogatory authority to 'regulate' orbits in the same way that ICAO had been given 'authority' to 'regulate' the airspaces above the high seas (another global commons); see e.g. N. Grief, *Public International Law in the Airspace of the High Seas* (1994). Strictly speaking, however, this so far has not happened with regard to satellite orbits in outer space. *Cf.* also *supra*, § 5.2.3.

[81] Art. 44(2), ITU Constitution, *supra* n. 24 (emphasis added).

space services, of any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to avoid harmful interference between radio stations of different countries'[82] and to 'coordinate efforts … to improve the use made of the radio-frequency spectrum for radiocommunication services and *of the geostationary-satellite and other satellite orbits*'.[83]

8.2.4.2 Space services in the ITU context

The 1959 WARC had essentially treated space communication services as comprising two new services, the 'space service' (the uplink) and the 'earth service' (the downlink), and allocated the first frequency bands to those services.[84] As the use of space continuously expanded, however, the simple concept of one downlink and one uplink service had to be constantly refined, more bandwidth had to be allocated and the principles guiding the actual allocation and allotment had to be refined.

Thus, an Extra-ordinary Administrative Radio Conference (EARC) in 1963, exclusively dedicated to space communications, among other things promulgated the 'first-come, first-served' principle as the leading one in allowing space system operations to use certain frequencies, and also introduced specific procedures for filing, consultation and coordination.[85] This referred to, for example, the need to include in the required advance publication the orbital slots, and orbits respectively, intended for the prospective satellite operations in addition to the requested frequencies.[86]

At the WARC of 1971, similarly dedicated to space communications, it was decided in 1971 to separate 'space services' into fixed-satellite services (FSS), mobile-satellite services (MSS) and broadcasting-satellite services (BSS), with appropriate amounts of (ever more) bandwidth set aside for each of them.[87]

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[82] Art. 1(2.a), ITU Constitution, *supra* n. 24 (emphasis added).

[83] Art. 1(2.b), ITU Constitution, *supra* n. 24 (emphasis added).

[84] See Lyall, *supra* n. 18, 110, fn. 133; White & White, *supra* n. 11, 113; Lyall, *supra* n. 2, 359; Meredith & Robinson, *supra* n. 1, 170; Smith, *supra* n. 11, 59; Supancana, *supra* n. 12, 79.

[85] See e.g. White & White, *supra* n. 11, 116–28; Lyall, *supra* n. 2, 360–4; Meredith & Robinson, *supra* n. 1, 171–3; Smith, *supra* n. 11, 59–60; Supancana, *supra* n. 12, 79–80. Cf. further *infra*, § 8.2.4.3.

[86] *Cf.* White & White, *supra* n. 11, 121–4; also e.g. Meredith & Robinson, *supra* n. 1, 172.

[87] *Cf.* e.g. White & White, *supra* n. 11, esp. 138–52; Lyall, *supra* n. 2, 364–71; Meredith & Robinson, *supra* n. 1, 174–7; Smith, *supra* n. 11, 61; Supancana, *supra* n. 12, 80–1.

As of 2012, among the 42 services distinguished, no fewer than 21 separate specific space services are recognized by the Radio Regulations, most of them satellite-specific versions of services more broadly defined, as follows:

> 1.21 – ***Fixed-satellite service***: A *radiocommunication* service between *earth stations* at given positions, when one or more *satellites* are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the *inter-satellite service*; the fixed-satellite service may also include *feeder links* for other *space radiocommunication services*.
>
> 1.22 – ***Inter-satellite service***: A *radiocommunication service* providing links between artificial *satellites*.
>
> 1.23 – ***Space operation service***: A *radiocommunication service* concerned exclusively with the operation of *spacecraft*, in particular *space tracking*, *space telemetry* and *space telecommand*. These functions will normally be provided within the service in which the *space station* is operating. …
>
> 1.25 – ***Mobile-satellite service***: A *radiocommunication service*: between *mobile earth stations* and one or more *space stations*, or between *space stations* used by this service; or between *mobile earth stations* by means of one or more *space stations*. This service may also include *feeder links* necessary for its operation. …
>
> 1.27 – ***Land mobile-satellite service***: A *mobile-satellite service* in which *mobile earth stations* are located on land. …
>
> 1.29 – ***Maritime mobile-satellite service***: A *mobile-satellite service* in which *mobile earth stations* are located on board ships; *survival craft stations* and *emergency position-indicating radiobeacon stations* may also participate in this service. …
>
> 1.35 – ***Aeronautical mobile-satellite service***: A *mobile-satellite service* in which *mobile earth stations* are located on board aircraft; *survival craft stations* and *emergency position-indicating radiobeacon stations* may also participate in this service.
>
> 1.36 – ***Aeronautical mobile-satellite (R)* service***: An *aeronautical mobile-satellite service* reserved for communications relating to safety and regularity of flights, primarily along national or international civil air routes. [(R) means 'en-route']
>
> 1.37 – ***Aeronautical mobile-satellite (OR)** service***: An *aeronautical mobile-satellite service* intended for communications, including those relating to flight coordination, primarily outside national and international civil air routes. [(OR) means 'off-route'] …
>
> 1.39 – ***Broadcasting-satellite service***: A *radiocommunication service* in which signals transmitted or retransmitted by *space stations* are intended for direct reception by the general public. In the broadcasting-satellite service, the term

'direct reception' shall encompass both *individual reception* and *community reception*. …

1.41 – ***Radiodetermination-satellite service***: A *radiocommunication service* for the purpose of *radiodetermination* involving the use of one or more *space stations*. This service may also include *feeder links* necessary for its own operation. …

1.43 – ***Radionavigation-satellite service***: A *radiodetermination-satellite service* used for the purpose of *radionavigation*. This service may also include *feeder links* necessary for its operation. …

1.45 – ***Maritime radionavigation-satellite service***: A *radionavigation-satellite service* in which *earth stations* are located on board ships. …

1.47 – ***Aeronautical radionavigation-satellite service***: A *radionavigation-satellite service* in which *earth stations* are located on board aircraft. …

1.49 – ***Radiolocation-satellite service***: A *radiodetermination-satellite service* used for the purpose of *radiolocation*. This service may also include the *feeder links* necessary for its operation. …

1.51 – ***Earth exploration-satellite service***: A *radiocommunication service* between *earth stations* and one or more *space stations*, which may include links between *space stations*, in which:

- information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment, is obtained from *active sensors* or *passive sensors* on Earth *satellites*;
- similar information is collected from airborne or Earth-based platforms;
- such information may be distributed to earth stations within the system concerned;
- platform interrogation may be included.

This service may also include *feeder links* necessary for its operation.

1.52 – ***Meteorological-satellite service***: An *earth exploration-satellite service* for meteorological purposes. …

1.54 – ***Standard frequency and time signal-satellite service***: A *radiocommunication service* using *space stations* on earth *satellites* for the same purposes as those of the *standard frequency and time signal service*. This service may also include *feeder links* necessary for its operation.

1.55 – ***Space research service***: A *radiocommunication service* in which *spacecraft* or other objects in space are used for scientific or technological research purposes. …

1.57 – ***Amateur-satellite service***: A *radiocommunication service* using *space stations* on earth *satellites* for the same purposes as those of the *amateur service*.

> 1.58 – ***Radio astronomy service***: A service involving the use of *radio astronomy*.[88]

Interestingly, these services also include radio astronomy, the last one mentioned here, which strictly speaking is not actively 'using' radio frequencies, merely 'passively' receiving them in order to distill information about cosmic and galactic phenomena through the radio waves emitted by supernovas, dying stars, black holes and their likes. Including radio astronomy as a service, however, allows allocating certain frequencies to it on a primary or secondary basis, hence entitling radio astronomers not to have their scientific activities disturbed, as relevant, by possible 'active' users of those frequencies.

When in the late 1990s impending multi-satellite communication projects for LEO were developed by such companies as Iridium and Globalstar, the radio astronomy community became concerned with interference by such high-power satellite systems, and, with the support of the OECD's Megascience Forum and the Committee on Radio Frequencies (CRAF) of the European Science Foundation (ESF), mounted a campaign to force those companies to adjust their plans partly to guarantee continuing respect for the frequency bands allocated to radio astronomy.[89]

8.2.4.3 From 'first-come, first-served' to *a priori* allocation

Following the straightforward focus on rational, efficient and economic use of radio frequencies demanded by Article 44(2) of the ITU Constitution, 'first-come, first-served' was the natural default principle for prioritization of potential competing or interfering requests for frequency usage. After all, every day a frequency was *not* used was lost for eternity.

Whilst this principle was considered inherently fair as between a set of similarly minded developed liberal market economies with roughly equal levels of technology, and not considered unduly burdensome as long as the geostationary orbit remained far from overcrowded, such underlying assumptions quickly began to change with the entry of more and more satellites into orbit and the growing interest of more and more lesser-developed and least-developed states in benefiting from satellite communications.

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[88] Art. 5, Radio Regulations, *supra* n. 32. *Cf.* also White & White, *supra* n. 11, xxii–xxiv.

[89] See also F.G. von der Dunk, Space for Celestial Symphonies? Towards the Establishment of International Radio Quiet Zones, 17 *Space Policy* (2001), 265–74.

The latter, in particular, became concerned that the geostationary orbit would be full, or that at least the most beneficial slots and frequencies would be occupied by the time they themselves might have obtained the technological and financial means to launch a satellite there. Closely related, there were also political and ideological issues, in that domination of the geostationary orbit by the developed, read Western, world would translate into Western control over telecommunications and Western cultural dominance of global broadcasting.[90]

This happened in particular with respect to the most politically sensitive of the original triad of space services developed at the 1963 EARC: satellite broadcasting (BSS) was viewed in particular by developing states as an instrument for the developed states to 'impose' their cultural and social values. Developing states were therefore in particular interested in, at some point in the future, running their own systems to counteract such 'imperialist' influences, but might not be able to do so beneficially by that time as a consequence of the hitherto applied 'first-come, first-served' principle – which consequently came under heavy criticism for the first time.[91]

The Plenipotentiary Conference of 1973 in this respect came up with a first compromise, that in addition to efficient and economic use (which dictated allocation as soon as some state was seriously interested) also equitable access (which should somehow guarantee to developing states they would not find all positions gone by the time they were ready to launch) was to be taken into consideration.[92]

At the 1977 WARC this general compromise was then worked out in that so-called *a priori* plans for BSS would apply for two out of the three global ITU Regions: Europe plus Africa and Asia plus Oceania respectively; for the Americas the old system of 'first-come, first-served' would continue to apply. These *a priori* plans meant effectively a few satellite

[90] These general concerns also gave rise to the efforts to limit the freedom to broadcast content with the help of satellite systems into countries not willing to accept such broadcasts in the context of the United Nations, leading to the establishment of the Principles on Direct Television Broadcasting by Satellite; see further *infra*, § 8.3.

[91] See Supancana, *supra* n. 12, 79; Lyall, *supra* n. 2, 361–4; White & White, *supra* n. 11, 123–4, 128–9; Meredith & Robinson, *supra* n. 1, 172–3.

[92] See e.g. Smith, *supra* n. 11, 61–2, 77–86; White & White, *supra* n. 11, 152–3; Meredith & Robinson, *supra* n. 1, 177–8; *cf.* also Supancana, *supra* n. 12, 72, 80–1.

slots plus assorted frequencies would be reserved for each state, regardless of whether that state was in a position to start using them immediately.[93]

At the so-called 1985 WARC-ORB, again dedicated to space services, some FSS frequency bands were also allocated for *a priori* allotment, whereas further to the principled decision in 1971 to distinguish MSS from other satellite services, at the 1987 WARC the first frequency bands were actually allocated to MSS.[94]

The discussion on 'first-come, first-served' versus *a priori* planning continued at another space-dedicated WARC-ORB in 1988. For FSS some frequency bands and slots were now reserved for some groups of states, while allowing 'first-come, first-served' to continue to apply for other parts of the spectrum, and for BSS *a priori* planning rules were drafted – and by contrast for MSS 'first-come, first-served' continued to apply squarely.[95]

Finally, as far as this cursory overview is concerned, the WARC of 1992 was particularly memorable for both allocating again a considerable measure of extra frequency bands for space communications, as opposed to terrestrial communications, and for such allocations including for the first time non-geostationary orbits.[96] The WARC of 2000 and the WRC of 2003 in turn became mainly famous for allocating more frequency bands for future satellite navigation systems, in particular for the purpose of the impending European satellite navigation system Galileo.[97]

8.2.4.4 The coordination of international frequency usage for international satellite services

In view of the special character of satellite communications as opposed to telecommunications *largo sensu*, with the need, for example, to deal with specific issues of satellite orbital slots and orbits, a special coordination process was established in the context of the ITU. This coordination process for a particular set of frequencies, satellite system and service

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[93] See Smith, *supra* n. 11, 63–4; Lyall, *supra* n. 2, 382–5; White & White, *supra* n. 11, 159–62; Meredith & Robinson, *supra* n. 1, 178–9.

[94] See Meredith & Robinson, *supra* n. 1, 181–4; Supancana, *supra* n. 12, 81–3; Smith, *supra* n. 11, 87 ff.; White & White, *supra* n. 11, 201–32; Lyall, *supra* n. 2, 393–5.

[95] See e.g. Meredith & Robinson, *supra* n. 1, 184; Supancana, *supra* n. 12, 83–8; Smith, *supra* n. 11, 117–56.

[96] See e.g. Noll, *supra* n. 31, 113–4; Meredith & Robinson, *supra* n. 1, 185; Supancana, *supra* n. 12, 89–91; Salin, *supra* n. 2, 56.

[97] *Cf.* Salin, *supra* n. 2, 464–5.

taking place under the auspices of the Radio Regulations Board starts with the advance publication of information on the proposed satellite system, effectively a formal filing, including requested slots/orbits and frequencies.[98] Such a proposal had to be forwarded to the ITU not earlier than seven years prior to the intended date of bringing the satellite system into use (in order to preclude efforts to 'reserve' frequencies and slots/orbits overly long in advance), and preferably not later than two years.[99]

The still-considerable time frames gradually gave rise to the problem of 'paper satellites', whereby states started to file requests well before the final decisions to go ahead with developing and building the satellite had been taken, in order to take up an early place in the 'queue'.[100] By the same token, however, the ITU system would be clogged with many proposals that would in the end not come to fruition, causing valuable manpower and other resources to be wasted. In order to counteract such strains on the system, in recent years in the ITU context a regime of 'administrative due diligence' has started to be implemented.[101]

The proposal for allotment/assignment would allow all ITU member states other than the one requesting the allotment/assignment to report threats of possible interference with their respective systems or those of operators falling within their jurisdictions (whether actual or intended, in

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[98] *Cf.* Art. 9(1), Radio Regulations, *supra* n. 32. Further e.g. Meredith & Robinson, *supra* n. 1, 187 ff.; Salin, *supra* n. 2, 47–9.

[99] See Art. 9(1), Radio Regulations, *supra* n. 32. *Cf.* also e.g. McNutt, *supra* n. 1, 133–5, on the problems arising for industry from such time frames.

[100] See in greater detail e.g. P. Stubbe, New Definition of 'Bringing Into Use' in the Radio Regulations, in *International Regulations of Space Communications* (Ed. M. Hofmann) (2013), 91–3; Lyall & Larsen, *supra* n. 1, 236–44; H. Wong, The 'Paper Satellite' Chase: The ITU Prepares for its Final Exam in Resolution 18, 63 *Journal of Air Law & Commerce* (1998), 849–79; *cf.* also Williamson, *supra* n. 12, 37–9.

[101] This meant *i.a.* that advanced filing would only be allowed upon proof of certain satellite manufacturing and/or launch contracts being in place, and a certain *a priori* deposit of administrative costs; see further e.g. Noll, *supra* n. 31, 117–22; Bohlmann, Schrogl & Zilioli, *supra* n. 31, 213–4; Lyall & Larsen, *supra* n. 1, 236–7; Salin, *supra* n. 2, 458–9; F. Lyall, The Radiocommunication Assembly (RA-12) and the World Radio Conference (WRC-12), Geneva, 2012: Progress (?), in *Proceedings of the International Institute of Space Law 2012* (2013), 583–4.

the latter case of course having formally entered the ITU process before the system whose allotment/assignment is now at issue).[102]

If such potential interference was reported, the requesting state had the primary obligation to accommodate, which usually meant that it had to propose alternative frequencies (in which case the process could basically start all over again) or other methods by which such interference would be avoided.[103]

The ITU's Radiocommunication Bureau is then in charge of monitoring the coordination procedure: it processes the information of states on application of the Radio Regulations, applies the Rules of Procedure on the handling of possible conflicts, effects an orderly recording and registration of frequency assignments and associated orbital characteristics, keeps the Master International Frequency Register up to date, and if necessary assists in the resolution of harmful interference conflicts.[104]

As of today, for all the space systems for which frequency bands were allocated and frequencies allotted and assigned, the on-line Space Network Systems (SNS) Database[105] contains, in addition to a brief overview of the Radio Regulations referring to space services (and general information concerning statistics), data on more than 10,600 geostationary satellite filings, 1,070 non-geostationary satellite filings and 7,900 earth station filings. Within this database, a freely navigable query system allows searching for specific information.[106]

8.2.5 Challenges to the ITU Regime in the Context of Satellite Communications

Though the ITU regime for coordinating the use of satellite frequencies and attendant slots or orbits has undeniably worked rather well so far, it is increasingly coming under pressure from various angles as a result of the involvement of increasing numbers of, in particular, private commercial operators and the 'traditional' character of the ITU regime as an intergovernmental construct sometimes coming close to a 'gentleman's

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102 *Cf.* e.g. Meredith & Robinson, *supra* n. 1, 187–8; Lyall & Larsen, *supra* n. 1, 232–3.

103 *Cf.* e.g. Lyall & Larsen, *supra* n. 1, 229.

104 See Art. 12(2), ITU Convention, *supra* n. 25. *Cf.* also on ITU dispute settlement in general e.g. Supancana, *supra* n. 12, 189–90; further *infra*, § 19.2.2.

105 At www.itu.int/sns, last accessed 12 March 2014.

106 At www.itu.int/snl/freqtab_snl.html, last accessed 12 March 2014.

arrangement'.[107] In view of the rapid developments it is not possible to address all those developments, even threats, to the ITU's proper impact in the area of satellite communications here, but a brief survey of some specific cases and scenarios should at least illustrate the general and broad nature of such developments.

All of those cases and scenarios provide evidence of a broader paradigmatic change in the environment in which satellites were used for telecommunication purposes, which ultimately all came down to increasing numbers of participants and increasing commercialization of their activities causing mounting pressures on the 'gentleman's agreement' that the ITU regime had, to many, represented, and that had so far rather successfully regulated the technical and operational developments in this global sector. In particular the overcrowding of certain geostationary regions led to increasing temptations for states and other operators to short-cut or simply bypass the ITU coordination process in view of the political, economic and commercial interests at stake.[108]

8.2.5.1 The Tongasat affair

The first and most (in)famous and specific 'attack' on the ITU regime came with the Tongasat case.[109] In 1987 a US entrepreneur and retired satellite expert convinced the King of Tonga, who was aware that the South Pacific region suffered from poor and expensive communications, to make use of the *a priori* planning regime meanwhile implemented[110] by claiming orbital positions 'reserved' for Tonga and other nations in the region. To properly be allotted, assign and register orbital positions in the geostationary orbit with the ITU and build and operate satellites in a joint venture with other South Pacific nations, the government of Tonga in

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[107] *Cf.* also e.g. Lyall, *supra* n. 2, 415–6; Lyall & Larsen, *supra* n. 1, 235 ff.

[108] With ongoing technological developments allowing increasingly efficient usage of geostationary spaces and frequencies, it is difficult to put a certain maximum number on satellites, but repeated disputes regarding specific slots have shown that at least certain regions of the orbit are subject to serious and substantiated interest by more possible operators than they could currently host. *Cf.* also e.g. Williamson, *supra* n. 12, 40–3; Stubbe, *supra* n. 100, 83–4; McNutt, *supra* n. 1, 127–31, 135; Lyall & Larsen, *supra* n. 1, 249–52; Salin, *supra* n. 2, 52–3; early on Smith, *supra* n. 11, 13–4.

[109] *Cf.* however for succinct references to similar cases Lyall & Larsen, *supra* n. 1, 238, fn. 157; Salin, *supra* n. 2, 52.

[110] See *supra*, § 8.2.4.3.

April 1988 authorized the entrepreneur to establish a Tongan company, soon known as Tongasat, as the exclusive agent of the government.[111]

The agreement did not require the government of Tonga to contribute funds to Tongasat yet allowed it to collect half its net income; all funds to get the new company off the ground coming from the entrepreneur. Tonga then, on behalf of Tongasat, applied for 16 slots, despite the fact that Tonga itself had just over a 100,000 inhabitants: the plan was essentially for Tongasat to sell or lease the slots thus to be allotted/assigned for profit, rather than use them for undertaking satellite communications itself – in violation of the 'gentlemen's agreement' providing hitherto that only frequencies and slots one actually intended to use oneself could be registered.[112]

Six states, including the United States, complained to the ITU that Tonga's claims were greatly in excess of any projected need, calling the move everything from exploiting a loophole to a space grab. For years it remained in doubt whether Tongasat would be able to succeed; whilst the provisions of the ITU Constitution and Convention did not explicitly prohibit making use of rights under the *a priori* planning regime for the purpose of selling or leasing rather than actually using claimed slots,[113] it had clearly not been the intention of the relevant provisions to allow that to happen – such a scenario simply had never been contemplated.

In the course of 'negotiations' Tongasat first scaled back its requests to six slots, which the ITU finally awarded in March 1991; half a year later

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[111] See generally e.g. Salin, *supra* n. 2, 51–2; Meredith & Robinson, *supra* n. 1, 167–9; J.C. Thompson, Space for Rent: The International Telecommunication Union, Space Law and Orbit/Spectrum Leasing, 62 *Journal of Air Law & Commerce* (1996), 279–311; D. Riddick, Why does Tongasat Own Outer Space?, 19 *Air & Space Law* (1994), 15–29.

[112] See e.g. Thompson, *supra* n. 111, 281–2, referring to the 'warehousing' of spectrum; Salin, *supra* n. 2, 51–3; Meredith & Robinson, *supra* n. 1, 168. *Cf.* also *supra*, §§ 8.2.3 and 8.2.4, describing the regulatory regime as tuned to allow states and their operators to actually operate satellites in particular slots or orbits with the attendant frequencies without interference as much as possible.

[113] It could even be argued that thus bringing into use slots that would otherwise most likely have lain dormant for at least a number of years – as reserved namely for South Pacific nations – would amount to these slots being 'used rationally, efficiently and economically'; Art. 44(2), ITU Constitution, *supra* n. 24. *Cf.* also Thompson, *supra* n. 111, 285 (referencing the prior version of the provision as per Art. 33, International Telecommunication Convention, Malaga-Torremolinos, done 25 October 1973, entered into force 1 January 1975; 28 UST 2495), also 299–300; differently however Salin, *supra* n. 2, 52–3; Lyall & Larsen, *supra* n. 1, 238, fn. 158; Supancana, *supra* n. 12, 63.

the company managed to sign up Unicom Satellite Corporation as its first licensee for two slots.[114] Soon Tongasat won its seventh slot, and currently Tongasat's filings include nine geostationary satellite orbital positions and a number of non-geostationary network filings.[115] These crucial positions connect the West Coast of the United States to Asia, one of the world's most important traffic streams with some 3.5 billion people in the coverage pattern.

The uneasiness in many quarters with this course of events, and the presumably facetious usage by Tongasat of the lack of legal precision in the ITU regime's documents, helped considerably to drive the process towards a broader reconsideration and adaptation of the ITU regime, including the introduction of such concepts as 'administrative due diligence' to try and filter out proposals of serious intention to operate a satellite system in the near future from the more capricious ones.[116]

8.2.5.2 Auctioning telecommunication frequencies

Next, there was the issue of 'auctioning' at a national level: in many leading telecommunication states in the 1990s access to frequencies was considered sufficiently valuable from a commercial perspective for governmental authorities in charge of granting such access to auction certain frequency bands, and collect huge sums from the winning bidders.[117]

Whilst national sovereignty of those states entitled them to distribute national access rights to frequencies as they saw fit, once those national access rights were effectively stemming from internationally granted rights – such as access to satellite frequencies in accordance with the ITU regime – or had other international effects, it should be clear that those international parameters would considerably limit, if not indeed simply exclude, auctioning of satellite frequencies. Requests by administrations for allotment of specific satellite frequencies under the ITU regime after

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114 Though Unicom Satellite Corporation then failed to obtain the financing it needed, by that time Tongasat had signed up Rimsat Ltd., which has since put satellites in three of Tongasat's positions and had options on two more. In 1994 Tongasat licensed one position to APT Satellite Company, a Hong Kong-based consortium that is principally owned by three ministries of the People's Republic of China. See further in general Salin, *supra* n. 2, 52; Thompson, *supra* n. 111, 300–2.

115 See www.tongasat.com/services/index.htm, last accessed 22 March 2014.

116 See *supra*, § 8.2.4.4; *cf.* also Lyall & Larsen, *supra* n. 1, 238 ff.

117 *Cf.* e.g. Bohlmann, Schrogl & Zilioli, *supra* n. 31, 214–5; S. Mosteshar, Comments on Frequency Management, in *Proceedings of the Workshop on Telecommunications* (2000), 117.

all were (supposed to be) made with a view to a specific planned satellite (system) – it would at least be highly questionable whether assignment to a highest bidder not known at the time of the coordination request would then be an allowable option.[118]

8.2.5.3 Trade aspects of satellite communications

With the increasing commercialization and privatization of the sector it was only logical that also international trade rules became of importance for global satellite communications – and it was clear that the ITU was not well equipped to handle those aspects. The fact that the World Trade Organization *did* pick up those aspects[119] may consequently have been a natural course of events; the fact that in particular Western states tended to start using the WTO regime for promoting their (commercial operators') interests over the ITU regime, which was less prone to address commercial interests over technological ones and those of interest also to the developing states – witness the establishment of the Telecom Development Sector in the latter context[120] – causes considerable concern within the ITU as potentially interfering with its purposes of enhancing the benefits of telecommunications, including satellite communications, for the entire globe.[121]

The development of an ITU-driven Memorandum of Understanding on Global Mobile Personal Communications by Satellite (GMPCS) in 1997 was one example of an effort on the part of the ITU to partially answer to those paradigmatic changes.[122] The idea was that by liberalizing the trans-border movement of personal terminals, an aspect of both trade-related and pragmatic/operational character, some measure of application of the ITU regime would be guaranteed also in the international trade context. Some 125 entities, state as well as non-state, signed up to the MOU, but as it remained legally non-binding, it could not rise to the

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[118] *Cf.* also Bohlmann, Schrogl & Zilioli, *supra* n. 31, 214–5.

[119] See further *infra*, § 15.4.

[120] See also *supra*, § 8.2.2.2.

[121] *Cf.* e.g. P.K. McCormick, Neo-Liberalism: A Contextual Framework for Assessing the Privatisation of Intergovernmental Satellite Organisations, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 21–5; Bohlmann, Schrogl & Zilioli, *supra* n. 31, 210–2.

[122] See e.g. Salin, *supra* n. 2, 454–6; Bolhmann, Schrogl & Zilioli, *supra* n. 31, 218.

same level of representing a trade-regulating regime as the more fundamental and more law-based GATS/WTO regime.[123]

Whilst increasing participation of non-state – read commercial – stakeholders in the ITU process has been realized as of the 1990s as another such effort,[124] the classical intergovernmental structure of the organization has been maintained. It may be difficult to envisage a fundamentally different course, but all the same the private sector may continue to broadly find the ITU non-responsive to its particular needs, slow, bureaucratic and politically charged as opposed to being tuned in to the practical, economic and commercial realities.[125]

8.2.5.4 Intellectual property rights and satellite communications

A further angle to be briefly mentioned here from which the ITU regime increasingly comes under pressure concerns efforts to apply intellectual property rights to the satellite communication sector in an effort to side-line other legal obstacles to monopolization of a certain type or category of telecommunication operations – particularly relevant for the high-key technological sub-sector of satellite communications.

The most 'notorious' example concerns the TRW case, in which the US company of that name tried to assert its patent rights to a certain technology to be used for a certain orbit in such a manner as to effectively exclude other potential operators from using that orbit – in front of a US court.[126] The case was settled out of court, but were it to have been successful in court, by using national US patent law a single operator would in fact have circumvented the international ITU regime for determining entitlement to use certain orbits and the attendant frequencies.[127]

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[123] *Cf.* on the GATS/WTO regime liberalizing international trade in satellite communication services comprehensively (as opposed to only addressing the physical movement of terminals) *infra*, § 15.4.

[124] *Cf.* also *supra*, § 8.2.2.1.

[125] *Cf.* also broadly McCormick, *supra* n. 121, 2 ff.

[126] See B.L. Smith & E. Mazzoli, Problems and Realities in Applying the Provisions of the Outer Space Treaty to Intellectual Property Issues, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 169–76; B.L. Smith, Recent Developments in Patents for Outer Space, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 190–4; S. Mosteshar, Satellite Constellation Patent Claim, 4 *Telecommunications and Space Journal* (1997), 251–5, *cf.* also Lyall & Larsen, *supra*, n. 1, 124–6; Bohlmann, Schrogl & Zilioli, *supra* n. 31, 207–8.

[127] *Cf.* Smith, *supra* n. 126, 193–4.

Nevertheless, also this specific case exemplified the risks inherent in the fragmentation of satellite communications law beyond the traditional lead of the ITU regime, as a consequence of commercialization and privatization bringing in some other legal regimes such as those concerning international trade or intellectual property rights.

8.2.5.5 Satellite communications as 'international public good' or 'international public service'

A last major area of worry for those concerned with the ITU's efficacy and future to be briefly discussed here concerns the nature of satellite communications as the international version of a 'public good' or 'public service'. 'Public service' has for example been defined as '[a] service provided or facilitated by the government for the general public's convenience and benefit';[128] 'public' more generally as '[r]elating or belonging to an entire community' and/or '[o]pen or available for all to use, share, or enjoy'.[129]

In the specific context of space activities this has translated most particularly into the generic requirement that '[t]he … use of outer space … shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind'.[130] As seen, the ITU was established *inter alia* to ensure that 'mankind', including the countries lagging behind in 'economic or scientific development', would indeed 'benefit' from the use of radio frequencies as later including satellite frequencies, by taking away at least technical, operational and interference-related obstacles to such optimum usage.[131]

While it is inevitable, and from many perspectives even necessary, for developed countries, and in particular their private entrepreneurs, to take the lead in such efforts in order to allow others to follow later on, the incentives to make them do so (notably to invest the necessary efforts and sums in ever further developing the possibilities of usage of satellite

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[128] *Black's Law Dictionary* (Ed. B.A. Garner) (8th edn., 2004), 1268.

[129] *Ibid.*, 1264.

[130] Art. I, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[131] See further *supra*, § 8.2.3.1.

frequencies and orbits) should always remain balanced with the opportunities for those others to then enjoy such benefits also.

To many observers, the latter side of the equation is increasingly seen to be at risk, as a consequence of the ITU's impossibility to fundamentally set aside state sovereignty when it comes to certain types of disputes and interests,[132] the increasing domination of commercial uses of satellite frequencies over the more public and less revenue-earning uses,[133] the increasing use of the WTO as a forum for arranging international legal and regulatory standards for satellite communications[134] and last but not least the privatization of some of the main intergovernmental satellite operators, where in particular INTELSAT had originally been established to offer a global public satellite communications infrastructure[135] – as it were, offering an international public good and an international public service in one go.[136]

There is in all likelihood no simple single solution to the problem. Commercialization and liberalization, as well as the irrepressible globalization that comes with them, cannot simply be undone – nor should they be. Actually, globalization in the end may even result in the *modi operandi* of commercial entrepreneurs in satellite communications becoming not only available but also ingrained in parts of the world where development is generally seen as lagging behind. Most interestingly, a quantum leap is occurring in Africa where the availability of mobile communications is overcoming the traditional underdeveloped telecommunications infrastructures in most countries there, and is now widespread enough to be a major catalyst of economic growth more broadly speaking. It is likely that that will soon include satellite communications as well.

Nevertheless, it will remain a governmental task to ensure that also clearly public satellite services, ranging from radio astronomy and a basic communication system where the commercial sector is unwilling to

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[132] One telling example is the dispute over the Notifying Administration on behalf of INTERSPUTNIK; see *supra*, § 5.7.2.

[133] An interesting early example of such fears, though for the moment dissipated by the failure at the time of the expected LEO operators, concerns the interference these operators were expected to give rise to with radio astronomy; see *supra*, text at n. 89. *Cf.* further e.g. Lyall, *supra* n. 101, 586.

[134] *Cf.* further *infra*, § 15.4.

[135] See also *supra*, § 5.4.1.

[136] See more in general on such worries e.g. Salin, *supra* n. 2, 435–84; Lyall & Larsen, *supra* n. 1, esp. 385–7 (under the heading of 'The World Public Interest'), also 235–44; McCormick, *supra* n. 121, 21–5.

provide such a system to tele-medicine[137] and tele-education, will (continue to) enjoy their place under the sun,[138] and not allow private commercial interests to prevail semi-automatically.

8.2.6 Concluding Remarks on the ITU Regime

As discussed, in spite of certain adjustments to the fundamental paradigm changes in the satellite communication sector over the last decades the ITU is (still) a classical intergovernmental organization, without a status for other IGOs and private entities equal to states. Its focus being very much on practical-technical and operational aspects, its traditional leadership role in the sector is increasingly challenged through other legal regimes, both internationally and domestically.

'Affairs' such as the Tongasat case and 'scenarios' on frequency auctioning may be relatively unique in their details and results; they also corroborate the conclusion on the special character of the ITU regime in the context of space activities and space law. For all its key contributions to space activities, in particular to the extent requiring the use of satellite frequencies and orbits, the ITU and its member states have not been able to preclude major non-technical/operational factors from frequently impacting the use of outer space for all mankind as mandated by Article I of the Outer Space Treaty in the context of satellite operations – sometimes for the better, sometimes possibly for the worse, but never simplifying the spacescape.

Also from the perspective of space law, the ITU regime stands out as being of a totally different origin and role than the UN outer space treaties. Developed long before the space treaties and long before man entered into outer space, and without any overriding focus on space activities, it soon turned out to be – and to this day remains – crucial for all space activities. Fortunately, the relations between the ITU and

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[137] See e.g. S. Rooke, SATMED: Legal Aspects of the Physical Layer of Satellite Telemedicine, in 34 *Michigan Journal of International Law* (2012), 209–47.

[138] One area where this discussion is particularly visible concerns the worries of some developing states regarding the Space Assets Protocol's potential impact on public services; see e.g. M.J. Stanford, The UNIDROIT Protocol to the Cape Town Convention on Matters Specific to Space Assets, in *Proceedings of the International Institute of Space Law 2012* (2013), 164; G. Catalano Sgrosso, Last Comments on the Text of the Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets, in *Proceedings of the International Institute of Space Law 2012* (2013), 217–20; also *infra*, § 16.4.3.

COPUOS have been rather effective so far in assuring that no undue divergences or incompatibilities arose between telecommunications law and space law in the overlapping area of satellite communications; in other respects, however, the ITU has increasingly come under pressure from various angles as discussed.[139]

A final interesting development to be noted here is the ITU being 'requested' to serve as Supervisory Authority for the UNIDROIT Space Assets Protocol, in view of its long-standing experience with registration of satellite orbits and frequencies.[140] At the time of writing, it is uncertain how this request will be answered; if ITU indeed were to take up this new task, rather different from its core activities so far, it would at least be able to ensure not just continued compliance but likely even consistency (in terms of technical details) of registrations in the Space Assets Protocol's International Registry with its own Master International Frequency Register.[141]

8.3 THE UN 'REGIME' ON DIRECT BROADCASTING BY SATELLITE

8.3.1 The UN Principles on Direct Television Broadcasting by Satellite

Politically speaking the most visible involvement of UN bodies, notably COPUOS, in the area of direct broadcasting by satellite may have been the discussion on the status of the geostationary orbit, and in particular the erstwhile efforts of several equatorial states to obtain special rights to certain parts of that orbit.[142] In terms of legal results, however, the

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[139] See on the ITU–COPUOS nexus e.g. Stubbe, *supra* n. 100, 83–4; F. Tronchetti, *Fundamentals of Space Law and Policy* (2013), 40; White & White, *supra* n. 11, 236 ff.; *in extenso* Salin, *supra* n. 2, 11 ff., 45 ff.; more generally on their respective roles e.g. Lyall & Larsen, *supra* n. 1, 561–5.

[140] See further for the UNIDROIT Space Assets Protocol *infra*, § 16.4; see also e.g. Stanford, *supra* n. 138, 165–6.

[141] See *supra*, § 8.2.3.6; *cf.* also e.g. S. Marchisio, Space Assets Protocol and Compliance with International and Domestic Law, in *Proceedings of the International Institute of Space Law 2012* (2013), 187–8; P.B. Larsen, The Space Protocol to the Cape Town Convention and the Space Law Treaties, in *Proceedings of the International Institute of Space Law 2012* (2013), 205.

[142] See further on this *supra*, § 2.3.1.3.

discussion on the appropriate legal principles and rules regarding the use of satellites for direct broadcasting would likely be the more profound one.

One major reason for that is that direct broadcasting by satellite (which generally squares with the concept of the 'Broadcasting-Satellite Service' as this is used in the context of the ITU[143]) is the most politicized area within satellite communications *lato sensu*, in view of the fear of many developing countries of 'cultural imperialism' being the result of the operation of such satellites as a consequence of the lopsided abilities to use and finance the relevant technologies.[144] From similar perspectives, both the communist states by way of INTERSPUTNIK[145] and the Arab states by way of ARABSAT[146] created their own satellite systems mainly for broadcasting purposes.

The international discussion on a separate set of rules on direct broadcasting by satellite essentially started in 1972, with a UNESCO Resolution focusing on the free flow of information and educational and cultural exchange by way of direct broadcasting satellites[147] and – following multi-year discussions in the United Nations – UN Resolution 2916(XXVII) calling for international agreements on the subject.[148]

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143 *Cf. supra*, § 8.2.4.2. With reference to the epithet 'direct', it may be noted that Art. 5(1.39), Radio Regulations, *supra* n. 32, defines the 'broadcasting-satellite service' as 'A *radiocommunication service* in which signals transmitted or retransmitted by *space stations* are intended for direct reception by the general public. In the broadcasting-satellite service, the term "direct reception" shall encompass both *individual reception* and *community reception*.' Thus, it includes so-called Direct-To-Home (DTH) services as well as distribution of signals to cable network heads and distributors.

144 See e.g. Meredith & Robinson, *supra* n. 1, 205; Fisher, *supra* n. 4, 2 ff.; Lyall & Larsen, *supra* n. 1, 258–60; McNutt, *supra* n. 1, 124–5; Cheng, *supra* n. 1, 563–4.

145 See further *supra*, § 5.7.

146 See further *supra*, § 5.8.

147 Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange, Res. 4, of 15 November 1972, UNESCO General Conference, 17th Sess. (1972), UN Doc. A/AC.105/109, 3 ff. (1973), see further F. Koppensteiner, The 1982 Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 165–6; Fisher, *supra* n. 4, 58–60; Lyall & Larsen, *supra* n. 1, 261–2.

148 UNGA Res. 2916(XXVII), of 9 November 1972, A/8730, Suppl. No. 30; see further Fisher, *supra* n. 4, 109–17; on the preceding discussions within the United Nations, 83–108; also Lyall & Larsen, *supra* n. 1, 260–1.

The UN Principles on Direct Television Broadcasting by Satellite[149] ultimately resulting in 1982 represented an effort at a compromise between two fundamental (sets of) principles of international (space) law. In particular the Western states promoted the freedom of information (including both reception and provision) as a general principle of international law,[150] in the context of outer space finding its more specific expression in the freedom to use outer space as long as not violating rules of international law.[151] By contrast, especially the developing countries based their approach on their sovereignty over their respective territory, which was translated in this particular context into the right to control whatever happens there, including the information broadcast into such territory.[152]

Those two sets of principles were *both* reflected throughout Resolution 37/92. For example, direct broadcasting satellite activities 'should be

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[149] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (hereafter Principles on Direct Television Broadcasting by Satellite), UNGA Res. 37/92, of 10 December 1982; UN Doc. A/AC.105/572/Rev.1, at 39. See further e.g. Koppensteiner, *supra* n. 147, 161–81; Fisher, *supra* n. 4, 45–54, 149 ff.; Lyall & Larsen, *supra* n. 1, 263–9; White & White, *supra* n. 11, 250–1; Meredith & Robinson, *supra* n. 1, 205–6; very extensively Stewart, *supra* n. 4.

[150] *Cf.* e.g. Art. 19, Universal Declaration of Human Rights, Paris, UN GA Res. 217 A (III) of 10 December 1948; A/RES/217; Art. 19(2), International Covenant on Civil and Political Rights, New York, done 19 December 1966, entered into force 23 March 1976; UKTS 1977 No. 6; Cm. 6702; 6 ILM 368 (1967). See further e.g. I. Brownlie, *Principles of Public International Law* (8th edn., 2012), 636 ff., esp. 643–4; M.N. Shaw, *International Law* (6th edn., 2008), 265 ff.; P. Rainger *et al.*, *Satellite Broadcasting* (1985), 247–54.

[151] *Cf.* Art. I, Outer Space Treaty, *supra* n. 130; also *supra*, § 2.1.1. See further e.g. Koppensteiner, *supra* n. 147, 173–7; Stewart, *supra* n. 4, 14–7; Fisher, *supra* n. 4, 120–3, 171–86; White & White, *supra* n. 11, 249–50; Lyall & Larsen, *supra* n. 1, 263.

[152] Indeed, the Outer Space Treaty, *supra*, n. 130, refers to respect for international law including the UN Charter (Charter of the United Nations, San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1), international cooperation and friendly relations amongst states (*cf.* e.g. Arts. I and III), which all include respect for sovereignty; such a concept of sovereignty moreover increasingly was held to encompass also 'cultural sovereignty', i.e. to refuse being impacted by anything considered fundamentally antagonistic to national cultures. See further e.g. Koppensteiner, *supra* n. 147, 171–3; Stewart, *supra* n. 4, 14–7, 21–4; Fisher, *supra* n. 4, 120 ff.; 131–2, 152–70; White & White, *supra* n. 11, 249–50; Lyall & Larsen, *supra* n. 1, 263.

carried out [both] in a manner compatible with the sovereign rights of States, including the principle of non-intervention, as well as with the right of everyone to seek, receive and impart information and ideas as enshrined in the relevant United Nations instruments'.[153] Also, these activities should promote both free dissemination and mutual exchange of information and knowledge, and respect for cultural integrity.[154] More oblique provisions called for international responsibility for relevant activities.[155]

None of those two-sided Principles, however, principally solved the dilemma that was underneath: are states, basing themselves on their sovereignty, entitled to condition or even preclude other states and their entities from broadcasting into their territories, or are by contrast states, basing themselves on the freedom to impart information and ideas, entitled to broadcast programmes even into states opposed to such broadcasting?

Strictly speaking, not even the Principles directly addressing this question of whether 'prior consent' of the target state was required solved the dilemma. Firstly:

> Any broadcasting or receiving State within an international direct television broadcasting satellite service established between them requested to do so by any other broadcasting or receiving State within the same service should promptly enter into consultations with the requesting State regarding its activities in the field of international direct television broadcasting by satellite.[156]

Also, '[a] State which intends to establish or authorize the establishment of an international direct television broadcasting satellite service shall without delay notify the proposed receiving State or States of such intention and shall promptly enter into consultation with any of those States which so requests.'[157]

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[153] Princ. 1, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149.

[154] See Princ. 2, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149. *Cf.* further Principles 4, 5, 6 & 11.

[155] See Principles 8, 9, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149.

[156] Princ. 10, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149. In addition, as per Princ. 12, such activities had to be notified to the UN Secretary-General.

[157] Princ. 13, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149.

It remained unclear, however, whether this duty to consult and right to be consulted, constituted an obligation of effort or an obligation of result: 'An international direct television broadcasting satellite service shall only be established *after the conditions set forth in paragraph 13* above have been met and on the basis of agreements and/or arrangements in conformity with the relevant instruments of the International Telecommunication Union and in accordance with these principles.'[158] Would the conditions of Principle 13 be complied with once consultation had taken place, regardless of whether the broadcasting state would then be going ahead anyway, or only if the wishes of the receiving state as expressed during such consultations were honoured?

However, in view of the widely prevailing interpretation of this clause as meaning 'that a state receiving deliberate DBS widely prevailing programming would be able to block the establishment of a DBS service to its territories without its prior consent', in other words an obligation of result in terms of agreement on the particular DBS service amounting to prior consent,[159] the states looking for the freedom to broadcast did not find the compromise satisfactory, and the Resolution was passed with many votes against.[160] As a consequence, no or little customary legal value could be attached to the substance of the Resolution, at least for those states voting against; a UN General Assembly not carrying legally binding weight in and of itself. This, interestingly, was in contrast with the Remote Sensing Principles[161] of four years later, where essentially the same dichotomy between states calling for the freedom of remote sensing to rule supreme and those calling for the respect for sovereignty

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[158] Princ. 14, Principles on Direct Television Broadcasting by Satellite, *supra* n. 149.

[159] Lyall & Larsen, *supra* n. 1, 265; see also e.g. Fisher, *supra* n. 4, 141–51, 187–200; Meredith & Robinson, *supra* n. 1, 205; Stewart, *supra* n. 4, 28–31; Tronchetti, *supra* n. 139, 15; Rainger *et al.*, *supra* n. 150, 243. Less convinced about 'prior consent' as the ruling principle, however, are e.g. Koppensteiner, *supra* n. 147, 167–9; S. Hobe, Space Law – An Analysis of its Development and its Future, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 480.

[160] The voting score was 107 in favour and 13 against, with 17 abstentions; *United Nations Resolutions* (Ed. D.J. Djonovich), Ser. I, Vol. XXI, 1982–1983 (1986), at 127. See further Lyall & Larsen, *supra* n. 1, 263–4; Fisher, *supra* n. 4, 45–6; Koppensteiner, *supra* n. 147, 170; White & White, *supra* n. 11, 251.

[161] Principles Relating to Remote Sensing of the Earth from Outer Space, UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986).

to do so was at play.[162] In that case, however, it could be resolved in a manner allowing the Resolution to be adopted with consensus, serving as a starting point for what is now generally considered to constitute customary law.[163]

8.3.2 Satellite Broadcasting Beyond the UN Principles

For direct satellite broadcasting, however, the international legal situation remains ambiguous: with no broadly accepted international agreement on whether 'prior consent' is required or the freedom to impart information should overrule any such principle, essentially national laws and some bi- and multilateral agreements on the issue will continue to result in a highly complicated patchwork of legal rights and obligations in this context.

Such multilateral agreements had been concluded between (by definition more limited) sets of like-minded states, and comprised conventions such as the 1974 Brussels Convention[164] or even a treaty pre-dating the space era such as the 1936 International Convention on the Use of Broadcasting in the Cause of Peace.[165]

The Brussels Convention focused on such requirements as preventing retransmission of DBS and other signals by others than the intended recipients and the protection of copyright in the context of retransmission, such as against piracy. Hence, it did not address the issue of contents and/or prior consent in that respect, essentially reflecting the Western perception on the freedom of provision of information – the impetus for the Convention came from UNESCO's desire to protect and

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[162] See further *infra*, § 9.4.1.2.

[163] See e.g. J.I. Gabrynowicz, The UN Principles Relating to Remote Sensing of the Earth from Outer Space and Soft Law, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 183–93; further *infra*, § 9.4.1.2.

[164] Convention relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite (hereafter Brussels Convention) Brussels, done 21 May 1974, entered into force 25 August 1979; 1144 UNTS 3; TIAS 11078; ATS 1990 No. 30; 13 ILM 1444 (1974). See further e.g. C.Q. Christol, The 1974 Brussels Convention relating to the Distribution of Program-carrying Signals Transmitted by Satellite: An Aspect of Human Rights, 6 *Journal of Space Law* (1978), 19–35.

[165] International Convention on the Use of Broadcasting in the Cause of Peace, Geneva, done 23 September 1936, entered into force 2 April 1938; 186 LNTS 301; 1938 UKTS, Cmd. 1714; *American Journal of International Law* (1938) Supp. 113; see further Lyall & Larsen, *supra* n. 1, 268; Fisher, *supra* n. 4, 160–2.

promote such free dissemination, and the negotiating states rejected any notion of a right to 'prior consent' on the receiving side in this respect.[166]

The Convention specifically did not address direct reception of satellite signals,[167] which would allow developing states a choice as to whether to control any unwanted information through central distribution facilities or simply allow individual reception, as long as copyrights remained – with a few possible exceptions regarding educational or scientific broadcasts – adequately protected.[168] Actual drafting and implementation of anti-piracy regulations, meanwhile, remained within the sovereign domain of the states parties.[169]

The International Convention on the Use of Broadcasting in the Cause of Peace more generally focused on prohibiting the 'broadcasting to the population of any territory intended to incite the population thereof to "acts incompatible with the internal order or the security"' of any contracting state.[170] Enunciated at a time when several localized armed conflicts were preparing the way for the Second World War, from the later perspective of the discussion regarding 'prior consent' this should be seen as a specific case where the need for such 'prior consent' was effectively pre-empted because of the (presumed) customary international law status of the prohibition on inciting foreign populations into non-permitted use of force.[171]

As a consequence of this rather fragmented legal landscape, it remains to be seen whether the increasing access also of the lesser-developed states to basic satellite and other telecommunication and Internet technology and services may make this particular political debate ultimately obsolete – those states still bent on controlling the information available to their respective populations have long since started to resort to other legal means to achieve such control.

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166 See Christol, *supra* n. 164, 20 ff., also 33–5; further Lyall & Larsen, *supra* n. 1, 263; Rainger *et al.*, *supra* n. 150, 255–60.

167 As per Art. 3, Brussels Convention, *supra* n. 164; see Rainger *et al.*, *supra* n. 150, 257; Lyall & Larsen, *supra* n. 1, 263.

168 *Cf.* Christol, *supra* n. 164, 30–1.

169 See e.g. Rainger *et al.*, *supra* n. 150, 259.

170 Fisher, *supra* n. 4, 161, quoting Art. I, International Convention on the Use of Broadcasting in the Cause of Peace, *supra* n. 165.

171 *Cf.* Fisher, *supra* n. 4, 161, *i.a.* referring to J. Evensen, Aspects of International Law Relating to Modern Radio Communications, 115 *Hague Recueil des Cours* (1965), 557–61.

8.4 CONCLUDING REMARKS

Satellite communications, as the most widespread, substantial and commercial application of space activities, is subject from a legal perspective to a set of sometimes interlocking, sometimes unrelated regimes – even if analysis remains at the international level. With the trade aspects thereof dealt with in chapter 15, the financing aspects in Chapter 16, the intellectual property rights aspects in Chapter 18 and (some of) the dispute settlement aspects in Chapter 19, the current chapter has focused on what is still the baseline of international satellite communications law.

This baseline falls apart in mainly two categories. The technical/operational aspects are generally handled in the context of an elaborate ITU framework focusing on the allocation, allotment and coordinated assignment of radio frequencies and attendant slots/orbits, as well as more generally promoting technical and operational harmonization and standardization, and involvement also of the less-developed parts of the world in a global communication society. In addition, due to its highly politicized character from the start, the sub-sector of international satellite broadcasting, even though subject to the same technical/operational ITU regime as appropriate, has seen a major content-related discussion giving rise to a UN Resolution. This set of Principles, however, so far has been unable to resolve the problem – even as it seems to have lost some of its urgency over time as a consequence of ulterior developments, as indicated.

Meanwhile, the major political challenge may no longer come strictly speaking from the developed–developing state dichotomy in the area of broadcasting, but more broadly from the involvement of private operators in all sub-sectors of international telecommunications, including satellite communications. As the ITU is increasingly seen as being unable to cater for their particular needs and desires (which boils down to quick solutions, pragmatically and commercially oriented, and with as little regulatory burden as possible), alternative venues addressing those – in particular the WTO one – are being turned to. It can only be hoped that in the process the *bona fide* interests and possible contributions of private enterprise would not be served at the expense of some of the overarching public values of satellite communications.

9. Legal aspects of satellite remote sensing

Fabio Tronchetti

9.1 INTRODUCTION

Recourse to satellites for sensing the earth constitutes one of the most widespread uses of outer space. Since the early days of space activities states have utilized satellites for reconnaissance and other military-related purposes. Nowadays, thanks to technological advancements and the increased number of space actors, remote sensing products find application in a broad array of areas, ranging from land monitoring to disaster management. As a consequence of the modified socio-political environment in which remote sensing activities take place, several legal issues related to the conduct of remote sensing operations as well as to the access, distribution and use of the resulting data emerge.

The legal framework regulating the operation of remote sensing systems, which consists of a heterogeneous combination of international laws, national regulations and data policies, fails to address these issues in a coherent and efficient way. This is mostly due to two factors. On one side, the international legal rules negotiated within the United Nations do not deal with the privatization and commercialization of remote sensing operations. On the other side, while national regulations associated with remote sensing and data policies specifically govern the conduct of remote sensing activities and the commercial distribution of products and data, they tend to do so pursuant to different strategies and standards. Ultimately, this leads to diverging conditions applicable to the availability, reliability, utilization and reproduction of remote sensing products. Overall, the picture that emerges is a rather contradictory one: while a vast amount of images and information is in theory available, an increasing number of barriers restricting the flow of remote sensing information and data exist.

The purpose of this chapter is to shed light on the complicated legal issues surrounding remote sensing activities. This will be done by analysing relevant international and national rules and policies and by having recourse to examples taken from the practical activities of remote sensing operators.

9.2 REMOTE SENSING FROM SPACE: CHARACTERISTICS AND APPLICATIONS

9.2.1 The Technology of Remote Sensing

Remote sensing is a means to gather information about distant objects without directly being in contact with them.[1] Remote sensing technology operates through sensors which 'make use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects'.[2] The study of the reflected or emitted energy allows scientists to identify and classify objects.[3]

Sensing may be passive or active. In the case of the former, the sensing device merely collects electromagnetic and other radiations naturally emanating from the target (for example reflected solar radiation) – photography is a typical example of passive remote sensing. In the case of the latter, the sensing device illuminates electromagnetically the target and analyses the reflection of that illumination – the use of radar is a classic example of active remote sensing.

Photographic remote sensing gathers information through cameras mounted on balloons and airplanes. Already in 1858, following the invention of the camera, aerial views of the earth's surface were taken by cameras mounted on balloons.[4] Systematic aerial photography was developed for military surveillance and reconnaissance during the First World War and reached a peak during the Cold War.

The development of artificial satellites in the latter half of the twentieth century allowed remote sensing to progress to a global scale and to be utilized for broader goals, especially civilian ones. Unlike cameras that use films, satellite remote sensing nowadays utilizes electronic photosensitive sensors to take images in a digital format. Every piece of data that is acquired through this process is given a digital value and sent via a radio communications link to a ground station where it is transformed

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[1] See P.J. Gibson, *Introductory Remote Sensing: Principles and Concepts* (2000), 1; NPA Group, *Final Report BNSC Sectors Studies Programme Application of Earth Observation to Legal Sector* (2001), 16.

[2] Principles Relating to Remote Sensing of the Earth from Outer Space (hereafter Remote Sensing Principles), UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986).

[3] See A. Ito, *Legal Aspects of Satellite Remote Sensing* (2011), 4.

[4] See L. Schmidt, New Tools for Diplomacy: Remote Sensing in International Law, http://earthobservatory.nasa.gov/Features/Diplomacy/, last accessed 15 April 2014; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 413.

into usable information, read imagery. Compared to aerial photography, satellite remote sensing has the advantage of enabling repeated observation of a certain area in an easier and less-restricted manner, particularly without being limited by physical national boundaries.[5] Furthermore, active sensors, such as radar, permit monitoring even at night, can penetrate cloud cover and are substantially unaffected by the weather.[6]

9.2.2 How Does Remote Sensing Work?

In order to acquire remote sensing data, satellites need to be put in a certain orbit around the earth.[7] Usually, remote sensing is conducted from two types of orbits: the geostationary orbit[8] and low earth orbit (LEO). Depending on the altitude of the orbit where a satellite is located the size of the object that can be observed changes: the lower the altitude, the smaller the object that can be discerned.

Thus, a key element in assessing the capability of a satellite is its spatial resolution, that is the smallest size of an object that can be discernible in an image. In a 1 meter spatial resolution image every pixel will represent a 1 meter by 1 meter area. Clearly, images with higher spatial resolution give users more specific information on the area and objects concerned. Spatial resolution is, however, not the only factor needed to determine the capability for remote sensing: temporal resolution, spectral resolution and swath width need to be taken into account too.[9]

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[5] See further Ito, *supra* n. 3, 4; Lyall & Larsen, *supra* n. 4, 418.

[6] See K.J. Markowitz, Legal Challenges and Market Rewards to the Use and Acceptance of Remote Sensing and Digital Information as Evidence, 12 *Duke Environmental Law and Policy Forum* (2000), 230.

[7] See D.H. Staelin & J. Kerekes, Remote Sensing Capabilities, in *Heaven and Earth*: *Civilian Uses of New Earth Space* (Eds. D.G. Dallymeyer & K. Tsipis) (1996), 169.

[8] The geostationary orbit is a circular orbit located 35,786 km above the equator where a satellite rotates around the earth in 23 hours, 56 minutes and 4 seconds. Such a period is synchronous with the earth's rotation on its axis. Thus, a satellite launched into the geostationary orbit appears to an observer on the earth's surface as being stationary over a certain point of the equator. For this reason, this orbit is commonly referred to as 'geostationary'.

[9] Temporal resolution is the frequency at which data of the target may be acquired, which varies depending on the orbit, the sensing capacity and the periodicity of the remote sensing satellite. Spectral resolution, which is the narrowness of the radio frequency band that is used for scanning, allows objects

Importantly, data gathered by satellites need to be elaborated on earth in order to generate useful information. This process involves different subjects and takes place in several steps. Once data are collected by a satellite they are sent to a ground station where they are processed by computers for human viewing and interpretation. Each station then elaborates the data so as to come up with a 'certified' product.[10] As soon as this product is ready, it is analysed and useful information is delivered.

The UN Remote Sensing Principles refers to three types of data: primary data, processed data, and analysed information.[11] However, in practice, remote sensing operators utilize many other terms: for instance, 'raw data' or 'unenhanced data' for primary data, and 'derived products' and 'value-added products' for analysed information. The bottom line is that there is no consistency in the way products from different systems are referred to.

9.2.3 Applications

Thanks to the advantages of sensing from space, remote sensing data and derived products (such as images and maps) are used in a variety of ways. Applications include mapping, meteorology, natural resource management, land use, urban planning, delimitation of boundaries, reconnaissance for military purposes and verification of claims.[12] Satellite remote sensing is useful for monitoring and protecting the environment.[13]

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to be discerned with similar sizes but different material. Often connected with spatial resolution is the swath width, which is the breadth of the earth's surface underneath a satellite's path that its sensor can observe at any particular moment.

[10] Every receiving station undertakes a certification process for each data type, for example the data certification of Radarsat data lasts approximately one year and the distributor is provided with a certification level of Blue, Silver or Gold. Each receiving station has a different set of processing stages to generate certified products. For more information see *Final Report BNSC Sectors Studies Programme Application of Earth Observation to Legal sector*, *supra* n. 1, 31.

[11] *Supra*, n. 2. The Remote Sensing Principles define: (1) primary data as 'raw data that are acquired by remote sensing borne by a space object and that are transmitted or delivered to the ground from space by telemetry in the form of electromagnetic signals, by photographic film, magnetic tape or any other means'; (2) 'processed data' as 'the products resulting from the processing of the primary data, needed to make such data usable'; and (3) 'analysed information' as 'the information resulting from the interpretation of processed data, inputs of data and knowledge from other sources', see Princ. I(b), (c) & (d) respectively.

[12] See Staelin & Kerekes, *supra* n. 7.

[13] See H. Ginzky, Satellite Images in Legal Proceedings Relating to the Environment – A US Perspective, 25 *Air and Space Law* (2000), 114; C. Davies,

Indeed, it provides crucial information to study the status of lands, atmosphere and oceans. Present and past data can be compared to evaluate the extent of deforestation, desertification, loss of polar ice, and air and marine pollution. Satellite images are also used for verification of environmental harm in specific areas.

Recourse to remote sensing products is particularly beneficial in the context of disaster management activities, as they provide information about earthquakes, floods, fires and landslides. Furthermore, they can measure the extent of damage caused by a natural or man-made event and be essential for the coordination and performance of rescue operations.[14] In addition, satellites play an important role from a meteorological point of view. Meteorological satellites sense the earth's atmosphere and enable weather forecasting. They can also provide warnings of hurricanes, snow storms and tsunamis, thus facilitating evacuation and other practices aimed at reducing human casualties.

Recently, the use of remote sensing data as evidence in municipal and international courts has also increased, although such a practice is still the subject of controversy.[15] In particular, in order to be admissible in the course of a trial, remote sensing data need to fulfil the requirements normally applicable to 'scientific data', such as reliability, or those concerning the chain of custody and security. Different courts may apply different standards and requirements. Satellite images are also utilized to verify implementation and compliance with environmental agreements.[16]

9.3 THE EVOLUTION OF REMOTE SENSING ACTIVITIES

Remote sensing from space has evolved from being an activity restricted to a limited number of states, which operated remote sensing satellites

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S. Hoban & B. Penhoet, Moving Pictures: How Satellites, the Internet and International Environmental Law Can Help Promote Sustainable Development, 28 *Stenson Law Review* (1999), 1091.

[14] See further *infra*, § 9.4.3.3.

[15] On the issue of the admissibility of remote sensing products in legal proceedings, see R. Macrory & R. Purdy, The Use of Satellite Images as Evidence in Environmental Actions in Great Britain, 51 *Droit et Ville* (2001), 70; *Evidence from Earth Observation Satellites* (Eds. R. Purdy & D. Leung) (2012).

[16] See N. Peter, The Use of Remote Sensing to Support the Application of Multilateral Environmental Agreements, 20 *Space Policy* (2004), 189; M. Onoda, Satellite Earth Observation as Systematic Observation in Multilateral Environmental Treaties, 31 *Journal of Space Law* (2005), 339.

and benefited from the resulting data, to a present environment characterized not only by an increasing number of states operating remote sensing satellites and benefiting from their products, but also by the active role played by intergovernmental organizations[17] and private companies. Significantly, some of these companies handle data provided by the state-owned and/or -operated space systems.[18] Others have begun launching their own satellites and entered into contracts with states to provide remote sensing services.[19] Overall, looking at the current situation, three major features of remote sensing should be highlighted: the variety of the actors involved, the extensive availability of remote sensing products, and the expanded number of users. This is mostly due to the fact that remote sensing products are released on a commercial basis.

The development of remote sensing activities can be roughly divided into four phases: (1) remote sensing for reconnaissance and weather forecast purposes (1957–1972); (2) the beginning of land observation for civil purposes (1972–1986); (3) civil remote sensing programmes by space-faring nations (1986–mid-1990s); and (4) the era of commercial remote sensing (late 1990s–present).

9.3.1 Remote Sensing for Reconnaissance and Weather Forecast Purposes

Similarly to most space technology,[20] also the origin of remote sensing from space is directly related to its military use and implications. In the early years of the space era the two superpowers, the United States[21] and the Soviet Union, developed remote sensing technology for defence and security-related purposes, such as defence planning and intelligence gathering. Throughout the Cold War the Soviet Union and the United States kept observing each other's territory by means of reconnaissance

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[17] This concerns in particular EUMETSAT; see further *supra*, § 4.2.6.3.

[18] See also on EOSAT and SpotImage further *infra*, § 9.3.3 and § 15.5.2.1.

[19] See e.g. J.I. Gabrynowicz, The Perils of Landsat from Grassroots to Globalization: A Comprehensive Review of US Remote Sensing Law with a Few Thoughts for the Future, 6 *Chicago Journal of International Law* (2005), 45.

[20] See e.g. K.U. Schrogl & J. Neumann, Article IV, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 70.

[21] The United States ran a reconnaissance programme 'Corona' until 1972. The first film capsule obtained under this programme dates back to 1960. See further D.A. Day, J.M. Logsdon & B. Latell, *Eye in the Sky: The Story of the Corona Spy Satellite* (1998).

satellites, thus highlighting the advantages provided by satellites in the military field.

Alongside military applications, weather forecasting constituted the other use of remote sensing satellites in the first decades of space activity. Satellite remote sensing changed the science of weather forecasting by enabling weather predictions up to several days in advance, and a much more precise understanding of weather conditions. The United States launched their first weather satellite, the Television and Infrared Satellite (TIROS-1) in 1960.[22] Geostationary weather satellites were launched in the late 1970s and, since then, their use has broadly expanded.[23]

9.3.2 The Beginnings of Land Observation for Civil Purposes

Land observation for civil purposes began in 1972, with the launch of the US Earth Resource Technology Satellites, usually referred to as Landsat-1, proving the usefulness of remote sensing data in several fields such as land use, natural resources management, agriculture and environmental monitoring. The US government was the primary user of Landsat-1 products; however, it enabled data reception by ground stations of other nations through agreements. For example, as early as the 1970s, ground stations in Canada, Japan, Italy and other states obtained raw data from Landsat-1.[24]

At the time Landsat-1 was launched there was only one policy governing remote sensing activity – a US national policy – and no formal law. This policy was based on the principle of non-discriminatory access, pursuant to which all data were made available to anyone requesting them on condition that the recipient also make the data available on a non-discriminatory basis.[25] The policy was inspired by the Cold War

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[22] See further TIROS I – 50th Anniversary of the First Weather Satellite, www.lib.noaa.gov/collections/TIROS/tiros.html, last accessed 15 April 2014.

[23] See The History of Geostationary Weather Satellites, in *NOOA Celebrates 200 Years of Science, Service, and Stewardship*, http://celebrating 200years.noaa.gov/foundations/satellites/welcome.html#geo, last accessed 15 April 2014.

[24] On the practice of NASA entering into agreements with foreign ground stations, see M.A. Roberts, US Remote Sensing Data from Earth Observation – Law and Practice, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 111; P.A. Salin, LANDSAT Contracts Signed by US Agencies with Foreign Ground Stations: Commercial Remote-Sensing from NASA Scientific Experiments to EOSAT Private Endeavours, 41 *Zeitschrift für Luft- und Weltraumrecht* (1992), 165 ff.

[25] See further on Landsat-1 and its non-discriminatory access policy https://directory.eoportal.org/web/eoportal/satellite-missions/l/landsat-1-3, last accessed

foreign policy goals of influencing allies and demonstrating technological capability.

9.3.3 Civil Remote Sensing Programmes by Spacefaring Nations

Starting from the early 1980s, numerous states and intergovernmental organizations began operating their civil remote sensing programmes; in this way the US–Soviet duopoly in remote sensing activities was rapidly put to an end.

The first state to join the 'remote sensing club' was France with the launch of the *Satellite Pour l'Observation de la Terre* (SPOT) in 1986.[26] Japan followed soon after by launching the Marine Observation Satellite (MOS)-1 in 1987, dedicated to observing the oceans.[27] India launched its first remote sensing satellite in 1988, the Indian Remote Sensing Satellite (IRS)-IA, which was developed by the Indian Space Research Organization (ISRO).[28] Also, the European Space Agency (ESA) launched its first remote sensing satellite, the Earth Resource Satellite (ERS)-1 in 1991.[29] Canada launched its first remote sensing satellite, Radarsat-1, in 1995.[30]

Until the mid-1980s spacefaring states conceived remote sensing as a governmental activity primarily intended to meet domestic needs. Remote sensing programmes were run by governmental space agencies and the users were largely limited to governmental bodies. Significantly, towards the end of the 1980s this situation changed: the first steps in the direction of commercializing remote sensing activities were taken, most

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15 April 2014; NOAA Advisory Committee for Commercial Remote Sensing, Open access meeting summary, 2005; www.nesdis.noaa.gov/CRSRA/files/ACCRES_6_Meeting_Minutes_020205.pdf, last accessed 15 April 2014.

[26] SPOT, which was developed by the French Space Agency CNES has ever since remained a competitor for Landsat. See further http://eoedu.belspo.be/en/satellites/spot.htm, last accessed 18 March 2014, www.cnes.fr/web/CNES-en/1415-spot.php, last accessed 15 April 2014.

[27] See further www.jaxa.jp/projects/sat/mos1/index_e.html, last accessed 15 April 2014.

[28] See further www.fas.org/spp/guide/india/earth/irs.htm, last accessed 18 March 2014; www.isro.org/, last accessed 15 April 2014.

[29] See further on ERS-1 https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/ers, last accessed on 4 January 2014.

[30] See further www.asc-csa.gc.ca/eng/satellites/radarsat1/, last accessed 15 April 2014; also T. Gillon, Regulating Remote Sensing Space Systems – New Legislation for a New Era, 34 *Journal of Space Law* (2008), 19.

notably through data sales from governmental remote sensing satellites.[31] For example, earth observation data from the SPOT-1 satellite were commercially sold on the market in 1987 by SpotImage.[32] Also some photos obtained from Russian military reconnaissance satellites became available for purchase in the early 1990s.

Importantly, in the mid-1980s, the United States attempted to commercialize Landsat and, in order to facilitate this process, the Land Remote-Sensing Commercialization Act, a piece of federal legislation, was passed.[33] However, this attempt was not successful; thus, in the early 1990s, the Landsat system was returned to the public sector. This process was accompanied by the adoption of the second federal statute, the Land Remote Sensing Policy Act, specifically amending its predecessor so as to extend its application to private entities and declassifying high resolution satellite technology making it available for commercial and environmental applications.[34]

Overall, an important development was the progressive delegation of the task to distribute remote sensing data from governments to private entities. Nevertheless, until the mid-1990s, despite the announced goal of commercialization (at that time commercialization of remote sensing products was not only a goal of the US government, but also of the French and Indian ones), governments remained the primary users of remotely sensed data.

9.3.4 The Era of Commercial Remote Sensing

The conclusion of the twentieth century marked the definite arrival of the era of commercial remote sensing; the sale of data and the users were no longer limited to governments but included a wider community. One of the reasons behind this development was the enhanced quality of the products available on the market. Indeed, because of the increased spatial

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[31] See R. Bender, *Launching and Operating Satellites, Legal Issues* (1997), 220; H. de Santis, *Satellites, Alliance, Relations and Developing World, Commercial Observation Satellites and International Security* (1990), 78.

[32] At that time SpotImage was a quasi-private entity controlled by CNES; now it is a private company under the European Aeronautic Defence and Space Company Group.

[33] Land Remote-Sensing Commercialization Act, Public Law 98-365, 98th Congress, H.R. 5155, 17 July 1984; 98 Stat. 451; *Space Law – Basic Legal Documents*, E.III.4.

[34] Land Remote Sensing Policy Act, Public Law 102-555, 102nd Congress, H.R. 6133, 28 October 1992; 15 U.S.C. 5601; 106 Stat. 4163.

resolution of the images,[35] earth observation[36] data began to have a high commercial value.

The advent of the commercial era logically meant increasing involvement of private actors in the remote sensing field. For example, private entities such as Space Imaging, Digital Globe, and OrbImage started launching high resolution satellites in the late 1990s.[37] Additionally, the usefulness of remote sensing data was gradually recognized by a growing number of states which started seeking access to remote sensing data. Some of them began operating remote sensing satellites developed for them by foreign private manufacturers,[38] while others launched and operated nationally manufactured satellites.[39] The remote sensing policies of these states were driven by commercial and environmental goals.[40]

In more recent years the practice of public–private partnerships (PPPs) to fund earth observation satellites has multiplied. For example, BlackBridge (the former RapidEye), a constellation of five optical earth observation satellites used for agriculture and mapping, is a PPP; similarly, the TerraSAR-X high resolution satellite is financed by both the

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[35] In 1999, Space Imaging was the first company to release images with a spatial resolution of 1 m. See further www.fas.org/irp/imint/space_imaging.htm, last accessed 15 April 2014; also D.G. Clarke, Access Control of Remote Sensing Satellites, in *Commercial Satellite Imagery and United Nations Peacekeeping* (Eds. J.F. Keeley & R.N. Huebert) (2004), 171.

[36] The expression 'earth observation' refers to 'the gathering of information about planet Earth's physical, chemical and biological systems via remote sensing technologies supplemented by Earth surveying techniques, encompassing the collection, analysis and presentation of data'; European Plate Observing System (EPOS), www.epos-eu.org/community/disciplinary-data-providers.html #.UskSs7-A3IU, last accessed 18 March 2014.

[37] See further Ito, *supra* n. 3, 12.

[38] These include Turkey, Pakistan and Thailand. For example, the first Turkish high resolution earth observation satellite, Göktürk-2, was launched from the Jiuquan Satellite Launch Center on 18 December 2012 on a Long March-2D (Chang Zheng-2D) launch vehicle. For details on Göktürk-2, see http://cn.cgwic.com/gk2/english/index.html, last accessed 18 March 2014.

[39] These include states like China, Nigeria, Iran and South Korea.

[40] See for example D.H. Kim, Korea's Space Development Programme: Policy and Law, 22 *Space Policy* (2005), 112; Y. Zhao, National Space Legislation, with Reference to China's Practice, in *Proceedings of the Space Law Conference 2006, Asian Cooperation in Space Activities, A Common Approach to Legal Matters* (2006), 51–64.

German Space Agency and EADS-Astrium.[41] This trend has also involved Canada after the decision by the Canadian government to increase the participation of the private sector in its remote sensing missions starting with Radarsat-2.[42] As Radarsat-2 is financed by the private sector, this has called for a redefinition of the rules applicable to the collection and dissemination of data. Other important achievements have been the development of small satellite technologies[43] and the emergence of coordinated satellite services.[44] The latter have proved to be particularly useful in the environmental sector, where different satellite operators combine their resources to provide essential data for environmental protection and disaster response.

9.3.5 The Present Environment for Remote Sensing Activities

The current environment for remote sensing activities offers a rather composite picture both in terms of the actors involved and of the process of generation and distribution of data. Compared to the situation which existed in the early decades of remote sensing from space, the number of satellite operators has greatly increased. Nowadays, over 30 states possess remote sensing satellites.[45] Also international intergovernmental organizations and private entities operate satellites. Ultimately, this results in a large amount of data and products available to users.

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[41] See further on BlackBridge http://blackbridge.com/rapideye/index.html, last accessed 18 March 2014; on TerraSAR-X M. Gerhard & B. Schmidt-Tedd, Germany Enacts Legislation on the Distribution of Remote Sensing Satellite Data, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 411–6; F.G. von der Dunk, European Satellite Earth Observation: Law, Regulations, Policies, Projects, and Programmes, 42 *Creighton Law Review* (2009), 432–3; also www.dlr.de/eo/en/desktopdefault.aspx/tabid-5725/9296_read-15979/, last accessed 15 April 2014.

[42] See *infra*, § 9.4.2.4.

[43] No internationally recognized definition of ‘small satellites’ exists. However, they are often referred to as satellites with a mass less than 1,000 kg; see further www.daviddarling.info/encyclopedia/S/satellite_mass_categories.html, last accessed 15 April 2014.

[44] Coordinated services based on operational remote sensing enable the provision of data from integrated systems through international cooperation. Coordinated services can result from using a constellation of satellites or a combination of several satellites that operate independently.

[45] See Ito, *supra* n. 3, 12.

Another change concerns the process of generating and supplying data, which has become highly elaborated. Currently, it consists of four main phases: data collection, processing, value-adding and distribution. Different entities are responsible for each phase, including data generators, image-processing wholesalers, value-added providers, and distributors. Data generators operate satellites and gather data. The image-processing wholesaler elaborates the data to a more advanced level. Value-adding entities further enhance the original data to obtain final products of greater availability to the end-user, such as maps. Distributors distribute the products to the end-users.[46] Data and derived products are disseminated with different pricing schemes, depending on the type of data and the users. Remote sensing data owners and producers individually decide the conditions governing accessibility and pricing of their data, which are usually referred to as 'data policies'.[47] Also, the user community has significantly expanded and diversified, including not only governmental bodies, but also private users.

Considering the significant changes that have occurred in the environment surrounding earth observation data production and distribution it is important to assess whether the existing legal regime can adequately regulate this fast-moving field. An overall assessment reveals the presence of several issues affecting access to and dissemination of remote sensing data.

First of all, there is an increasing number of restrictions to the flow and utilization of remote sensing products. On one side, limits are imposed by data policies which, as described, regulate access to and price of remote sensing data and products. On the other side, further restraints are set forth by national regulations associated with remote sensing. Pursuant to these regulations access to remote sensing data may be restricted for reasons of national security, and states may reserve for themselves priority access to data in times of crisis.[48]

Secondly, because data policies are defined by each data provider for its own data sets, there is no unified mechanism to ensure the integrity and authenticity of data as well as the reliability of the information. This leads to an additional issue concerning responsibility and liability arising from the supply and use or misuse of data and resulting products. Indeed, incorrect data may cause damage to the end-users as well as to a third

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46 For such data chains, see Crowsey Incorporated, *Legal Assistant Guide to Legal Applications for Geospatial Information*, 10 June 2002, 24.

47 See *infra* § 9.4.3; also § 18.2 on the application of copyright in this context.

48 See *infra* § 9.4.2.

party relying on them. Currently, there is a great deal of uncertainty connected to this problem, as data policies normally do not address it.

A further issue concerns the rights of the data supplier. As data are so easily available on the Internet, they can be used and reproduced in violation of the supplier's intellectual property rights.[49] Also, end-users that have legally obtained data through contractual arrangements face a number of restrictions; for example, they are normally prohibited from selling the data to a third party.

Considering the above legal issues and their impact on the supply and use of remote sensing data, the following section will analyse the current legal framework governing remote sensing activities.

9.4 THE LEGAL FRAMEWORK FOR REMOTE SENSING ACTIVITIES

The legal framework for remote sensing activities consists of laws and regulations adopted at international and national levels. On the one hand, there are general international space law principles which apply as well as specific legal documents addressing remote sensing. On the other hand, there are laws and regulations adopted by individual states for the purpose of coordinating and supervising the actors operating in space under their jurisdiction. This framework is completed by a multitude of data policies put in place by remote sensing data generators to manage the distribution of their products.

9.4.1 International Space Law

International space law includes binding and non-binding instruments negotiated within the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS).[50] Among the former are five international treaties, notably the 1967 Outer Space Treaty,[51] the 1968 Rescue and

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49 See further *infra*, § 18.2.

50 See also *supra*, §§ 2.2, 2.3.

51 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

Return Agreement,[52] the 1972 Liability Convention,[53] the 1975 Registration Convention,[54] and the 1979 Moon Agreement,[55] providing the legal foundation for space activities by regulating key issues relating to the exploration and use of outer space. The latter include a series of Declarations and Principles that address legal problems connected to specific space applications.[56]

9.4.1.1 The UN space treaties

The UN space treaties do not specifically deal with remote sensing from space. However, the majority of their rules and principles are applicable and provide guidance, at least indirectly, to it.

The Outer Space Treaty is based on the principle of freedom of space activities.[57] Accordingly, outer space is open to all and freedom to conduct space activities is guaranteed to every state; no state can be impeded from carrying out space activities or be requested to obtain prior authorization to do so. If this concept is applied to remote sensing, it means that each state is entitled to launch satellites into space for the purpose of remote sensing and that this choice cannot be lawfully impeded by other states. Certainly, remote sensing activities must be conducted pursuant to international law principles, including those of the UN Charter.[58] However, as the Outer Space Treaty does not impose any

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[52] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968).

[53] Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).

[54] Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

[55] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979).

[56] See *supra*, §§ 2.2.1.1, 2.2.1.3.

[57] *Cf.* Art. I, Outer Space Treaty, *supra* n. 51; see also *supra*, § 2.3.1.2.

[58] *Cf.* Art. III, Outer Space Treaty, *supra* n. 51, specifically referring to Charter of the United Nations (hereafter UN Charter), San Francisco, done 26

specific restriction on the uses of outer space, remote sensing activities can, in theory, pursue scientific, military and commercial goals.

Significantly, private entities willing to carry out space activities are under an obligation to obtain an authorization from their national state.[59] Thus, if a private entity wishes to launch and operate a remote sensing satellite it must request an authorization from the appropriate state party to the Treaty. Once it has granted such an authorization, this state has the duty to continuously supervise the authorized activities.

An interesting legal situation could arise when a private entity decides to undertake remote sensing activities without the authorization from its national state, for example because there is not yet a national law/licensing system in place. It should be kept in mind that, pursuant to Article VI, sentence 1, states are in any case internationally responsible for national activities in outer space, whether such activities are carried out by governmental or non-governmental entities.

Private national activities comprise activities undertaken by nationals of that state and activities carried on from its territory. Significantly, private 'national' space activities not only encompass launch activities, but also satellite communications and remote sensing as well. Thus, a state would be internationally responsible for violation of international obligations committed by the private operator as well as liable for damage caused in the course of its space activities regardless of whether these activities had been licensed or not.[60]

In the absence of a system to authorize private remote sensing operations the state would be unable to effectively supervise these operations and to ensure that they complied with the provisions of the Outer Space Treaty[61] and did not undermine national security interests. In order to protect itself, the state could put in place means to obtain compensation for the amounts paid to cover damage caused by the private entity. Where no specific statutory provisions existed, the state could seek recovery of compensation from the non-governmental entity based on contract law or the principles of tort or negligence. However, where the damage occurred as a result of an international or criminal act

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June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1.

[59] See Art. VI, Outer Space Treaty, *supra* n. 51; see also *supra*, § 2.3.1.1.

[60] *Cf.* on the liability Art. VII, Outer Space Treaty, *supra* n. 51; Arts. I–V, Liability Convention, *supra* n. 53. See further *supra*, §§ 2.3.1.1, 2.3.3.2.

[61] *Cf.* Art. VI, 2nd sent., Outer Space Treaty, *supra* n. 51.

or omission on the part of the private entity, criminal proceedings would be more appropriate.[62]

It is also important to point out that a state could have the option to extend the applicability of relevant licensing systems not directly applicable to space activities to the licensing of remote sensing satellites. For example, if a state has legislation governing telecommunication systems which also include telecommunication satellites, the applicability of the licensing requirements provided for under such legislation could be extended to cover private remote sensing activities.

In any case, if a state realizes that its national private entities are interested in carrying out remote sensing activities, it should set up a system to authorize and supervise non-governmental space activities. The lack of such a system could also result in the phenomenon of 'licence shopping', as private entities could seek authorization for their remote sensing activities from a third state.

Every object launched into outer space must be duly registered.[63] Pursuant to the Registration Convention the duty to register a space object falls upon the 'launching State'. The Convention identifies four categories of 'launching States': (1) the state that launches the space object; (2) the state that procures the launching of the space object; (3) the state from whose territory the object is launched; and (4) the state from whose facility the object is launched.[64]

As there can only be one state of registry, if more than one state qualifies as 'launching State', it is up to them to choose the one which is going to register the space object.[65] State practice reveals that the state of registry is determined less on the basis of the location of launch than on who procures the launch.[66] For example, the United States does not register all objects launched from its territory but only those which are

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62 See more generally on liability *supra*, §§ 2.3.3, 3.2.3; also *infra* § 17.2.

63 *Cf.* Art. II(1), Registration Convention, *supra* n. 54; see also *supra*, § 2.3.4. Further F.G. von der Dunk, Beyond *What*? Beyond *Earth Orbit*?..! The Applicability of the Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight, 43 *California Western International Law Journal* (2013), 269.

64 See Art. I(a), Registration Convention, *supra* n. 54. See also *supra*, § 2.3.3.1 on the identical definition of the 'launching State' in the context of the Liability Convention, *supra* n. 53.

65 See Art. II(2), Registration Convention, *supra* n. 54.

66 See B. Schmidt-Tedd & M. Gerhard, Registration of Space Objects: Which Are the Advantages for States Resulting from Registration?, in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 132.

owned or controlled by US private or governmental entities. Thus, it is possible that a state performing commercial launch services from its territory, for example by launching remote sensing satellites on behalf of another state, even as it qualifies as a launching state does not become the state of registry.

Furthermore, the Registration Convention requires the state of registry to exercise control over the registered object, although it leaves open the possibility that jurisdiction and control may be exercised by a 'launching State' other than the state of registry through special arrangements.[67] The extent to which control should be exercised is, however, uncertain. This is an issue of particular relevance in relation to remote sensing, as it is not clear whether this control covers the dissemination of data and the potential damage arising from their use.[68]

As far as damage is concerned, the Liability Convention attributes to the 'launching State' the liability to compensate for the damage caused by its space object, either on earth or in space. However, the definition of 'damage' provided for in the Convention does not include potential damage arising specifically in connection with remote sensing activities, such as damage connected to inaccurate, wrong or undelivered data.[69]

9.4.1.2 The UN Remote Sensing Principles

The United Nations Remote Sensing Principles[70] constitute the only international legal instrument specifically addressing the sensing of the earth from space. The Principles thereby provide the basic legal framework applicable to all kinds of remote sensing activities. In particular, they lay down rights and duties of the actors involved in such activities and establish rules regarding access to and distribution of data at

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[67] *Cf.* Art. II(2), Registration Convention, *supra* n. 54.

[68] Importantly, under national Canadian, German and US remote sensing legislation the notion of 'control' has been elaborated so as to include control over ground stations, marketing, etc.; see for Canada, Arts. 2, 8(d) & (e), Remote Sensing Space Systems Act (hereafter Canadian Remote Sensing Space Systems Act), assented to 25 November 2005; S.C. 2005, c. 45; for Germany, Secs. 11, 12, Act Protecting Against the Endangerment of German Security Through the Proliferation of High Resolution Aerial Imagery of the Earth (*Satellitendatensicherheitsgesetz*; hereafter German Act on Satellite Data Security), 23 November 2007, effective 1 December 2007; Federal Gazette (BGBl.) Year 2007 Part I No. 58, of 28 November 2007; for the United States, C. III, V, Land Remote Sensing Policy Act, *supra* n. 34.

[69] *Cf.* the definition of 'damage' as per Art. I(a), Liability Convention, *supra* n. 53; also *supra*, § 2.3.3.2. Further Ito, *supra* n. 3, 194, 303.

[70] *Supra*, n. 2.

international level. The Principles have provided guidance for remote sensing activities for nearly 30 years, yet in spite of their significance, they have major shortcomings related to the ambiguous meaning of some key terms and the inadequate regulation of issues like availability, accuracy, supply, and use of remote sensing data.

9.4.1.2.1 Status of the Principles The Remote Sensing Principles are included in a United Nations General Assembly Resolution, Resolution 41/65 of 3 December 1986. A UN General Assembly Resolution is not a binding document per se. A binding instrument, such as a treaty, is made, executed and ratified by states; once the process of ratification is completed such an instrument becomes applicable and mandatory law for the ratifying states. A UN General Assembly Resolution is not subject to ratification and its implementation is largely left to the will of states.[71]

Further to its recommendatory nature, the value of a General Assembly Resolution could still vary considerably. Factors that can influence this evaluation are: the process of adoption of the resolution itself, such as whether unanimously adopted or not, and consequent state practice. From this perspective a large number of scholars consider the majority of the Remote Sensing Principles to constitute customary international law.[72] Article 38 of the Statute of the International Court of Justice[73] recognizes international custom as evidence of a general practice accepted as law. This definition reflects the widely accepted view that custom consists of

[71] On the non-binding nature of UN General Assembly Resolutions see V. Kopal, The Role of the United Nations Declarations of Principles in the Progressive Development of Space Law, 16 *Journal of Space Law* (1988), 5; A.T. Guzman & T.L. Meyer, *Explaining Soft Law* (2009); F. Tronchetti, Soft Law, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 621–3.

[72] The customary nature of the Remote Sensing Principles is argued e.g. by B. Cheng, *Studies in International Space Law* (1997), 136; S. Marchisio, Remote Sensing for Sustainable Development in International Law, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 338–40; J.I. Gabrynowicz, The UN Principles Relating to Remote Sensing of the Earth from Outer Space and Soft Law, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 183–93.

[73] See Art. 38(1) (b), Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1.

two elements: general practice, or *usus*, and the conviction that such practice reflects, or amounts to, law (*opinio juris*).[74]

First of all, the Principles have found extensive confirmation in state practice. Indeed, over the past two decades, states and private entities have widely followed them. For example, as far as the principle of sensing from space without prior consent is concerned, states have undertaken remote sensing activities without seeking permission from other states or external authority.[75] Considering that the practical implementation of the Principles has by now taken place for an extensive period of time and that the Principles are often specifically referred to in domestic, bilateral and multilateral legal documents, there is room to argue their international customary nature.[76] Nevertheless, as the International Court of Justice has never explicitly confirmed the binding nature of the substance of a General Assembly Resolution as constituting customary law, similar arguments need to be treated with caution and corroborated by factual and legal evidence.

Secondly, remote sensing operators largely comply with the Principles on a spontaneous basis, thus contributing to support the view of the existence of an *opinio juris* regarding the applicability of the Principles. It is also significant that the final text of the Principles was the synthesis of several drafts submitted by various delegations and that it was unanimously adopted by the UN General Assembly.[77]

9.4.1.2.2 Scope of the Principles Before analysing the content of the Remote Sensing Principles it is important to understand their scope, namely to which applications, activities and types of data they apply. The Principles are relevant to a limited number of remote sensing applications for civil purposes, specifically natural resource management, land use,

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[74] The elements constituting international custom have been delineated by the International Court of Justice in the 1969 *North Sea Continental Shelf Cases* (ICJ Reports, 1969, p. 3) and in the 1986 *Nicaragua Case* (ICJ Reports, 1986, pp. 76, 98). On international custom generally see I. Brownlie, *Principles of Public International Law* (7th edn., 2008), 6 ff.; also further *supra*, § 5.9.1.

[75] *Cf.* V.S. Vereschetin & G.M. Danilenko, Custom as a Source of International Law of Outer Space, 13 *Journal of Space Law* (1985), 121.

[76] For example, the phrase ‘non-discriminatory’ appears in international data exchange instruments such as the data policies of NASA and ESA, and WMO Resolutions such as World Meteorological Organization Resolution 40, CG-XII.

[77] See Ito, *supra* n. 3, 56; A.D. Terekhov, UN General Assembly Resolution and Outer Space Law, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 98; Kopal, *supra* n. 71, 18.

and protection of the environment.[78] From this, one can infer that military applications of remote sensing are not included within the scope of the Principles. It is also questionable if dual-use satellites, which can perform both civil and military functions such as those to be used for Global Monitoring for Environment and Security (GMES), are regulated under the Principles.[79] Furthermore, it is challenging to argue that commercial activities other than the ones listed in Principle I are covered notwithstanding.

The above issues are of primary importance as, nowadays, remote sensing satellites are used in many applications other than natural resource management, land use, and protection of the environment, such as disaster management, urban planning, agriculture and verification. The use of data for these purposes may fall outside of the scope of the Principles and legal issues connected with these applications may not be adequately addressed in the present regime.[80]

The Remote Sensing Principles concern remote sensing activities as including the operation of remote sensing space systems, the collection of primary data and the operation of storage stations, the processing of data, interpreting the data and dissemination of data and products. Importantly, although data handling activities and dissemination are purely terrestrial undertakings, they fall within the reach of the Principles.

Finally, the Principles are virtually silent on the position of private entities. The only reference to them appears in Principle XIV, which makes a link between state activities and those of private operators, referring to Article VI of the Outer Space Treaty.[81] This means that on

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[78] See Princ. I, Remote Sensing Principles, *supra* n. 2.

[79] On the legal issues surrounding the use of the Global Monitoring for Environment and Security (GMES), see F.G. von der Dunk, The 'S' of 'Security': Europe on the Road to GMES, 2 *Soochow Law Journal* (2007), 1. Generally on GMES see J. Aschbacher & M.P. Milagro-Pérez, The European Earth Monitoring (GMES) Programme: Status and Perspectives, 120 *Remote Sensing of Environment* (May 2012), 3.

[80] See J. Monserrat, A Remote Sensing Convention for the Advancement of Space Law, in *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (2004), 63.

[81] Princ. XIV, Remote Sensing Principles, *supra* n. 2, provides: 'In compliance with article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, States operating remote sensing satellites shall bear international responsibility for their activities and assure that such activities are conducted in accordance with these principles and the norms of international law,

one side, the state authorizing and licensing a private entity to perform remote sensing from space is internationally responsible for the activities of that entity and that, on the other side, such an entity is bound by the national regulations of the state under whose jurisdiction it operates. However, neither Article VI of the Outer Space Treaty nor Principle XIV of the Remote Sensing Principles provides any direction on how non-governmental entities should be authorized and supervised.

9.4.1.2.3 Content of the Principles The Remote Sensing Principles lay down fundamental rules and principles regulating remote sensing activities from space.[82] The Principles devote particular attention to the issues of responsibility for conducting remote sensing operations and access, distribution and use of data. They tend to use rather general language which, at times, gives room to flexible and somewhat controversial interpretations.[83]

The key provisions of the UN Remote Sensing Principles can be divided into three groups: those dealing with the freedom of remote sensing, those dealing with respect for the rights and interests of the sensed states, and more specific data rules.

As to the first group, Principle IV has a pivotal importance as it establishes a fundamental concept: the freedom of sensing from space. The first sentence of Principle IV thus stipulates: 'Remote sensing activities shall be conducted in accordance with Article I of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space.' As Article I of the Outer Space Treaty lays down the

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irrespective of whether such activities are carried out by governmental or non-governmental entities or through international organizations to which such States are parties. This principle is without prejudice to the applicability of the norms of international law on State responsibility for remote sensing activities.'

[82] For an elaborate description and discussion of the Remote Sensing Principles see S.M. Williams, Reflections and Suggestions on Remote Sensing and International Law, 50 *Zeitschrift für Luft- und Weltraumrecht* (2001), 409; C.Q. Christol, Remote Sensing and International Space Law, 16 *Journal of Space Law* (1988), 21; G. Catalano Sgrosso, International Legal Framework for Remote Sensing, *Workshop on legal remote sensing issues Project 2001*, 5; R.S. Jakhu, International Law Governing the Acquisition and Dissemination of Data, 29 *Journal of Space Law* (2003), 65; F.G. von der Dunk, United National Principles on Remote Sensing and the User, in *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 29–40.

[83] *Cf.* S.M. Williams, The UN Principles on Remote Sensing Today, in *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space* (2006), 2 ff.

freedom of states to explore and use outer space,[84] Principle IV, at least indirectly, bases itself on this clause to set forth the right of states to sense the entire globe from space using satellites. Such a provision, which was strongly supported by the developed Western states during the negotiation of the Principles, attributes to all states the right of data collection from outer space.[85] Principle IV goes on to set forth the rules according to which data collection should be carried out, namely: (1) there is no need for prior consent, notification, or consultation before sensing; (2) no veto rights are attributed to sensed states on the sensing of their territories; (3) no conditions are imposed for sensing capabilities in terms of spatial and temporal resolution; and (4) areas cannot be exempted from observation based on geographic considerations.[86]

The second group is addressed by the second sentence of Principle IV, which deals with the sovereign rights of the sensed states. This clause provides:

> These [remote sensing] activities shall be conducted on the basis of respect for the principle of sovereignty of all states, and people over their own wealth and natural resources … Such activities shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed state.

The status of the sensed states was widely debated during the formulation of the Principles. However, the final text of Principle IV is rather ambiguous, as it fails to clarify what the principles of sovereignty and the legitimate rights of the sensed states entail in practical terms; also it does not cover the issue of the participation of sensed states in remote sensing activities together with the sensing state.[87] Furthermore, the requirement not to carry out remote sensing activities that go against the legitimate rights and interests of the sensed states seems to be limited to the conduct of remote sensing itself rather than to what happens after the data are disseminated.

Usually, the interests of the sensed state are affected by the use and misuse of data concerning its territory; nevertheless, Principle IV does

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[84] See also a similar discussion in the context of satellite direct broadcasting *supra*, § 8.3.1.

[85] See further e.g. S. Gorove, *Developments in Space Law* (1991), 295.

[86] See S.M. Williams, Observing the Earth from Space in Light of the Principle of Sovereignty, 82 *Revista Brasileira de Direito Aeroespacial* (April 2001).

[87] See G. Catalano Sgrosso, Prevention and Management of Natural Disasters, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 299; Ito, *supra* n. 3, 60.

not seem to protect such interests as no specific obligations are imposed on the sensing state (such as any liability for damage suffered by the sensed state in case of misuse of data) and no specific rights are attributed to the sensed state (such as control over access and distribution of data concerning its natural resources). This issue is aggravated by the impact of the commercialization of remote sensing activities and the consequent easier accessibility to remote sensing data and products.

Finally, the issue of data rules is addressed by Principle XII, which lays down general provisions concerning remote sensing data access and dissemination: 'As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed state shall have access to them on a *non-discriminatory basis* and on *reasonable cost terms*.'[88] These provisions have numerous implications.

Firstly, again no prior consent before dissemination is required: the sensed states are not attributed any veto right or control over the dissemination of information concerning their territories. Thus, at least theoretically, sensed states can neither select to whom territorial information is disclosed nor decide the type and quality of data to disseminate.[89] Secondly, sensed states are not given any preferential access to data and information concerning their territories, either exclusively or by way of priority. Furthermore, sensed states are not given any financial privilege, such as data provision, either free of charge or at a lower cost than for the other states. The expression 'reasonable cost terms' is of doubtful meaning. It could signify 'marginal costs' or it could mean 'commercial market price' if so deemed under the market conditions of that particular moment. Thirdly, while under the non-discriminatory access principle included in Principle XII sensing states have a general obligation to make imagery available to sensed states, the former actually make the data available based on their good faith.[90] No legal mechanisms exist to force sensing states to release data. Importantly, Principle XII does not make a distinction based on the purpose for which data are used.

Another crucial issue concerns the availability of analysed information derived from remotely sensed data. Principle XII presents a loophole, particularly on this issue, as it provides: 'The sensed states shall also have access to the available analysed information concerning the territory

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[88] Princ. XII, Remote Sensing Principles, *supra* n. 2 (emphasis added).

[89] See von der Dunk, *supra* n. 82, 33; J.I. Gabrynowicz, Expanding Global Remote Sensing Services, in *Proceedings of Workshop on Space Law in the Twenty-First Century* (2000), United Nations, ST/SPACE/2, 101.

[90] See L.J. Smith & C. Doldirina, Remote Sensing: A Case for Moving Space Data Towards The Public Good, 24 *Space Policy* (2008), 22.

under its jurisdiction in the possession of any state participating in the remote sensing activities on the same basis and terms.' Literally, this may exclude situations where analysed information is not in possession of any state – but for example in the possession of a private company. Furthermore, the obligation to provide analysed information may not be applicable to individuals or juridical persons, such as processing wholesalers, creating a risk of discrepancy between the theory and the reality of current practice. This uncertainty is among the reasons which explain why data availability can be structured differently in the context of data policies.

The other Principles included in the Remote Sensing Principles largely repeat the provisions of the Outer Space Treaty, although, at times, they adapt them to situations specifically related to remote sensing from space.[91] Particular attention is paid to the use of remote sensing data for environmental and disaster management purposes, as states are requested to warn in cases of harm to the environment or impeding disasters and to freely disseminate the relevant information, as per Principles X and XI.

Another important topic is that of international responsibility. While it is clear that states are internationally responsible for remote sensing activities, including the dissemination of data, it is more controversial to argue their responsibility for what happens afterwards as a consequence of any activity by the state or a third party. Literally, the Remote Sensing Principles do not impose responsibilities on either those states or entities that are not operating satellites but who are actually receiving images and/or engaged in data handling activities, or the third parties that use the data. This is a significant loophole in the Principles, especially taking into account the ever-increasing number of users of remote sensing products and applications.

In conclusion, the Remote Sensing Principles constitute a positive contribution to space law by laying down basic norms to regulate sensing from space and connected operations. They establish the basic conditions for operating remote sensing satellites and formulate the general responsibilities expected of sensing states. However, the Principles utilize vague language and do not adequately address key issues such as the rights and obligations of the parties involved in remote sensing activities (either data generators and end-users), ownership, availability and accessibility of

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[91] Among the issues addressed by the Remote Sensing Principles, *supra* n. 2, the following can be listed: applicability of international law (Principles II and III); strengthening of international cooperation (Principle V); and modalities to structure international cooperation (Principles VI, VII and VIII).

data, and the regulation of data accuracy and validation.[92] Overall, the Principles do not appear to be an effective instrument to manage modern sensing activities and to deal with all the legal questions that they encompass.

In any case it should not be underestimated that the Remote Sensing Principles are a product of the 1980s, and reflect the politics, interests and issues that were relevant at that time. In fact, as back then only few sensing states existed and the rest of the world was composed of sensed states, the Principles focus on the relation between sensing and sensed states. Nowadays, the situation is different: not only has the number of sensing states increased, but also private entities operate satellites. Furthermore, the number of users and applications of remote sensing products has greatly increased. Thus, right now the debate focuses on the rights and obligations of data providers, data recipients and third parties: all issues that were not seen as priorities during the drafting of the Principles. As the relevance of these issues keeps growing they have been extensively addressed at national level by states and on an individual basis by remote sensing data generators.

9.4.2 National Regulations on Remote Sensing

9.4.2.1 Introduction

In the last two decades an increasing number of states has adopted national space laws and regulations. The rationale behind this choice is twofold: to ensure implementation of and compliance with the international obligations laid down in the space treaties, as well as to organize, supervise and control the space activities of the subjects under their jurisdiction. The legal foundation for national space legislation is Article VI of the Outer Space Treaty, which makes states internationally responsible for national space activities carried out either by governmental agencies or by non-governmental entities, and requires them to authorize and continuously supervise the activities of non-governmental actors.[93]

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[92] See Smith & Doldirina, *supra* n. 90, 25; Ito, *supra* n. 3, 65.

[93] For an extensive analysis of the relationship between Article VI of the Outer Space Treaty and national space legislation see F.G. von der Dunk, The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 3–28; also e.g. E. Back Impallomeni, Article VI of the Outer Space Treaty, in *Proceedings of the United Nations/Republic of Korea Workshop on Space Law – Actions at the National Level* (2004), United Nations, ST/SPACE/

Although national space laws differ from each other, normally they contain provisions addressing the following issues: (1) authorization and licensing of national, that is notably private, space activities; (2) supervision and control over the authorized activities; (3) launching of space objects and operation of launching facilities; (4) operation of objects in space; (5) conduct of activities in outer space; (6) liability for damage caused by space objects; and (7) registration of space objects.[94]

Once a state registers an object that it has launched into outer space it retains jurisdiction and control over it.[95] This is an aspect of particular relevance for remote sensing since information acquired by satellites can affect the interests of the state sensed and the international community at large. Thus, states with remote sensing capabilities as well as nationals involved in the launching and operation of remote sensing satellites are increasingly adopting laws and policies to supervise the conduct of remote sensing operators and to control and regulate the way in which data are collected and distributed.

9.4.2.2 National regulations relating to remote sensing: General remarks

National regulations on satellite remote sensing impose restrictions on commercial remote sensing satellites, in particular in terms of data collection and/or dissemination. There are two main purposes of this form of governmental control: the first is to safeguard national security by denying or restricting access to information; the second is to guarantee the government priority access to the system's capabilities during times of crisis.

In tandem with the emergence of private actors and commercial remote sensing satellites, numerous states have adopted national regulations regulating remote sensing activities. Nevertheless, there is no consistency in the way states have acted. While there are some states, such as the United States, Canada, Germany and France, that have formal, specific and transparent remote sensing legislation, or at least provisions clearly

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22, 73–6; M. Gerhard, Article VI, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 106 ff., esp. 120–2. *Cf.* also *supra*, § 2.3.1.1.

[94] For an extended analysis of national space legislation in general, see *supra*, Chapter 3.

[95] *Cf.* Art. VIII, Outer Space Treaty, *supra* n. 51.

dedicated to remote sensing, others, such as Australia[96] and Argentina,[97] have general space laws and regulations that include remote sensing and data activities. Yet other states, such as China and India, have adopted certain policies with regard to data collection and dissemination.[98]

The following sections will examine the main national laws and policies specifically and explicitly governing (commercial) remote sensing activities. The concluding part will highlight the current trends related to national regulation of remote sensing activities.

9.4.2.3 The United States

US legislation on remote sensing has constantly evolved to respond to technological developments, market trends and social needs.[99] Compared to other national legislation, the US laws focus on practical issues, such as data policies and maintenance of competitiveness of domestic actors. A general analysis of US laws and policies associated with remote sensing reveals that their adoption has been mostly guided by the goals of maintaining the leadership in this field whilst safeguarding national security and foreign policy interests.[100]

Starting its activities in 1972 under the control of NASA, by the end of the 1970s the United States began attempting to privatize the Landsat system. This choice was codified into the Land Remote-Sensing

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[96] For an analysis of Australian space law see S.R. Freeland, Reshaping Australia's Space Policy and Regulation, 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 97; N. Siemon & S.R. Freeland, Regulation of Space Activities in Australia, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 37–59.

[97] For an analysis of Argentina's regulation of space activities see J. Hermida, *Legal Basis for a National Space Legislation* (2004), 185 ff.; J. Hermida, Regulation of Space Activities in Argentina, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 23–35.

[98] See e.g. on India R. Kaul & R.S. Jakhu, Regulation of Space Activities in India, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 153–98.

[99] For a comprehensive analysis of US space law in general see J.I. Gabrynowicz, 2010 One-Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-term Emerging Issues, 4 *Harvard Law & Policy Review* (2010), 901; P.S. Dempsey, Overview of the United States Space Policy and Law, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 373–404.

[100] For a description of US remote sensing law see Gabrynowicz, *supra* n. 19, 45; E. Sadeh, Policies and Regulation of Earth Observation Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 443–58; Ito, *supra* n. 3, 75–82.

Commercialization Act of 1984.[101] The original idea was to slowly progress towards the commercialization of Landsat through the data sales and to develop the Landsat series on a private-sector-driven basis at a later stage. However, the commercialization did not go as planned, mostly because of the increase in data price and the competition by SPOT, funded by the French government, which took away significant market share.[102] Thus, the Landsat system returned to full governmental control. The Land Remote-Sensing Commercialization Act was then replaced by the Land Remote Sensing Policy Act in 1992.[103] The Act brought Landsat's operation under the Department of Defense and NASA, while licensing competencies and obligations were given through the Secretary of Commerce to the National Oceanic and Atmospheric Administration (NOAA).

Among the goals of the Land Remote Sensing Policy Act, spreading public knowledge of the value and utility of Landsat data and enhancing their distribution and use were of crucial importance.[104] Cost obstacles based on market prices were lifted and a standard (minimum) price for unenhanced data was established, particularly applicable to governmental agencies or subjects financially supported by the US government.[105] Aiming at stimulation of the development of the commercial market, exclusive rights for distribution of Landsat-7 products were no longer handed to a single entity but were open to competition within the private sector.

The Land Remote Sensing Policy Act regulates the licensing of the operation of private remote sensing systems. The Act foresaw that in the years to come commercial players would operate remote sensing systems other than Landsat and proceed to subsequent data distribution. Consequently, it requires persons under US jurisdiction and control to obtain a licence to operate private remote sensing systems.[106] Such a licence imposes restrictions aimed at preserving US national security, such as making unenhanced data available to the governments of other states and informing the Secretary of Commerce of the characteristics of the systems and the intention to conclude agreements with foreign states.

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[101] *Supra*, n. 33.

[102] On the attempt to commercialize the Landsat system, see C.C. Joyner & D.R. Miller, Selling Satellites: The Commercialization of Landsat, 26 *Harvard International Law Journal* (1985), 63.

[103] *Supra*, n. 34.

[104] *Cf.* Sec. 5601(6), Land Remote Sensing Policy Act, *supra* n. 34.

[105] See Sec. 5601(13), Land Remote Sensing Policy Act, *supra* n. 34.

[106] See Sec. 5622(b), Land Remote Sensing Policy Act, *supra* n. 34.

Fines up to US$ 10,000 per day can be imposed upon violation of these conditions.[107]

The Land Remote Sensing Policy Act, which remains the main legal instrument governing remote sensing activities in the United States, has been updated and complemented by a series of policies and regulations. The Presidential Decision Directive 23 (PDD-23) was promulgated in 1994.[108] Its formulation was moved by the recognition of the emergence of non-US remote sensing capability and the need to ensure continued US global leadership in this sector. In order to achieve this goal the Directive follows three directions: (1) it relaxes restrictions on data sale, in particular by separating out tasks among the governmental agencies involved in remote sensing activities; (2) it clarifies the operational regime of Landsat (thus, for example, US entities are entitled to sell up to 1 metre ground resolution images); and (3) it specifies national security measures as a licensing requirement.[109]

As to the latter, the Directive introduces a provision usually referred to as 'shutter control', which enables the US government to shut down the operation of a satellite to protect national security and foreign policy interests as well as to comply with international obligations. In this respect, the 1997 National Defense Authorization Act prohibits licensees from disseminating imagery of Israel that is more detailed than what is available from foreign commercial sources.[110] Currently, limitation of space resolution is implemented through a two-tiered approach. Electro-optical imagery of 0.5 metres can be marketed generally, whereas imagery higher than 0.25 metres can only be distributed with specific authorization to recipients individually authorized by the US government.[111] In this case, before granting such an authorization the US Department of State must first obtain assurance from the foreign government that the imagery will not be released further without prior permission by the United States.

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[107] See Sec. 5658, Land Remote Sensing Policy Act, *supra* n. 34.

[108] Presidential Decision Directive 23, US Policy on Foreign Access to Remote Sensing Capability, 9 March 1998 (PDD-23).

[109] See A. Florini & Y.A. Dehqanzada, No More Secrets? Policy Implications of Commercial Remote Sensing Satellites, Carnegie Paper no. 1 (July 1999), 6.

[110] Kyl-Bingaman Amendment to the 1997 National Defense Authorization Act, 15 U.S.C. 5621. See also Public Law 104-201 div. A, Title X, Sec1064, September 23, 1996, 110 Stat. 2653.

[111] J.C. Kessler, *Leadership in the Remote Sensing Satellite Industry – US Policy and Foreign Competition* (2008), 8.

Aware of the fact that remote sensing was still not commercially profitable, the US government decided to actively support its national remote sensing actors. Pursuant to this goal the US government released the Commercial Remote Sensing Policy in 2003.[112] This policy, which replaces the earlier PDD-23, is intended to foster competitiveness of national actors by softening restrictions on spatial, spectral and radiometric resolution and supporting the national remote sensing industry. A key element of the 2003 Commercial Remote Sensing Policy is the intention of the US government to increase reliance on US commercial remote sensing capabilities. The policy states that the US government will 'rely to the maximum practical extent on US commercial remote sensing space capabilities for filling imagery and geospatial needs'.[113] This means that the US government intends to become a major customer of US private remote sensing systems.

Finally, in order to implement the 1992 Land Remote Sensing Policy Act and apply it to private actors, the United States adopted the Licensing of Private Land Remote Sensing Systems Regulations in 2006.[114] This licensing regulation incorporates detailed procedures for licensing terms and conditions, review procedures, and monitory compliance provisions. Accordingly, private remote sensing systems are strictly controlled and subject to an annual audit. A licence holder must file an application for amendment of the licence as well as to notify when it intends to enter into an agreement with a foreign entity.[115]

In terms of data policies, the regulation distinguishes three situations based on the funding mechanism: (1) systems that are not funded by the US government; (2) systems partially funded by the US government; and (3) systems fully or largely funded by the US government. As to non-US-government funded systems, a licensee is allowed to enable access to its unenhanced data on reasonable commercial terms and conditions, subject to the condition of providing data to the sensed state. With regard to systems partially funded by the United States a case-by-case decision, taking into account US interests, will be made concerning availability of the data on a non-discriminatory basis. For fully or

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[112] US Commercial Remote Sensing Policy, 28 April 2003. See also W. von Kries, The US Commercial Remote Sensing Policy of April 28, 2003: Some Comments, 52 *Zeitschrift für Luft- und Weltraumrecht* (2003), 555.

[113] Sec. II, Commercial Remote Sensing Policy, *supra* n. 112.

[114] Federal Register Vol. 71, No. 79, April 25, 2006, 15 CFR Part 960, Licensing of Private Land Remote Sensing Systems: Final Rule (hereafter Remote Sensing Licensing Regulations).

[115] See Sec. 960.8, Remote Sensing Licensing Regulations, *supra* n. 114.

significantly US government-funded systems a licence is required for the distribution of data on a non-discriminatory basis.[116]

9.4.2.4 Canada

Canada's legislation relating to remote sensing is largely inspired by the US precedent, yet it presents some relevant distinctions based on Canadian national interests.[117] This legislation, which includes a Remote Sensing Space Systems Act[118] and Remote Sensing Space Systems Regulations,[119] offers comprehensive regulation of national remote sensing activities. Additional rules are provided by the bilateral agreement concluded between Canada and the United States concerning the Operation of Commercial Remote Sensing Satellite Systems.[120]

One of the reasons leading to the adoption of the Act and the Regulations was the need to adequately regulate the involvement of private operators in remote sensing activities. The scope of the Canadian Remote Sensing Space Systems Act is quite broad: it applies to public, private and public–private systems.[121] Hence, the Act is not only relevant for commercial satellites, but also for satellites operated by the Canadian Space Agency and other governmental entities. The intended use of a satellite is not a relevant factor for determining the applicability of the Act, and all systems following under Canadian jurisdiction are bound by the data distribution controls set by the Minister of Foreign Affairs.

The wide scope of the Act is also visible when looking at the definition of 'remote sensing satellite' that it provides, which includes optical radar,

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116 See Sec. 960.12 (c), Remote Sensing Licensing Regulations, *supra* n. 114.

117 For an analysis of Canada's remote sensing legislation see Gillon, *supra* n. 30, 19–32; Ito, *supra* n. 3, 82–6; also B.W. Mann, First License Issued under Canada's Remote Sensing Satellite Legislation, 34 *Journal of Space Law* (2008), 67–87. For a broader description of the regulation of Canadian space activities see R.S. Jakhu, Regulation of space activities in Canada, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 81.

118 *Supra*, n. 68.

119 Remote Sensing Space Systems Regulations (Canadian Remote Sensing Space Systems Regulations), 29 March 2007; SOR/2007-66.

120 Agreement between the Government of Canada and the Government of the United States of America concerning the Operation of Commercial Remote Sensing Satellite Systems, Washington, done 16 June 2000, entered into force 16 June 2000; 2000 CTS No. 2000/14.

121 *Cf.* Sec. 2, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

thermal infrared, multi-spectral and other types of sensors.[122] Furthermore, the applicability of the Act is not limited to high resolution satellites and concerns operations from inside and outside Canadian territory. Anyway, it is significant that, although the Act is in theory relevant to such a vast number of satellites, the Ministry of Foreign Affairs may exempt any persons, satellite system or data on an individual or class from all or some aspects of the licensing regime.[123] This is meant to avoid situations where the Canadian government would exercise jurisdiction over operations largely in the hands of other states.

The Canadian Remote Sensing Satellite System Act regulates and controls remote sensing activities, particularly those of private entities, through a system of licensing, continuous supervision and enforcement mechanisms.[124] As far as licensing is concerned, every person falling under the jurisdiction of Canada must obtain a licence to carry out remote sensing activities.[125] Licences are granted by the Ministry of Foreign Affairs and can be amended or suspended for a period of up to 90 days, or cancelled pursuant to the decision of the government.[126]

One of the main concerns of the licensing system is to ensure that the operations of the satellite are secure.[127] In other words, under the Act, the government wants to guarantee that positive control of a satellite is maintained at all times throughout its mission life and that at the end of its operation, the spacecraft is disposed of in such a way that orbital debris risks are mitigated and the spacecraft is de-orbited safely.

Another key aspect of the Canadian remote sensing regime is the regulation of collection and distribution of raw data and remote sensing products. The Act distinguishes between 'raw data' (the zeros and ones of the digital information), 'transforming' (processing the data – the zeros and ones – to form an image such that it is impossible to reverse-engineer the raw data), and 'remote sensing products' (that is finished products produced by this transformation, such as images or digital elevation models).[128] The raw data, particularly from high resolution synthetic

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[122] *Cf.* Sec. 2, Canadian Remote Sensing Space Systems Act, *supra* n. 68.
[123] *Cf.* Sec. 4(3), Canadian Remote Sensing Space Systems Act, *supra* n. 68.
[124] On this point see Mann, *supra* n. 117, esp. 76 ff.
[125] See Secs. 10–13, Canadian Remote Sensing Space Systems Act, *supra* n. 68.
[126] *Cf.* Secs. 10–13, Canadian Remote Sensing Space Systems Act, *supra* n. 68.
[127] See Gillon, *supra* n. 30, 27.
[128] *Cf.* Sec. 2, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

aperture radar (SAR) systems,[129] should be controlled. Such a control is important to prevent the most sensitive information falling into the hands of those who could use it against Canada or Canada's friends and allies. Furthermore, before granting a licence, the government will undertake efforts to understand, in cooperation with the prospective licensees, the nature of the systems applying for a permission to operate.[130] Thus, the review will not be limited to the technical elements of the application, but will also include other considerations, such as the business models of the applicants, the participants and clients of the proposed systems, who will be operating the system, who will own it and how the sensitive information will be managed.[131]

A large portion of the Act is dedicated to the obligations of the licensee and rights of the government in connection with the operation of the remote sensing systems, particularly with regard to supervision of activities and control of data distribution. On one side, the licensee may be restricted from communicating raw data and distributing remote sensing products to any person other than the licensor.[132] On the other side, the government can issue orders limiting the authorized operations of the licensee.[133] These may include the suspension or cancellation of the licence or the interruption of service and priority access. Additionally, the Canadian government has the right to obtain priority access to data for the purpose of international relations and national defence interests.[134]

The Canadian Remote Sensing Space Systems Act also lays down how the government can exercise effective supervision and control over the licensed activities. Inspectors selected by the Minister can enter and inspect, at any reasonable time, any place owned by or under the control of the licensee.[135] A licensee can breach the provisions of the Act in two ways, namely by committing a violation or an offence. A violation is not a criminal act, and a licensee is entitled to react to a notice of violation within 30 days. An offence on the contrary, is deemed to be a criminal

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[129] SAR systems provide a different sort of image than optical systems, as their sensors collect reflected energy emitted from the satellites themselves, and do not collect naturally reflected energy in the form of light waves from the earth, as happens with optical sensors. In this way SAR systems can penetrate cloud cover and be used to image at night.

[130] See Sec. 8, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[131] See Sec. 9, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[132] *Cf.* Sec. 8(4)(d), Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[133] *Cf.* Sec. 14, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[134] See Sec. 15, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[135] *Cf.* Sec. 18, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

act which does not allow the licensee to respond.[136] An offence concerns four specific provisions of the Act: (1) the operation of satellite systems without licence; (2) letting a person outside of Canada control the satellite; (3) not complying with measures relating to suspension or cancellation of the licence; and (4) not complying with a Minister's order to interrupt the service.[137] An individual committing a violation is fined up to C$ 5,000; for other cases the fine is C$ 25,000. The fine is imposed on a daily basis and continues until the violation stops. A person guilty of offence can be fined up to C$ 50,000, receive 18 months' imprisonment, or both. A juridical person can be fined up to C$ 250,000.[138]

9.4.2.5 Germany

Germany, similarly to Canada, lacks comprehensive domestic legislation addressing overall space activities; instead, it has established specific regulations dedicated to remote sensing from space.[139] Until recently Germany did not have an urgent need for adopting national space legislation. The situation changed with the development of high resolution remote sensing satellites and the involvement of the private sector. Indeed, the drafting of the German law specific to remote sensing began alongside the implementation of the first large-scale PPP in the field of Earth observation, TerraSAR-X. The German Act on Satellite Data Security, the *Satellitendatensicherheitsgesetz*, came into force on 1 December 2007.[140] The Act empowers the German government to control collection and dissemination of high resolution satellite data so as to reduce any threat to national security and the security of other nations.[141]

The German Act on Satellite Data Security applies to the operation of high-grade remote sensing systems and the handling of data generated by

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[136] See Secs. 38–39, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[137] See Secs. 5, 16(1), 13 & 14, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[138] See Sec. 38, Canadian Remote Sensing Space Systems Act, *supra* n. 68.

[139] On the regulation of earth observation services, including licensing, data processing and distribution in Germany see generally B. Schmidt-Tedd & M. Kroymann, Current Status and Recent Developments in German Remote Sensing Law, 34 *Journal of Space Law* (2008), 97–114; S. Hobe & J. Neumann, Regulation of Space Activities in Germany, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 142–5; Ito, *supra* n. 3, 86–90.

[140] *Supra* n. 68.

[141] For a description of the Act see Schmidt-Tedd & Kroymann, *supra* n. 139, 105–14.

such systems.[142] Thus, its scope arguably does not include low resolution satellites. Significantly, the Act covers the operation of high-grade earth remote sensing satellites and the handling of data resulting from these systems by German nationals (natural and juridical persons), by foreign juridical persons or associations of foreign nationals having their headquarters in Germany, and cases where the system is commanded from the territory of Germany.[143]

Notably, the German Act separates remote sensing operators from data providers and requires different types of authorization for them.[144] Other legal systems do not make this distinction and have only one type of licence, usually for a system operator.[145] Instead, the Act follows a growing tendency to distinguish between the operation phase and the distribution of products.

Under the German Act on Satellite Data Security a remote sensing operator needs to obtain an 'approval', while the data operator is requested to obtain a licence.[146] The approved and licensed persons share common obligations such as the duties to communicate to the responsible authority any changes after the authorization and to allow inspectors to investigate their premises. By contrast, requirements for documentation are different for system operators and data distributors.[147] Overall, the obligations on the data distributors are, quite understandably, more stringent and detailed. For instance, they are obliged to record the precise detail of every transaction.

Importantly, before a data distributor complies with a data request, such a request must undergo a 'sensitivity check', which will take into account elements such as the content of the data, the location observed, who purchases the data, the country of destination, and the time between data acquisition and the processing of the data request.[148] The sensitivity

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[142] The Act defines a 'high-grade remote sensing system' as '[a} space-based transport or orbital system, including the ground segment, by means of which data about the Earth are generated, where its sensor is itself/sensors are themselves technically capable either alone or in combination with one or more other sensors of generating data with a particular high information content with the meaning of Paragraph 2'; Sec. 2(1), German Act on Satellite Data Security, *supra* n. 68.

[143] See Sec. 1(1), German Act on Satellite Data Security, *supra* n. 68.

[144] *Cf.* Secs. 3, 11, German Act on Satellite Data Security, *supra* n. 68.

[145] This is the case of the Canadian Remote Sensing Space Systems Act, *supra* n. 68. See also Ito, *supra* n. 3, 87.

[146] See Sec. 1(1), German Act on Satellite Data Security, *supra* n. 68.

[147] See Secs. 5, 18, 19, German Act on Satellite Data Security, *supra* n. 68.

[148] See Sec. 17, German Act on Satellite Security, *supra* n. 68.

check takes place in two stages: the first one is performed by the data distributor, while the second one is to be conducted on a case-by-case basis by the Federal Office of Economics and Export Control.[149] The data distributor does not evaluate the sensitivity of the request arbitrarily, but pursuant to a mandatory set of procedures.[150]

If a data request is deemed to be 'non-sensitive', the data distributor is allowed to deliver the requested data without further approval from the government.[151] If, on the contrary, the distributor evaluates a data request as 'sensitive' and yet wishes to proceed with answering it, a permit from the Federal Office must be obtained. The Federal Office examines the risk involved in the data request and will permit the distribution of data if this is not going to endanger national security. Where compliance with the data request is considered to be risky a permit may be conditionally granted through measures such as reduced spatial resolution of data, time delay, and reduced processing quality of the data.[152] Noticeably, nearly 99 per cent of the permit applications are granted.[153]

Both data producers and distributors must grant priority access to data to the German government in the event of an emergency, such as a threat to national security.[154]

The provisions of the German Act on Satellite Data Security are enforced through sanctions. Offences can be classified as either serious or less serious, and the amount of the fines changes depending on the seriousness of the offence. For serious offences, such as operating remote sensing systems without permission or distribution of data without permit, the fine can be up to € 500,000 and can lead to imprisonment. For less serious offences, such as failure to undertake a safety check, the fine may be as high as € 50,000.

9.4.2.6 France

France belongs to that group of states that do not have specialized laws for remote sensing and regulate remote sensing from space through their overall national space legislation.[155] The 2008 French Law on Space

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149 See Schmidt-Tedd & Kroymann, *supra* n. 139, 108.

150 *Cf.* Sec. 17, German Act on Satellite Data Security, *supra* n. 68.

151 See Sec. 17, German Act on Satellite Data Security, *supra* n. 68; also Schmidt-Tedd & Kroymann, *supra* n. 139, 109.

152 See Sec. 17, German Act on Satellite Data Security, *supra* n. 68.

153 See Schmidt-Tedd & Kroymann, *supra* n. 139, 113.

154 *Cf.* Sec. 21, German Act on Satellite Data Security, *supra* n. 68.

155 For a description of French space law see P. Achilleas, Regulation of Space Activities in France, in *National Regulation of Space Activities* (Ed. R.S.

Operations[156] addresses the issues of remote sensing operations and control of data distribution in its Title VII.[157] As the provisions of this Title are fairly general, they have been complemented by regulations in the form of decrees. Notably, a decree of 6 June 2009[158] supports the application of measures provided by Title VII of the French Law and articulates the rules provided thereby.

The legislation is applicable to the natural or juridical persons responsible for the programming of a remote sensing satellite or responsible for the collection of space-based remote sensing data.[159] Thus, data resellers and value-added service providers are not covered by it. Furthermore, data from military satellites or data collected on behalf of the Ministry of Defence fall outside of the scope of the legislation.[160] Distribution of remote sensing data is subject to prior declaration to the Administrative Authority, which is identified by the legislation as the Secretary General for National Defence.[161] A declaration must be submitted two months prior to the commencement of operations.

Importantly, governmental control is carried out by declaration instead of through a licence.[162] A declaration is a weaker means of control than a licence, closer to a notification than to an authorization, and, contrary to a licence, is not subject to rejection.

Title VII of the French Law on Space Operations further foresees possible restrictions on remote sensing actors to protect national interests. In particular, the Administrative Authority must ensure that the primary operator of space-based remote sensing data does not compromise the

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Jakhu) (2010), 109–22; more specifically on the remote sensing aspects P. Achilleas, French Remote Sensing Law, 34 *Journal of Space Law* (2008), 1–9; Ito, *supra* n. 3, 90–4.

156 Law on Space Operations (*Loi relative aux opérations spatiales*; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453.

157 Title VII, French Law on Space Operations, *supra* n. 156, deals with the issue of 'space-based data'.

158 Décret No. 2009-643 relatif aux autorisations délivrées en application de la loi no. 2008-518 du 3 juin 2008 relative aux opérations spatiales (hereafter French Decree on Remote Sensing); Journal Officiel de la République Française, 10 June 2004, text 30 of 154.

159 See Art. 1, French Law on Space Operations, *supra* n. 156.

160 See Art. 26, French Law on Space Operations, *supra* n. 156.

161 *Cf.* Art. 23, French Law on Space Operations, *supra* n. 156, and Art. 2, French Decree on Remote Sensing, *supra* n. 158.

162 *Cf.* Art. 3, French Decree on Remote Sensing, *supra* n. 158.

fundamental interests of the nation.[163] In practice, a concrete mechanism to control the commercial distribution of data has been established through GIRSPOT, an inter-ministerial working group that reports on cases that trigger the restrictive measures.[164] Although the Law does not specify concrete restrictive measures, restrictions may include suspension of data distribution for a limited time, the obligation to delay data distribution and the permanent prohibition of data distribution for certain locations.[165]

The French Law on Space Operations also includes enforcement mechanisms which enable the imposition of fines up to € 200,000 against a person that distributes data without a declaration or does not comply with data restriction regulations.[166] This is a civil penalty, which makes no distinction between an individual and other persons, such as a juridical person. Clearly, the goal of the Law is not to promote the remote sensing industry but to guarantee governmental control of remote sensing activities and data distribution.

Practice reveals that France's civilian remote sensing policy supports a space imagery global market where data can be acquired on a non-discriminatory basis. To ensure active French participation in this market, SpotImage, a private law company, has been established in order to organize the distribution of SPOT data distribution and to offer data of a better resolution than the major alternative foreign systems. SpotImage sells data collected not only by SPOT satellites, but also by foreign systems such as QuickBird, Ikonos and Radarsat.[167]

9.4.2.7 Other relevant states

Other states, while not having specific laws governing remote sensing activities, have adopted policies regulating data dissemination. Such a choice has been mostly driven by the launch of high-performance remote sensing satellites and the consequent need to manage the distribution of the derived products. Amongst others, China, India and Japan have followed this path.

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[163] *Cf.* Arts. 5–6, French Law on Space Operations, *supra* n. 156.
[164] See Achilleas, French Remote Sensing Law, *supra* n. 155, 5.
[165] *Cf.* Art. 2, French Decree on Remote Sensing, *supra* n. 158.
[166] See Art. 25, French Law on Space Operations, *supra* n. 156.
[167] See Achilleas, French Remote Sensing Law, *supra* n. 155, 2.

China[168] exercises rather strict control over the distribution and use of its high resolution products. For example, the 4 metre resolution data on Chinese territory generated by its high resolution satellite Beijing-1[169] are not available to users outside China. Furthermore, the National Mapping Service makes maps available to users; however, users not authorized by the Chinese government are only allowed to access up to 1:1 million scale maps. These restrictions are relevant to remote sensing because maps are often derived from satellite remote sensing data.

Interestingly, China has also launched initiatives to promote the sharing of remote sensing data and to maximize their access and use for various social aspects. The China-Brazil Earth Resources Satellite System (CBERS), which consists of a series of remote sensing satellites aimed at supporting users' needs in earth resources applications, is based on the idea of free access to data and products. Indeed, CBERS images received in Brazil are freely available on the Internet for Brazilian and other Latin American users,[170] while CBERS images received in China are freely accessible to users in China. A high-quality image-processing software (SPRING) is also available to users in Brazil. The Chinese–Brazilian cooperation is based on a bilateral agreement concluded in 1998[171] and complemented by an inter-agency Protocol signed in 2009.[172]

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[168] For an overall analysis of Chinese space legislation see Y. Zhao, Regulation of Space Activities in China, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 247–65.

[169] Beijing-1 was launched in 2005 and belongs to the Disaster Monitoring Constellation (DMC), a group of satellites from several states/entities, whereby 32 m data can be exchanged among the DMC partners; see www.dmcii.com/, last accessed 15 April 2014.

[170] Since June 2004 more than 500,000 images have been freely distributed in Brazil. See further J. Monserrat, Regulation of Space Activities in Brazil, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 61–80.

[171] Framework Agreement between the Government of the People's Republic of China and the Government of the Federative Republic of Brazil on Cooperation in the Peaceful Applications of Outer Space Science and Technology, Beijing, done 8 November 1994, entered into force 29 June 1998; 2036 UNTS 335.

[172] Protocol on the Cooperation related to CBERS Continuity, Expansion and Applications, of 19 May 2009, signed by the Chinese National Space Administration and the Brazilian Space Agency (AEB). The goal of the Protocol is to favour the expansion of cooperation in the fields of space applications, satellite development and other areas.

India has a comprehensive earth observation data policy.[173] This Remote Sensing Data Policy, which was established in 2001, sets forth a licensing mechanism and guidelines controlling the dissemination of remote sensing data. As to licensing, a licence/permission issued by the Department of Space is required to operate remote sensing data as well as to acquire/disseminate data within India.[174] The Department of Space assigns licensing operations to two entities: the National Remote Sensing Centre, which is responsible for acquisition and distribution of remote sensing data within India, and Antrix Corporation Limited, which is in charge of granting licences for acquisition/distribution of data outside of India.[175] With regard to data dissemination, the guidelines apply different criteria depending on the degree of resolution.[176] Data between 5.8 metres and 1 metre resolution can be distributed to users after screening and ensuring that sensitive areas are excluded. Distribution of higher than 1 metre depends on the type of users. While no further clearance is required by government users, other users are subject to a case-by-case review by an inter-agency body, the High Resolution Image Clearance.

Japan constitutes an interesting example because it is an important remote sensing nation but lacks a formalized, detailed data policy for all remote sensing satellites.[177] The guidelines of the Space Activities Commission attribute a key role to the Japanese Space Agency JAXA, which is in charge of promoting dissemination of data and results, which, in turn, include remotely sensed data. In principle, all data are available to the public without regard to a specific spatial resolution limit.

Data access is determined on a satellite-by-satellite basis. Decision-makers can have internal discussions and ask who is requesting data and why. All data can be used only for peaceful purposes and JAXA retains intellectual property rights. Users are divided into three categories: public data users, national security users and all others. Public users include those that contribute to promotion of data utilization. For them, data is available at the cost of reproduction, which means there should be almost

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[173] See ISRO: EOS: Policy-01:2001, Remote Sensing Data Policy.

[174] *Cf.* Sec. 2, Remote Sensing Data Policy, *supra* n. 173.

[175] See Sec. 3, Remote Sensing Data Policy, *supra* n. 173.

[176] *Cf.* Sec. 4, Remote Sensing Data Policy, *supra* n. 173.

[177] For an analysis of the organization of space activities in Japan see S. Aoki, Current Status and Recent Developments in Japan's National Space Law and its Relevance to Pacific Rim Space Law and Activities, 35 *Journal of Space Law* (2009), 363 ff.; also S. Aoki, Regulation of Space Activities in Japan, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 199–223.

no charge on networks.[178] Other data users include commercial users who can be offered a low price, but not lower than prices offered by private companies. National security data are classified and comes from Japan's Information Gathering Satellite (IGS).[179]

In August 2008 Japan experienced a major development when its first national space law, the Basic Space Law, entered into force.[180] The Law, however, did not innovate in the field of remote sensing as it did not deal with licensing of remote sensing operators and policies for distribution of data, but this situation of course could change in the future through the adoption of a second national space law of Japan. This law, which is currently under discussion, is supposed to contain criteria for authorization and supervision of satellite operators, obligations of licensees, and provisions on data distribution.[181]

Apart from the above examples a major catalyst for establishing remote sensing policies and law is the availability of affordable satellite technology and small satellite missions. These missions create the need for rules governing access and distribution of data. This is the path that has been followed, for example, by Colombia, Nigeria, and South Africa. Interestingly, in some nations that do not have a national space law, private law and the satellite operating licensing regulations of another state can govern a transaction. In Poland and the United Arab Emirates, for example, contracts between the national data receiving entity and the foreign satellite data provider are the only legal bases for data distribution absent national laws and policies.[182]

9.4.2.8 Final remarks

In short, more and more states are operating and benefiting from remote sensing satellites. This has led numerous states to pass laws and policies governing remote sensing activities and data distribution. An overall

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178 See J.I. Gabrynowicz, The Land Remote Sensing Laws and Policies of National Governments: A Global Survey, 18; www.spacelaw.olemiss.edu/resources/pdfs/noaa.pdf, last accessed 15 April 2014.

179 Gabrynowicz, *supra* n. 178, 18.

180 Fundamental Act of Outer Space (hereafter Japanese Basic Space Law), Law No. 43, 2008, enacted 21 May 2008, entered into force 27 August 2008; 34 *Journal of Space Law* 471 (2008). A summary of the Basic Space Law is provided by S. Aoki, Introduction to the Japanese Basic Space Law of 2008, 57 *Zeitschrift für Luft- und Weltraumrecht* (2008), 589.

181 See S. Aoki, Japanese Space Activities Act in the Making, 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 111.

182 See Gabrynowicz, *supra* n. 178, 8.

analysis of the current situation reveals five major points concerning the legal framework for satellite remote sensing.

Firstly and most fundamentally, there is only a limited number of specific national laws on remote sensing, and there are more national policies than laws.

Secondly, the transparency of laws and policies is rare, but it is slightly improving. While there are states such as the United States, Canada, Germany and France which make their laws and policies available in published national codes or on the Internet, many other states, particularly from the developing world, lack this kind of transparency. This is mostly due to differences in legal systems and negative attitudes towards open access to information. Some developing countries also consider transparency as a weapon in the hands of developed ones. At times, language is a barrier, as an official English translation of the policies is not often available. The advent of the Internet has, however, enhanced access and distribution of national laws and policies.

Thirdly, national remote sensing laws are a means to regulate non-governmental activities and public–private remote sensing operations. Normally, these laws provide a regime to authorize and supervise remote sensing activities and attribute to the government the right to interrupt services and priority rights in times of emergency.

Fourthly, there are an increasing number of restrictions to access and distribution of remote sensing data. While space-based, non-military remote sensing activities are based on the idea that data are to be made available in particular to sensed states on a non-discriminatory basis, practice reveals the presence of a significant number of restrictions to the access and distribution of data, particularly high resolution data. Furthermore, national security interests are given priority over general data access, and governments are engaging in a practice generally referred to as 'controlled access'. In addition, the UN Remote Sensing Principles are interpreted narrowly, for instance, by limiting the sensed state's right to data of its territory to data used for resource management purposes (such as Canada). In addition, all national laws foresee a form of 'shutter control'.

Fifthly, there is an emerging trend of shifting from 'commercialization' of data to 'use' of data. National laws and policies reveal a growing tendency to move from the goal of commercializing remote sensing data to the objective of increasing their practical uses. Such a strategy is often driven by the need to justify socially the enormous costs related to the operation of remote sensing satellites. In fact, with the exception of the United States, generally remote sensing laws are not meant to achieve the purpose of promoting remote sensing activities but rather to adequately regulate them. This does not mean that commercial interests should not be respected or even stimulated. For instance, one can notice limits to the possibility of governmental authorities to restrict licensed non-governmental activities (because of threats to national security). However, commercial interests cannot prevail over public benefits.

9.4.3 Data Policy

9.4.3.1 General considerations

Modern societies rely heavily on remote sensing data for numerous applications, and there is widespread demand for remote sensing products. However, such a request does not find adequate regulation within the existing space law legal framework, as issues like access, distribution, use and authenticity of data are covered in an uncertain and inconsistent manner.

In particular, the UN Remote Sensing Principles fall short of such a goal. Principle XII, which deals with data availability, limits its scope to sensing states, sensed states, and other states interested in the data. Additionally, it does not as such allow free access to data for public benefit, for instance for disaster relief.[183] Furthermore, regrettably the Principles address the question of pricing policy in a controversial and unsatisfactory way. The expression 'reasonable cost terms' is indeed ambiguous and gives room to diverging interpretation. Also, the Principles are silent as to the rights of data generators, such as intellectual property rights or the conditions for the use of data, and disregard the questions of accuracy, integrity and reliability of data.[184]

Consequently, at the present time validation, access, distribution and use of remote sensing data take place pursuant to the individual decision of the supplier through various policies. In other words, legally speaking unilateral decisions are made by data suppliers on how data are going to be handled or allowed to be handled, using their intellectual or other property rights over the data as the legal basis and therefore by definition limited only to *those* data sets.

9.4.3.2 The relevance of data policies

In recent years, the market of remote sensing data has expanded greatly. Only a minority of governmental space agencies retain their data for internal use or release them at marginal cost; instead, quite frequently

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183 See further the discussion *supra*, § 9.4.1.2.
184 See Ito, *supra* n. 3, 200; von der Dunk, *supra* n. 82, at 33.

data are distributed on a commercial basis.[185] This fact, coupled with the increasing presence of privately owned and -operated remote sensing satellites, PPPs and cooperation among states in the operation of remote sensing systems (including multi-state constellation of satellites), makes the issue of data policy highly relevant.

Data policies lay down the rights and duties for data providers and recipients.[186] Effective data policies are crucial to ensure that users can receive information in a timely manner and at the right time. Ideally, a data policy should be established in such a way that users can enjoy quality products whilst suppliers can exercise the rights associated with the data. However, as data generators develop data policies in an independent manner and pursuant to their own interests, these policies tend to vary by, thus, affecting in diverging manners the conditions for the access to data and the interests of suppliers, end-users and third parties.

9.4.3.3 Main differences in data policies: Access and pricing

Existing data policies can be distinguished especially in terms of access and pricing.[187] As far as access is concerned, governmental agencies generally follow two alternative approaches: open access (particularly in the United States) versus more regulated access (especially in Europe).

Open access normally enables users to access data freely, or at least at marginal cost, regardless of who the end-user is and the purpose for which the data is used. For example, Orthorectified Landsat Data is available free of charge via File Transfer Protocol (FTP).[188] NASA allows Quick SCAT data to be accessed free of charge for scientific and educational goals.[189] This reflects US federal policy, which applies the concept of freedom of information for the data collected at the federal level or using federal funds.

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[185] See L.J. Smith & C. Doldirina, Remote Sensing Data: Some Critical Comments on the Current State of Regulation and Reflection on Reform, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 253–63.

[186] For an extensive description of the characteristics of data policies see A. Ito, Improvement to the Legal Regime for the Effective Use of Satellite Remote Sensing Data for Disaster Management and the Protection of the Environment, 34 *Journal of Space Law* (2008), 45 ff.; R. Harris & R. Browning, *Data Policy Assessment for GMES Final Report*, EVK2-CT-2002-80012-DPAG, University of London (2004).

[187] See further e.g. Ito, *supra* n. 3, 202.

[188] *Cf.* further www.landsat.org, last accessed 15 April 2014.

[189] See Harris & Browning, *supra* n. 186, 35.

By contrast, ESA and the Canadian Space Agency adopt a much more regulated access approach, which distinguishes between different categories of users. For example, the Envisat data policy distinguishes between category 1 and 2 uses, where the former is for research and application development use, while the latter is for other uses, including operational and commercial.[190] The private entities operating remote sensing systems, such as GeoEye and Digital Globe, mostly distribute their data on a commercial basis. These commercial data generators only sell data to a single category of commercial users, unless special arrangements are made. For example, data may be supplied free of charge for disaster relief purposes.

As previously described, entities face limitations imposed by the governments through national legislation and policies, including shutter control and priority access.[191] Entities operating under the jurisdiction of, *inter alia*, the United States, Canada, Germany and France need to adhere strictly to the obligations imposed upon them by these respective states by way of legislation or regulation. Other states, such as India and China, by means of specific policies have established restrictions on the distribution of data based on the criteria of spatial resolution. Hence, users in all these states face various limitations in accessing remote sensing data. In the coming years this tendency is expected to grow as a consequence of the planned launch of high resolution satellites.

With regard to pricing, the policies differ depending on the type of satellites concerned and the products derived therefrom. An important distinction can be made between entities operating an open access policy offering a free or marginal cost pricing and entities acting under a regulated access with cost recovery pricing.

Entities of the first kind, which operate mostly in the United States, set prices at the 'marginal cost' level, that is 'the price that recovers the costs incurred in providing data beyond the costs of the basic ground infrastructure'.[192] For instance, NASA applies a 'cost of fulfilling user request' mechanism to Landsat data; all marginal costs that are necessary to satisfy the user request[193] are charged. Normally, such a cost is set at

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190 See F.G. von der Dunk, Non-discriminatory data dissemination in practice, *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 44.

191 *Cf. supra*, §§ 9.4.2.3, 9.4.2.4 and 9.4.2.5.

192 Ito, *supra* n. 3, 202.

193 For details on this point see G. Schreier, Data Policy Implications on Archive Design, *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 175.

approximately US$ 600 per scene for newly collected data,[194] and US$ 20–25 for archived data.

Instead, entities operating under a regime of regulated access policy adopt different price schemes depending on the category of users they deal with. For entities having more than one category of users, only data for public use, such as those for internal, educational and humanitarian applications, are disseminated under preferential conditions, either with a price waiver or distributed at marginal cost. For example, ESA distinguishes between category 1 and 2 use: under category 1, which includes research and development, data are distributed at marginal cost, that is 'at or near the cost of reproduction'.[195] If a governmental space agency also includes a commercial use data category, the data will be released on a commercial basis. Private commercial entities target commercial users; thus, private commercial data generators distribute their data on a commercial basis. Data generators of high resolution satellites, like GeoEye's Orbview, sell their data at a full commercial price. For example, data with spatial resolution of 60 cm are sold at a price of US$ 10 per square km.[196] Evidently there is a contrast between the price offered by entities operating under an open access policy and the prices of those acting on a more regulated basis.

An interesting case is represented by the European Union's GMES initiative, now labelled Copernicus, which aims at providing integrated information for monitoring the environment from various sources for the benefit of public and private users.[197] A definitive data policy has not been decided yet but it is expected that a certain measure of harmonization will take place by ensuring a user-friendly service and cost-effective access. Indeed, it is envisaged that a large amount of information should be available free of charge.[198]

Overall, numerous factors influence the final price of satellite images and derived products. Clearly, the accuracy, quality and reliability of the

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[194] See R. Harris, Comparison of Regime: ESA, NASA and NOAA, in *Proceedings of the International Conference: Satellite Remote Sensing in Aid of Development: Legal Considerations* (2003), 37.

[195] ESA/PB-EO (97) 57 rev. 3, 4–6. See also F.G. von der Dunk, *supra* n. 41, 397.

[196] For further information, see www.glcf.umd.edu/library/guide/Orbview3_Product_Guide_25jan06.pdf, last accessed 15 April 2014.

[197] See on GMES also *supra*, § 4.4.4.2.

[198] See e.g. Communication from the Commission to the European Parliament and the Council Global Monitoring for Environment and Security (GMES): Establishing a GMES capacity by 2008 – Action Plan 2004–2008, COM (2004) 65 final, 6.

data play a key role, as high spatial resolution data or data with value-added attributes are more expensive than products with lower characteristics. However, other elements, not necessarily related to the data itself, contribute to determining the price of remote sensing products, in particular national policies, the type of data generator, and the financing for building and managing the satellites, which may be either fully or partially funded by public funding or financed solely by private funding. In this respect, commercial entities normally set their prices in a way that allow them to recover their initial investments for manufacturing and launching satellites as well as the satellite's operational costs. In short, because of the various elements affecting access and price policies of remote sensing products it is not feasible to have a single access policy with a uniform price setting for all satellites.

It is, however, important to point out that, in recent years, common access and pricing policies favourable to users are increasingly being established and implemented in the fields of environmental monitoring and natural disasters response. In Europe, public access to environmental information is laid down in the Directive on access to environmental information.[199] The Directive establishes the right of any requestor to access environmental information held by or for public authorities at reasonable cost without having to reveal his/her interest. The Directive is also applicable to earth observation data produced by private entities as long as they are used for public services related to the environment.

In addition, the European Union is undertaking efforts to establish a common infrastructure for the distribution and use of spatial information. The adoption of the INSPIRE Directive constitutes a key step in this process.[200] The scope of INSPIRE is limited to Europe for the purpose of environmental applications and covers any data with a direct or indirect reference to a specific location or geographical area, including satellite data and products.[201] Importantly, the INSPIRE Directive is applicable to

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[199] Directive of the European Parliament and of the Council on public access to environmental information and repealing Council Directive 90/313/EEC, 2003/4/EC, of 28 January 2003; OJ L 41/26 (2003).

[200] Directive of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (hereafter INSPIRE Directive), 2007/2/EC, of 14 March 2007; OJ L 108/1 (2007). See also F. Tronchetti, Access and Distribution of Earth Observation and Spatial Data in the European Context: The Impact of the European Directive INSPIRE, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 167–87.

[201] Article 4, INSPIRE Directive, *supra* n. 200.

spatial data held by public authorities but it may also be relevant to individuals and private entities. In terms of pricing policy, spatial data sets to public authorities are available at marginal cost, while network services and data fulfilling obligations under EU legislation are available free of charge.

As far as the use of remote sensing data for natural disaster response is concerned the most significant development has been the adoption and implementation of the International Charter for Space and Major Disasters.[202] The Charter's initiative was launched in 1999 by ESA and the French Space Agency CNES for the purpose of promoting cooperation among space agencies in the use of satellite data to manage crises during and after disasters. The idea of establishing the Charter came from the consideration that remote sensing from satellites can contribute to a more effective response to disasters and enhance coordinated rescue operations.

Currently, 15 space organizations and a series of commercial data providers (such as Digital Globe and GeoEye) make their space resources available to help emergency managers worldwide to deal with a variety of natural and anthropogenic disasters.[203] Specifically, when a major natural or man-made disaster has happened and relief and reconstruction efforts are needed, upon activation of the Charter by the end-user, space agencies respond with a review of applicable satellite data resources and archive retrieval capabilities, and determine appropriate priority spacecraft tasking. Data are processed at predetermined levels (for example as GIS-ready data sets), and in some cases value-added commercial data fusion capabilities are initiated.[204]

Remarkably, under the International Charter for Space and Major Disasters, data from different sources are supplied free of charge for the benefit of all afflicted states, provided that they follow the procedure set

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[202] Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (hereafter International Charter for Space and Major Disasters); www.disasterscharter.org/, last accessed 19 March 2014; see also Ito, *supra* n. 3, at 317. Further A. Ito, Issues in the Implementation of the International Charter on Space and Major Disasters, 21 *Space Policy* (2005), 141–9; F.G. von der Dunk, Legal Aspects of Using Space-Derived Geospatial Information for Emergency Response, with Particular Reference to the Charter on Space and Major Disasters, in *Geospatial Information Technology for Emergency Response* (Eds. S. Zlatanova & J. Li) (2008), 21–40.

[203] See www.disasterscharter.org/web/charter/members, last accessed 15 April 2014. *Cf.* further Ito, *supra* n. 3, 202.

[204] See Smith & Doldirina, *supra* n. 90, 24.

forth in the Charter. The success of the Charter is demonstrated by the steady increase of activation in the last decade.[205]

9.4.3.4 Distribution of data and rights of suppliers and users

The majority of remote sensing data producers do not release their data in an unregulated manner but through contractual arrangements, that is licence agreements, with the users. In this way, suppliers maintain control over the data and products after distribution. Broadly speaking, a licence authorizes a third party to conduct certain activities and exercise rights over certain products, which would be unlawful without the licence. A licence related to satellite data and products lays down the rights of data suppliers and regulates the activities of data recipients.

A licensee is under the obligation to pay a licence fee (usually referred to as 'royalty') in return for permission to exercise rights that belong to the licensor. In case of satellite images, a distinction between a licence fee and a royalty can be made: the former is paid by users for access to data, while the latter is paid to the owner/operator of a satellite by distributors and value-added resellers upon the sale of products. Furthermore, users must comply with the conditions set by the licensor in the licence. Compliance with such requirements is a precondition for the issuing of the licence.[206]

Licensing conditions include permitted and prohibited activities. Although the terms of the licence tend to vary, it is possible to identify a common pattern according to which conditions are structured. Permitted activities include the reproduction of products and use of the products for internal use, permission for subcontractors to use products on behalf of the licensee, and the generation of derived and value-added products. Prohibited activities comprise further distribution of products to a third party, sales of products, and sub-licensing without notification and authorization.[207]

In any case, the commercial resale of the data is not allowed unless the licensee is an authorized value-added reseller. Prohibited activities tend to vary depending on the choice of the licensor and thus impact the dissemination in different ways. Some entities adopt a very restrictive approach towards further distribution and the treatment of the data, while others are less restrictive. For example, under the licences issued by Digital Globe end-users can share the data with affiliated entities by

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205 See at www.disasterscharter.org/web/charter/map, last accessed 15 April 2014.

206 See Smith & Doldirina, *supra* n. 90, 27.

207 *Ibid*.

means of a joint project, only if they consent to be bound by the licence's conditions and if they agree that upon completion of the project affiliated entities are not entitled to retain the data.[208]

Overall, data generators limit further distribution and sharing of data with third parties. This is evident from the higher levies imposed by data generators in the case of multiple users' sharing of data. This approach is particularly detrimental in the field of environmental protection and disaster management, as it may create obstacles to the implementation of programmes based on the principle of sharing of data among operators and users.

One should not forget that data generators tend to protect their products by means of intellectual property rights.[209] Remote sensing data and products are the result of substantial financial investments and technical achievements; thus, it is understandable that data generators apply intellectual property rights to safeguard their efforts and assets. Commonly the ownership of data stays with the data generators and copyright is claimed by them over their products.

Clearly, the imposition of intellectual property rights influences access to and distribution of data. Intellectual property rights create impediments to the free flow of data and information, as well as creating obstacles to the growth of the value-added sector. This trend can be keenly witnessed in Europe, where public authorities claim copyright on the results of their activities and do not always classify data and information they possess as a public good.[210] Nevertheless, in spite of the practice of claiming such rights, it is doubtful whether the intellectual property rights of the data generator are actually safeguarded. In fact, it is virtually impossible to exercise an absolute control over the flow of data, especially considering the technological means to spread information and products in real time.[211]

Furthermore, several images and products are now available on the Internet and can easily be used and reproduced in violation of copyright. Complications also arise as each data supplier is bound by the intellectual

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[208] See http://nsidc.org/data/barrow/digitalglobe_license_form.html, last accessed 15 April 2014.

[209] See further *infra*, esp. § 18.2.

[210] *Cf.* Smith & Doldirina, *supra* n. 90, 28.

[211] See further M. Mejia-Kaiser, Proprietary Rights in Remote Sensing Images, in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (1996), 30 ff.; M. Mejia-Kaiser, The 1989 Berlin Court Decision on Copyright to a Space Remote Sensing Image, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 91 ff.

property law of the nation whose jurisdiction covers the data supplier. Many national laws require certain degrees of human intellectual intervention, hence it is particularly questionable as to whether they apply to raw data and processed data.[212]

Overall, although access and pricing policies are decided independently by data generators, absolute certainty and protection of intellectual property rights depends on the characteristics and strengths of the existing legal regime applicable to remote sensing activities, in particular on the suitability of intellectual property rules to protect satellite images and on the gaps that might exist between the existing regime and the practice of data generators.[213]

Another issue, which while being largely unaddressed within the existing legal regime still substantially affects the relation between data generators and end-users, is the liability for damage arising in relation to remote sensing activities. International space law establishes international liability of a 'launching State' for the damage caused by its space object or its component part in space or on earth. Without doubt, this includes liability in cases where a remote sensing satellite falls on the earth's surface and causes damage.[214] However, no provisions deal with other types of damage associated with satellite remote sensing, such as damage which arises from relying on inaccurate data and/or misuse of data. Any person, either natural or juridical, and state is potentially exposed to the risk of liability connected with this kind of damage. Data suppliers bear liability risks in cases where aid workers are injured as a result of inappropriate instructions or when users suffer damage caused by the inaccuracy of the provided data. On the other hand, users may suffer a risk of liability if misuse of data causes damage to data suppliers or to third parties.

Under the current uncertain legal regime the damaged parties may face negative consequences. Users may not recover compensation for the loss they incur. It is significant that data generators have the tendency to waive any kind of liability associated with the use of data. At times it can also be challenging to prove the causal link between the use of data and the damage. As a result, users may be less confident to use data for

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212 *Cf.* M. Mejia-Kaiser, Satellite Remote Sensing Data in Databases Copyright or sui generis Protection in Europe?, 22 *Annals of Air and Space Law* (1997), 496.

213 This, and other issues related to the application of intellectual property rules to satellite images and products are discussed, *infra*, § 18.2, so they are not addressed in further detail here.

214 See also *supra*, § 2.3.3, esp. § 2.3.3.2.

critical decision-making that significantly affects either their interests or third parties. Also suppliers may face unnecessary litigation costs under uncertain liability. This fact can make them reluctant to provide data, particularly on a voluntary basis.

This is also where the famous ‘Good Samaritan’ principle may come in, for example in the context of the International Charter for Space and Major Disasters. The doctrine has been used widely – and rather differently – in different jurisdictions throughout the world.[215] In essence, application of the principle ‘prevents a rescuer who has voluntarily helped a victim in distress from being successfully sued for “wrong-doing.” Its purpose is to keep people from being so reluctant to help a stranger in need for fear of legal repercussions if they made some mistake in treatment.’[216]

What the ‘Good Samaritan’ principle means in the context of the Charter, however, and whether its main criteria and parameters are overruled by it, remains an issue to be dealt with in further detail. For example, the principle is usually found to apply only when there is no specific (legal) obligation resting upon someone to come to the rescue. Are states or governmental agencies in the possession of relevant knowledge, alternatively of technological means to easily acquire such knowledge, however, not obliged to share such information? In other words, do the Charter partners qualify as ‘Good Samaritans’ so as to be able to invoke this principle in their defence?

In conclusion, while the existing policies regulating the distribution and use of remote sensing data represent an essential factor enabling the flow of remote sensing products worldwide, they are far from flawless and in many respects lack the required legal precision and clarity. Indeed, as a consequence they create barriers to accessing data, discriminate in terms of users, reduce commercial opportunities, do not adequately protect the position of users in case of damage caused by the use of the provided data, and finally do not ensure adequate protection against violation of intellectual property rights over remote sensing data. While some of these problems could, in theory, be addressed and possibly solved on a bilateral basis between data generators and end-users, ideally adequate solutions should be developed at the international level.[217] The

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[215] See e.g. Ito, *supra* n. 3, 177–80, 193–4, 266–7; von der Dunk, *supra* n. 202, 31.

[216] See http://pa.essortment.com/goodsamaritanl_redg.htm, last accessed 15 April 2014.

[217] *Cf.* also Ito, *supra* n. 3, 64.

latter approach, although preferable, faces numerous obstacles due to economic and political interests related to remote sensing activities.

9.5 CONCLUSION

Remote sensing from space influences decision-making and affects the lives of millions of people on a worldwide scale. The use of remote sensing satellites has changed our understanding of the earth climate and enabled a better management of land, sea and natural resources.

In recent years, the usefulness of remote sensing data has produced two phenomena: an increase in the number of remote sensing satellites operators and a wider request to access and use remote sensing-derived products. The existing legal framework regulating remote sensing activities has managed to handle these phenomena in a rather contradictory way: on one side, it has enabled the launch and operation of remote sensing systems by both governmental and non-governmental actors as well as the distribution of data and products across the world; on the other side, it has not been able to avoid various barriers being imposed to the access and use of remote sensing products and to adequately and coherently address the issues related to the rights and obligations of data generators, distributors and users.

Notably, despite the stated goals of commercializing remote sensing data and products, the number of restrictions on access is rising. This fact has led scholars to call for a reorganization of the international rules governing the distribution and use of remote sensing products. In any case, it is significant that in the last decade, in recognition of the social and public benefits deriving from the use of remote sensing-derived products, space actors have launched initiatives aimed at sharing their space resources and allowing the free distribution of these products to those in need, particularly from the less-developed states. Such a trend, which has been particularly visible in the field of natural disaster management and rescue operations, can be considered as one of the best practical means to implement the dictates of Article I of the Outer Space Treaty, providing: 'The exploration and use of outer space … shall be carried out for the benefit and in the interests of all countries'.

10. Legal aspects of satellite navigation

Lesley Jane Smith

10.1 INTRODUCTION

Global Navigation Satellite Systems (GNSS) belong to a fast-growing field of international space activities that have become the primary method for navigation and localization around the world.[1] The variety of GNSS applications developed over the previous decades that require precise positioning and timing in their operations and impact on almost all areas of navigation, modern logistics and numerous other fields is vast. These GNSS applications constitute an important contribution to navigation, not only from an economic perspective, but also in relation to the legal issues they raise.

While not subject to any one specific set of GNSS rules, the legal issues raised through the range of operations of GNSS applications continues to attract interest. There is no one comprehensive table of answers or rules applicable to GNSS operations. This is because the characteristics of GNSS, a high-technology tool that has been developed to assist various logistical operations that take place in virtual and terrestrial terms, are hybrid. The technology forms an integral part of the services which are offered in modern communication, observation and navigation technology, with various levels of legal relations existing between those producing, operating and retailing this technology, and not least, its users.

The impact and significance of GNSS is now what the development of postal and communication services represented to society in the nineteenth century, with one great exception: it is a high-impact, international system of communication and navigation, but without a single international union of states responsible for its operations.

That not all legal questions raised by GNSS operations have therefore been accorded a tailor-made response goes without saying; there has

[1] See N. Ward *et al.*, The Role of GNSS in E-Navigation and the Need for Resilience; General Lighthouse Authorities, Research & Radio Navigation Directorate, 2010, www.gla-rrnav.org/publications/index.html, last accessed 15 January 2014.

been interest in, but no decisive moves to introduce either a union of GNSS systems or a regulatory community of states taking on the form of an international convention. This reflects a lack of willingness at a political level to invest in an international regulatory body; it also reflects the interest in regional independence between the planned GNSS systems. Finally, it shows some hesitation in accepting structured legal obligations arising from integrated GNSS system owners/providers towards the various interest and user communities involved. The fact that GNSS systems are for the most part provided free of charge is a further related complexity from a liability perspective.

United States v. Jones,[2] a US Supreme Court case decided in 2011 relating to the use of GPS tracking devices as a surveillance measure by US government officials, is but one response to the spectrum of GNSS-related legal issues that such technological applications raise. Legal issues concerning the utilization of GNSS data vary according to the specific up- or downstream technology and type of data in the particular sector. This may involve passenger-related carriage at commercial or private level, online banking services or even security-related measures and services designed to ensure cargo or personal protection during transport. There is no one finite category of the various upstream and downstream products and services that are available. As a result, the scope of differing legal rules potentially applicable within this sector is equally broad.[3]

This chapter first offers a detailed analysis of the scope of GNSS systems and the particular applications, and thereafter continues with an analysis of the legal rules applicable to GNSS *de lege lata*. It reflects on whether there is a need to expand on a dedicated GNSS legal regulation in future, notably in the context of liability. The technical background of the different GNSS systems and their organizational structures are discussed along with legal questions stemming from their operations. Some explanation is provided on the contemporary GNSS applications market and on potential applications. This includes an appreciation of their reliability, particularly as to whether there is a need for the introduction of an international GNSS convention governing third-party

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[2] *United States, Petitioner v. Antoine Jones*, 565 U.S. 3 (2012), www.supremecourt.gov/opinions/11pdf/10-1259.pdf, last accessed 15 January 2014; on warrantless installation of a GPS tracking device by the US government, which constituted a violation of the Fourth Amendment.

[3] Some legal systems may classify the use of GPS tracking as a breach of data protection and privacy, for Germany, see K. Cornelius, Strafbarkeit einer GPS Überwachung, 46 *Neue Juristische Wochenschrift* (2013), 3340.

liability. In addition, the interaction between augmentation systems and GNSS is discussed from a technical perspective and their impact on the rules of liability for GNSS is thereafter reviewed.

10.2 THE CURRENT GNSS SYSTEMS

10.2.1 Basic Technical Aspects

The GNSS systems, which have become the primary means for most navigation and positioning purposes, provide highly precise positioning and timing information. The four major systems, namely the American NAVSTAR GPS, the Russian GLONASS, the European Galileo and the Chinese Beidou (Compass) share very similar technical features and structures, which allow for comparable accuracy.[4]

Every GNSS is composed of three main segments, the space, the ground and the user segment. The GNSS space segment consists of a constellation of 24 to 30 satellites, which orbit the earth at an orbital height of approximately 19,000 to 24,000 km. Each of these GNSS satellites emits a signal to earth, which contains the satellite's position and time. The distance from the satellite to the receiver is calculated through the time transmitted. In order to measure the distance as accurately as possible, the chronometry is carried out by an atomic clock. In other words, the more precisely time is measured, the more precise the localization. The information from four satellites is sufficient for the GNSS receiver to determine its position on earth.[5] An uplink operations centre controls the satellites and monitors their proper functionality, so that malfunctioning can be limited to a minimum. Despite the similarities in the technical structures, major differences exist in the organizational and management structures of the different navigation systems. These are expanded further below.

10.2.2 Organizational Structures and Services

10.2.2.1 The Global Positioning System (GPS)

The GPS satellite navigation system, operated by the US Department of Defense (DOD), is divided into a space, a control and a user segment.

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[4] See B. Bhatta, *Global Navigation Satellite Systems Insights to GPS, GLONASS, Galileo, Compass and Others* (2010), 49 ff.

[5] *Cf.* www.gps.gov/systems/gps/space/, last accessed 15 January 2014.

The space segment consists of a constellation of at least 24 satellites, that are divided over six circular orbits, with at least four satellites in each orbit.[6]

The control or ground segment is further divided into a Master Control Station (MCS) located in the United States and four monitoring stations, which are unmanned and located around the world. The monitoring stations aid the MCS in collecting information about the orbits of the satellites. By sending this received signal information to the MCS, the data can be evaluated and transmitted back to the satellites. The corrections focus on adjusting the satellite's orbit, as well as correcting difference in elapsed time.[7] The user segment consists of all technical equipment required to receive the GPS signal and calculates the exact position and time.

The organisational and management structures of the NAVSTAR GPS are built around the permanent National Executive Committee for Spaced-Based PNT, established under the National Security Presidential Directive 39 (NSPD-39).[8] Figure 10.1 illustrates the National Executive Committee's composition and the relations between the departments and agencies involved.

The National Executive Committee is chaired by the Deputy Secretaries of Defense together with the Deputy Secretaries of Transportation and exercises a determining role in advising and coordinating within the decision-making process. While the responsibilities for the supervision and operation of the GPS satellite constellation lie with the DOD, the Department of Transportation (DOT) holds the responsibilities for the civil augmentation systems.[9] The GPS system is mainly managed by the DOD, but as of 2008 the DOT provides appropriations to the DOD for the maintenance of its civil programme.[10] The National Space

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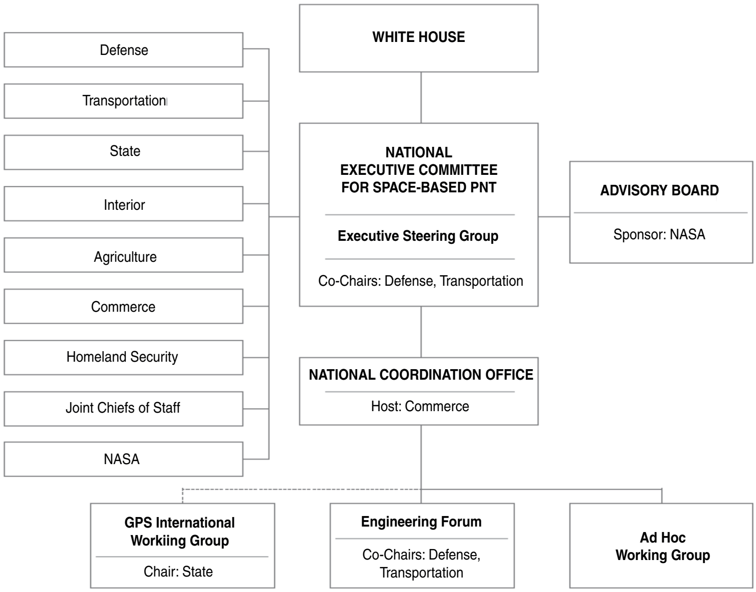
6 See U.S. Coast Guard Navigation Center – NAVCEN MS 7310, Alexandria, www.navcen.uscg.gov/?pageName=GPSmain, last accessed 15 January 2014.

7 See R. Lewis *et al.*, *Building a Multinational Global Navigation Satellite System: An Initial Look* (2005), 16.

8 Federal Radionavigation Plan (2010), Department of Defense, DOT-VNTSC-RITA-08-02/DoD-4650.05. For more information on the specific directive, see www.fas.org/irp/offdocs/nspd/nspd-39.htm, last accessed 15 January 2014.

9 See Lewis, *supra* n. 7, 2.

10 For more specific information on the GPS budget, see www.gps.gov/policy/funding/, last accessed 15 January 2014.



Source: 2010 Federal Radionavigation Plan, Department of Defense, DOT-VNTSC-RITA-08-02/DoD-4650.05, 2-12.

Figure 10.1 National Space Based PNT management structure for GPS

Policy[11] gives the Secretary of Defense primary responsibility for providing resources for GPS development, acquisition, operation, sustainment and modernization. The policy also states that the Secretary of Transportation shall provide resources to the Secretary of Defense for assessment, development, acquisition, implementation, operation and sustainment of additional designated GPS civil capabilities, beyond the second and third civil signals.

The GPS provides two main services, namely, the civilian GPS service or Standard Positioning Service (SPS) and the military GPS service or Precise Positioning Service (PPS). Since the Selective Availability restriction was removed, both services allow for an equivalent horizontal accuracy of about 7.8 metres.[12] The main differences lie, firstly, in the

[11] National Space Policy of the United States of America, 28 June 2010; see www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf, last accessed 15 January 2014.

[12] For more detailed technical information concerning the SPS, see www.gps.gov/technical/ps/2008-SPS-performance-standard.pdf, last accessed 16

PPS's utilization of two frequencies, allowing it to compensate for ionospheric effects that can constrain the accuracy better than the SPS and, secondly, in an improved reliability and jam resistance of the PPS.[13]

10.2.2.2 The Global Navigation Satellite System (GLONASS)

The GLONASS satellite navigation system, which is under the supervision of the Russian Ministry of Defence, consists of 21 regular operational satellites and four spare satellites, which are divided into three orbital planes with up to eight slots.[14]

The space segment (satellite constellation) is similar to the GPS space segment. The GLONASS system is further categorized into a control and user segment. The control segment is composed of a system control centre, namely, the Coordination Scientific Information Centre (KNITs)[15] and five monitoring stations, all of which are located on Russian territory. An expansion of the network of monitoring stations is expected.[16] The user segment is represented by all individual devices needed to receive the GLONASS signal and compute the individual location. After an initial struggle, due to the late market entry of the system,[17] the GLONASS user segment has latterly been able to increase the implementation of its signal receivers.[18]

April 2014; and for the PPS, see www.gps.gov/technical/ps/2007-PPS-performance-standard.pdf, last accessed 16 April 2014.

[13] For further information see e.g. www.gps.gov/systems/gps/performance/accuracy/, last accessed 16 April 2014.

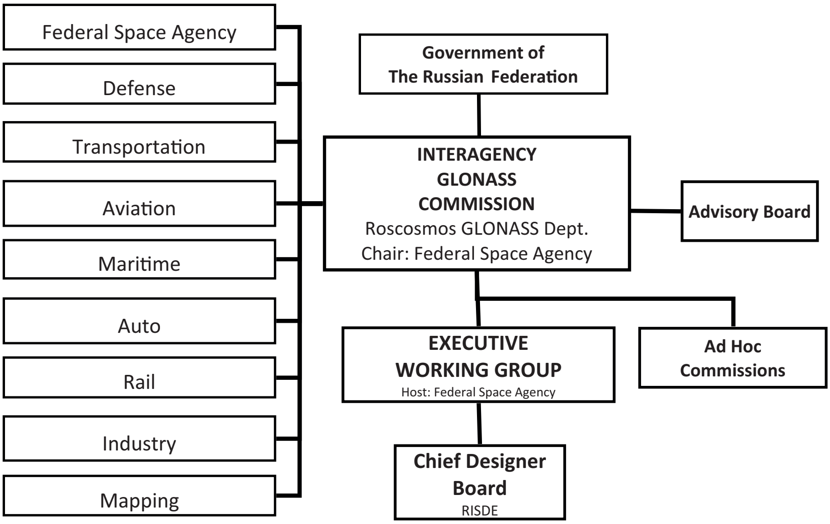
[14] For the latest information concerning the GLONASS satellite constellation, see www.glonass-ianc.rsa.ru/en/GLONASS/, last accessed 15 January 2014.

[15] See G. Kirk, GPS Modernization, GLONASS Augmentation and the Status of Galileo – Benefits for Heavy and Highway Contractors, Trimble Construction Division (2007), 2, www.trimble-productivity.com/media/pdf/whitepaper_GPS_GLONASS_Galileo_construction.pdf, last accessed 16 April 2014.

[16] See Current Planned Global and Regional Navigation Satellite Systems, United Nations Office for Outer Space Affairs, International Committee on Global Navigation Satellite Systems Providers' Forum, New York, 2010, 14.

[17] For more detailed information concerning this initial hurdle, see http://news.bbc.co.uk/2/hi/8595704.stm, last accessed 16 April 2014.

[18] The GLONASS receiving devices are implemented in various contemporary cell phone and tablet devices, which constitute the biggest market for GNSS receiving devices; cell phones implementing GNSS, such as Apple (see www.apple.com/iphone/specs.html, last accessed 15 January 2014), and Sony (see http://developer.sonymobile.com/wp/2012/01/19/glonass-support-in-our-latest-xperia-phones/, last accessed 15 January 2014) are good examples.



Source: GLONASS Status and Progress (S. Revnivykh, Central Research Institute for Machine Building, 3d meeting of the International Committee on GNSS (ICG), December 2008, p. 28; www.oosa.unvienna.org/pdf/icg/2008/icg3/04.pdf %5B).

Figure 10.2 Interagency GLONASS Commission management structure

The management responsibilities for GLONASS were originally held by the Russian Ministry of Defence (MOD). Since the Federal Mission Oriented Program (FMOP) was established in 2002, however, many of those responsibilities shifted towards the Russian Space Agency (Roscosmos).[19] The contemporary management structures of the GLONASS navigation system (see Figure 10.2) provide that the responsibilities concerning the development and operation of the system were to be held jointly by the MOD as well as Roscosmos. Roscosmos is also responsible for the development of the GLONASS augmentation system, while the Federal Agency of Industry, together with the MOD, will supervise the development and production of the user segment. The funding for the entire system is received directly through the Russian federal budget.[20] In

[19] See www.oosa.unvienna.org/pdf/sap/2004/vienna/presentations/wednesday/pm/revnivyk.pdf, last accessed 16 April 2014; at 2.

[20] See M. N. Krasilshchikov, The Federal Russian Mission Oriented Program 'GLONASS' and State Concept of the United Positioning, Navigation and Time System, SAE Meeting, October 2006, http://acgsc.org/Meetings/Meeting_98/Subcommitte%20B/6.1.PPT, last accessed 16 April 2014.

order to rebuild the GLONASS system a general budget for its reconstruction was approved by Government Resolution No. 587 of 20 August 2001. This initial programme was scheduled to last from 2002 until 2011; however, with a view to expediting the systems deployment, an additional programme (as per Government Resolution No. 423 of 14 July 2006) was put forward, providing additional funding.[21]

GLONASS provides a Standard Precision (SP) signal and a High Precision (HP) signal. Similar to the American GPS, one signal is publicly accessible and one signal is reserved for military or governmental purposes.[22] The authorized signal, namely the HP service, is accessible not only to Russian authorities, but also to the Indian officials.[23] Such access or even interoperability is a sign of international understanding between the relevant countries.[24]

10.2.2.3 Galileo

The European Galileo satellite navigation system (GNSS Galileo Programme) belongs to the European Union as a supranational governmental organization. The European Union has, since the entry into force of the Lisbon version of the Treaty on European Union[25] and the introduction of Article 47 thereof,[26] a legal personality separate from that of its member

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[21] See www.oosa.unvienna.org/pdf/sap/2006/icg/02-1.pdf, last accessed on 16 April 2014.

[22] The GLONASS Interface Control Document provides more detailed technical information on each signal and can be inspected at http://gauss.gge.unb.ca/GLONASS.ICD.pdf, last accessed 16 April 2014.

[23] For more information concerning the Indian–Russian agreement, see www.flightglobal.com/news/articles/india-and-russia-to-revive-glonass-191325/, last accessed 16 April 2014.

[24] See also Art. 5, Regulation of the European Parliament and of the Council on the implementation and exploitation of European satellite navigation systems and repealing Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council, No. 1285/2013/EU, of 11 December 2013; OJ L 347/1 (2013), which now regulates the compatibility and interoperability of Galileo GNSS and EGNOS. It makes provision for further international agreements to be concluded by the European Commission relating to Galileo, including interoperability.

[25] Treaty on European Union as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (hereafter Consolidated version of the Treaty on European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 326/13 (2012).

[26] Art. 47, Consolidated version of the Treaty on European Union, *supra* n. 25, simply provides: 'The Union shall have legal personality.'

states, as well as an independent legal system and jurisdiction over matters of substantive European law. The Galileo navigation system was originally subdivided into four phases,[27] of which two main phases, the In-Orbit Validation (IOV) phase and the Full Operational Capability (FOC) phase are more commonly known. Unlike GPS or GLONASS, Galileo GNSS has not yet reached FOC, and the deployment phase has to be completed by 31 December 2020.[28] During the IOV phase, preliminary testing was carried out on two experimental satellites (GIOVE-A and GIOVE-B), together with four operational satellites,[29] on which positioning tests were thereafter conducted.[30] The remaining satellites are currently under construction.[31] The FOC phase includes an initial operational capability phase, during which basic operational requirements are provided by an infrastructure of 18 satellites that are expected to be in orbit by the end of 2014. On completion of the system in 2020, there will be 30 satellites in operation.[32]

The original Galileo management structure was initially conceptualized as a Public–Private Partnership (PPP), in the form of a Joint Undertaking between the private and the public sector.[33] This was subsequently

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[27] The four phases (definition; development and validation; deployment; exploitation) were specified in the – since repealed – Regulation of the European Parliament and of the Council on the further implementation of the European satellite navigation programmes (EGNOS and Galileo), No. 683/2008/EC, of 9 July 2008; OJ L 196/1 (2008), and are now reinstated in Art. 3, Regulation 1285/2013, *supra* n. 24.

[28] For the latest information concerning the status of Galileo, see www.gsa.europa.eu/galileo/programme, last accessed 15 January 2014.

[29] The IOV Phase was set for the time frame 2008–2013, the GIOVE-A and GIOVE-B satellites were already launched in 2011 and the other operational satellites are expected to launch soon. For updated information see further www.esa.int/Our_Activities/Navigation/The_future_-_Galileo/What_is_Galileo, last accessed 7 February 2014.

[30] First steps of Galileo – European satellite navigation system achieves its first position fix; Press release, IP/12, Brussels, 12 March 2013.

[31] Deployment is to be completed by 31 December 2020; see Art. 3(c), Regulation 1285/2013, *supra* n. 24.

[32] For more Information concerning the IOV or FOC phases, see ESA's Galileo fact sheet, http://download.esa.int/docs/Galileo_IOV_Launch/Galileo_factsheet_20120321.pdf, last accessed 16 April 2014.

[33] The concept of a Joint Undertaking was laid down in Progress report on the GALILEO research programme as at the beginning of 2004, COM/2004/0112(final), 52004DC0112; more generally and formally established by Art. 187, Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the

replaced by an entirely publicly financed structure (see Figure 10.3). The Galileo system is funded by the European Union, with the European Space Agency (ESA) acting as its contracting authority under a specific delegation agreement between both organizations.[34] Supervision over its operations is held by the European Commission and delegated to its specialist agency, the European GNSS Supervisory Authority (GSA).[35]

The responsibilities of the European Commission on behalf of the European Union lie in ensuring the monitoring and development of the programme, as well as ensuring the security of the system and taking an active role in the decision-making process. The European Union has the power of disposition over the Galileo budget and plays the most significant role in matters of funding.[36] The GSA, as an agency of the European Union,[37] is currently preparing concepts for the Galileo exploitation phase, conducting market analyses for future applications, as well as monitoring potential security threats of the system.[38]

European Community (hereafter Treaty on the Functioning of the European Union), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 326/47 (2012). The Joint Undertaking itself was formally established by means of Council Regulation setting up the Galileo Joint Undertaking, No. 876/2002/EC, of 21 May 2002; OJ L 138/1 (2002).

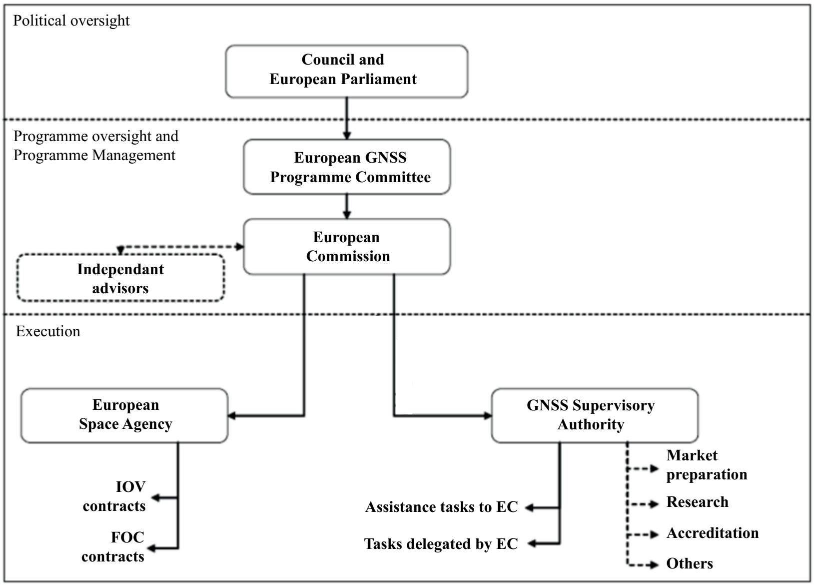
[34] See Art. 12, Regulation 1285/2013, *supra* n. 24. *Cf.* more generally for an update on the latest division of institutional responsibilities in the current deployment phase and relations between the Commission, ESA and the GSA, Arts. 12–15.

[35] The European GNSS Supervisory Authority's current structures were mapped out in Regulation of the European Parliament and of the Council setting up the European GNSS Agency, repealing Council Regulation (EC) No 1321/2004 on the establishment of structures for the management of the European satellite radio navigation programmes and amending Regulation (EC) No 683/2008 of the European Parliament and of the Council, No. 912/2010/EU, of 22 September 2010; OJ L 276/11 (2010); and are further specified for the exploitation phase in Art. 14, Regulation 1285/2013, *supra* n. 24.

[36] The tasks of the Commission were originally outlined in Regulation 683/2008, *supra* n. 27, which has now been replaced by Regulation 1285/2013, *supra* n. 24, notably Art. 12 thereof, together with a new Financial Regulation, Regulation (EU, Euratom) of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002, No. 966/2012, of 25 October 2012; OJ L 298/1 (2012).

[37] A list of all EU Agencies can be found through http://europa.eu/about-eu/agencies/index_en.htm, last accessed 16 April 2014.

[38] A full list of all responsibilities of the GSA can be found at www.gsa.europa.eu/gsa/organisation, last accessed 15 January 2014.



Source: Galileo Public Sector Governance (Communication from the Commission to the European Parliament and the Council – Progressing Galileo: re-profiling the European GNSS Programmes, COM (2007) 534 final, of 19 September 2007, at 10).

Figure 10.3 Galileo organizational structure

The responsibilities of the European Space Agency are contained in a multi-annual delegation agreement,[39] which transfers the technical responsibilities of installing the system as well as taking monitoring and inspection measures concerning the technical reliability of the constellation and parts thereof.

The Galileo navigation system will provide five distinct services as follows:[40]

[39] The multi-annual delegation agreement was contained in Art. 24, Regulation 683/2008, *supra* n. 27. This has now been repealed and updated by Regulation 1285/2013, *supra* n. 24, which refers in Art. 15 to the delegation agreement concluded under Regulation 966/2012, *supra* n. 36, on the financial rules applicable to the general budget.

[40] See Art. 2(4)(a)–(d), Regulation 1285/2013, *supra* n. 24. For more information on the Galileo services, see www.gsa.europa.eu/galileo/services, last accessed 16 April 2014.

1. Open Service (OS): The OS will be publicly accessible and free of charge, with an accuracy similar to other leading public GNSS services.
2. Safety-of-Life Service (SOL): The SOL will be designated for safety-critical applications and also compliant with the aviation APV-I (Approach with Vertical Guidance) requirements,[41] as defined by ICAO in Annex 10 … as well as Open Sky Regulations.[42]
3. Commercial Service (CS): The CS will, unlike the OS and the SOL, make use of two frequencies and therefore provide higher accuracy.
4. Public Regulated Service (PRS): The PRS will utilize two encrypted frequencies and will only be authorized to selected governmental institutions.

Additionally, as a fifth service the Galileo programme will support the COSPAS-SARSAT SAR rescue network by detecting distress signals transmitted by beacons and relaying messages to them and to a designated Rescue Coordination Centre.[43]

10.2.2.4 Beidou-2/Compass

As with the European Galileo system, the Chinese Beidou-2 or Compass system is not yet fully operational, and still under development. The programme is divided into three phases and has already entered its second, or deployment phase. A total of 16 satellites have been launched into orbit, 14 of which are currently operational.[44]

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[41] See Safety of Life Service Definition Document, Ref: EGN-SDD SoL, V2.0; www.essp-sas.eu/downloads/hokiog/egnos_sol_sdd_in_force.pdf, last accessed 15 January 2014.

[42] See Convention on International Civil Aviation (hereafter Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300; International Standards and Recommended Practices and Procedures for Air Navigation Services, Annex 10, Aeronautical Telecommunications, Vol. II, Communication Procedures including those with PANS status, 6th edn., October 2001.

[43] See Art. 2(4)(e), Regulation 1285/2013, *supra* n. 24.

[44] See www.insidegnss.com/node/3590, last accessed 15 January 2014.

The complete constellation of the Beidou-2 system will contain 30 satellites in a medium earth orbit (MEO) and five satellites in geostationary orbit.[45] This will constitute Beidou's third phase, namely, the operation and replacement phase. The control segment will be composed of a Master Control Station (MCS), Upload Stations (US), and a network of globally distributed Monitor Stations (MS).[46]

The Beidou-2/Compass system is owned by the Chinese government and operated by its military.[47] Specific information concerning the organizational or financial structures as well as the procuring corporations or organizations of the system have not yet been made public. However, two official documents have been released to date,[48] namely, a Beidou Interface Control Document (ICD)[49] and a development report of the Beidou system,[50] and an official Chinese website has been developed.[51] Beidou is to offer an open and an authorized service on a global level; the authorized service will include a regional augmentation service and a short message service.[52]

10.2.3 Regional Satellite Navigation Systems

The Regional Satellite Navigation Systems (RNSS) are, just like the GNSS, independent operating satellite based navigation systems that provide precise positioning and timing services. From their technical prescription, the RNSS are similar to the GNSS, divided into the standard operational segments, the main difference being that the reception area of

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[45] See Current planned global and regional navigation satellite systems, *supra* n. 16, 35.

[46] Bring the World and China to Your Doorstep, China Satellite Navigation Office Beidou, June, 2012, www.oosa.unvienna.org/pdf/pres/copuos2012/tech-07.pdf, last accessed 16 April 2014.

[47] See UNIDROIT 2010 Study LXXIX – Preliminary Study, March 2010, 6.

[48] See Current planned global and regional navigation satellite systems, *supra* n. 16, 38; Bring the World and China to Your Doorstep, *supra* n. 46, at 11.

[49] See Beidou Navigation Satellite System Signal in Space Interface Control Document (Test Version); www.beidou.gov.cn/attach/2011/12/27/2011122773f3be6124f7d4c7bac428a36cc1d1363.pdf, last accessed 15 January 2014.

[50] See Report on the Development of Beidou (Compass) Navigation Satellite System (V1.0), www.beidou.gov.cn/attach/2011/11/29/201111292061d0391c074ed0bee7493617237c88.pdf, last accessed 15 January 2014.

[51] The official Beidou website does not provide an English translation; further comment is therefore not possible. See www.beidou.gov.cn/, last accessed 15 January 2014.

[52] See Report on the Development of Beidou (Compass) Navigation Satellite System (V1.0), *supra* n. 50.

the system is regionally limited. This means that there is a lower number of satellites and ground stations. Many countries which have installed RNSS see these as a cost-effective alternative to the current major GNSS systems, as independent implementation and operation are possible.

10.2.3.1 Beidou-1

The Beidou-1 system, also referred to as Beidou Navigation Satellite Demonstration System, is a preliminary regional satellite-based navigation system, which has been extended to become the Beidou-2/Compass or Beidou Navigation Satellite System.[53] The Beidou-1 system was installed in the year 2000 and its signal has been publicly accessible since 2003.[54]

The system consists of three satellites in a geostationary orbit. As with the current Beidou-2 system, it provides a civil and an authorized service, with a short message service included in the latter.[55] The Chinese government holds the ownership of the system and provides the funding. However, most of the Beidou-related documents are not available for public viewing, although various official documents regarding the Beidou system as well as the latest report are listed on the official Beidou website, along with other policy statements.[56]

10.2.3.2 The Quasi-Zenith Satellite System (QZSS)

The Quasi-Zenith Satellite System (QZSS) is a Japanese RNSS, which can operate independently but also function as a GPS augmentation system. The initial system consists of three satellites in a highly elliptical orbit (HEO) and was expected to become operational as of 2013.[57]

In relation to its funding, the Japanese government tried unsuccessfully to establish a basis of collaboration between the private and the public sector. The current structure foresees private involvement, but not in the form of a PPP as originally envisaged.[58] The key organisation of the QZSS system is the Satellite Positioning Research and Application

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[53] See *ibid*.

[54] See www.dragoninspace.com/navigation/beidou.aspx, last accessed on 15 January 2014.

[55] See Report on the Development of Beidou (Compass) Navigation Satellite System (V1.0), *supra* n. 50.

[56] See http://en.beidou.gov.cn/beidoupolicy.html, last accessed 15 January 2014.

[57] See www.navipedia.net/index.php/QZSS, last accessed 16 April 2014.

[58] For further details see www.crcsi.com.au/Research/1-Positioning/1-11-Japanese-QZSS, last accessed 15 January 2014.

Center (SPAC), which carries out the main governmental task by interacting with the academic, industrial, research and other procuring parties.[59] The Japanese Basic Space Law (2008) established the strategic Headquarters for Space Policy, which supervises the QZSS programme.[60]

10.2.3.3 The Indian Regional Navigation Satellite System (IRNSS)

The Indian Regional Navigation Satellite System (IRNSS), which is to offer its services over the broader area of the Indian subcontinent, launched its first satellite in July 2013 and is scheduled to become fully operational by mid-2015.[61] The system will consist of seven geostationary satellites and provide a standard and a precision service.[62] The system will be funded by the Indian government and is currently developed by the Indian Space Research Organisation (ISRO). The budget proposals for the Department of Space for 2013–2014 have been formulated under the framework of Decade Profile 2010–2020 and the Twelfth Five Year Plan (2012–2017). The formulation of an Indian Satellite Navigation Policy to facilitate the growth of satellite-based navigation applications is also to be pursued.[63]

10.2.4 GNSS Augmentation

The GNSS augmentation systems, which increase the accuracy and availability of the actual GNSS, originally emerged against the backdrop of augmenting the US GPS system, as it was the only fully operational

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[59] See www.space.mict.go.th/activity/doc/aprsaf15_19.pdf, last accessed 16 April 2014.

[60] However, the law constituted only a preliminary stage for the Japanese Basic Plan for Space Policy (2009), which further promotes the commercial utilization of space. For the Japanese Basic Plan for Space Policy, see www.kantei.go.jp/jp/singi/utyuu/basic_plan.pdf, last accessed 15 January 2014. For further information on the programme see also www8.cao.go.jp/space/english/pdf/nationalspacepolicy.pdf, last accessed 16 April 2014.

[61] See also www.isro.org/scripts/futureprogramme.aspx, last accessed 16 April 2014.

[62] For more detailed technical information, see www.oosa.unvienna.org/pdf/icg/2008/expert/2-3.pdf, last accessed 16 April 2014.

[63] Outcome Budget of the Department of Space, Government of India, 2013–2014, www.isro.org/pdf/Outcome%20budget2013-14.pdf, last accessed 15 January 2014.

system at that point in time.[64] Augmenting the GPS system became necessary for a variety of reasons, one of which was the civil demand for a more precise GPS signal than was available under its degraded public service. The GPS signal with the SA limitation would provide for a location with a horizontal accuracy of about 100 metres. In order to implement the GPS system in the civil aviation sector, as well as in the surveying and the agricultural sector, the GPS signal had to be refined to increase its precision to an expedient level.[65]

On the technical side of the GNSS augmentation systems, a distinction has to be made between Ground-Based Augmentation Systems (GBAS) and Satellite-Based Augmentation Systems (SBAS). Both make use of the Differential GPS method, allowing accurate positioning through fixed ground stations that deliver a corrected GNSS signal to the receiver.[66] The main difference between SBAS and GBAS lies in the use of satellites as relay stations in the case of the former, and in the coherent expansion of range of signal coverage.[67]

The impact of augmentation systems on considerations relating to liability is discussed further below.

10.2.5 Ground-Based Augmentation Systems (GBAS)

The various Ground-Based Augmentation Systems (GBAS) provide extremely high accuracy through a network of terrestrial ground stations that are installed regionally.[68] Safety-critical tasks, such as air traffic or precision surveying, are the most common areas where GBAS are

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[64] See Informal Consultation Meeting, Third party liability for Global Navigation Satellite Systems (GNSS), UNIDROIT 2010 Study LXXIX – Preliminary Study, March 2010, at 9.

[65] See H. Dodel & D. Häupler, *Satellitennavigation* (2004), 219.

[66] See *ibid*.

[67] See R. Prasad & M. Ruggieri, *Applied Satellite Navigation Using GPS, GALILEO and Augmentation Systems* (2005), 82. GNSS signal corrections are necessary to compensate any deliberate limitation of accuracy, and also to avoid unintentional errors of the GNSS signal by *force majeure*. These errors can result from unpredictable solar activities that lead to ionospheric effects. Any alteration of the transmitted time that changes in proportion to the satellite's velocity according to the theory of relativity can lead to a distortion of the signal. See also P.W.L. van Barneveld, O. Montenbruck & P.N.A.M. Visser, Differential Ionospheric Effects in GPS Based Navigation of Formation Flying Spacecraft, *Deutsches Zentrum für Luft- und Raumfahrt* [German Space Operations Centre (GSOC)], 2004.

[68] See Dodel & Häupler, *supra* n. 65, 219.

utilized. In order to achieve such a high accuracy, the GBAS ground stations transmit a revised GNSS signal to the receiver, located within the reception area. Depending on the system, the accuracy may vary from less than three metres[69] up to a few millimetres;[70] this depends mainly on the degree of delay in the localization process; in other words, the faster the localization information has to be received, the more inaccurate it will be.

Annex 10 of the Convention on International Civil Aviation contains provisions governing the standards to be maintained for augmentation systems used in aviation.[71]

10.2.5.1 The Local Area Augmentation System (LAAS)

The Local Area Augmentation System (LAAS) is a real-time GPS augmentation system, which is commonly implemented in areas surrounding major airports in the United States. The system provides incoming as well as departing aircraft with accurate positioning data that coincide with ICAO standards.

Although the ICAO standards provide an excellent technical regulatory framework for the incorporation of GNSS into the field of aviation, they have not been developed to fulfil all the requirements needed for the various tasks undertaken by GNSS applications. They are not therefore primarily suited as the principal regulatory regime for this segment. Developing GNSS-dedicated system rules and requirements could be one way towards enabling a safe utilization of GNSS services that are integrated and certified for the aviation sector. However, this would require a common line of approach to be put forward by the GNSS service providers and implemented, if its adoption by the air carriers and ICAO is to be ensured.

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[69] For the accuracy of EGNOS, exemplary for SBAS, see http://egnos-portal.gsa.europa.eu/discover-egnos/about-egnos/benefits, last accessed 16 April 2014. See further *infra*, § 10.4.3.

[70] Accuracies in the range of millimetres are found in post-processing services, such as the HGHPS. For more information, see Dodel & Häupler, *supra* n. 65, 226.

[71] Annex 10, Chicago Convention, *supra* n. 42, contains requirements for GBAS regarding the system's accuracy, continuity, availability and integrity. Additional specifications concerning performance and functions of GBAS can be found under 3.7.3.5.1/3.7.3.5.2 of the International Standards and Recommended Practices and Procedures for Air Navigation Services, Annex 10, Aeronautical Telecommunications, Vol. I, Radio Navigation Aids; 6th edn., July 2006.

Technically the system's range is limited to a 45 km radius, which allows for landing and take-off augmentation only. The supervision of the system is carried out by the Federal Aviation Administration (FAA).[72]

10.2.5.2 The Continuously Operating Reference Stations (CORS)

The Continuously Operating Reference Stations (CORS) are a network of ground stations, which transmit a corrected highly accurate GPS signal. The system is supervised by the US National Geodetic Survey (NGS), however, the system's structure is composed of a loose network of over 200 organisations that provide and maintain all of their respective CORS equipment. Hence, the NGS does not operate the individual site(s) and does not consider itself as the primary verifier of a site's data quality.[73] The CORS enables the NGS to take highly precise measurements, through a post-processing method, in surveying the sector. The data measurements are made publicly accessible for scientific purposes.[74]

10.2.5.3 The Nationwide Differential GPS System (NDGPS)

The Nationwide Differential GPS System (NDGPS) was devised as a system enabling the US public to make use of the GPS's open service, while still degraded by Selective Availability. It covers the main US roads and waterways and, unlike the CORS, provides a real-time GPS correction signal. The NDGPS is mainly funded by the US Department of Transportation[75] and operated by the US coastguard on behalf of the DOT.[76]

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[72] Various reports are available online relating to the details of LAAS operations. Some are submitted in response to FAA development contracts, see e.g. M.F. DiBenedetto, Review of Local Area Augmentation System (LAAS) Flight Inspection Requirements, Methodologies, and Procedures for Precision Approach, Terminal Area Path, and Airport Surface Guidance Operations, Technical Memorandum OU/AEC 07-01 TM15689/2-1, www.faa.gov/air_traffic/flight_info/avn/flightinspection/onlineinformation/pdf/tm_07-01_laas_final.pdf, last accessed 15 January 2014.

[73] Guidelines for New and Existing Continuously Operating Reference Stations, www.ngs.noaa.gov/PUBS_LIB/CORS_guidelines.pdf, last accessed 16 April 2014.

[74] For more information on the CORS, see www.ngs.noaa.gov/CORS/, last accessed 16 April 2014.

[75] The main regulation outlining the operating and financial structures is Public Law 105-66, of 27 October 1997; 111 Stat. 1425, www.navcen.uscg.gov/pdf/ndgps/ndgpsESC/backgroundDocuments/Public%20Law%20105-66.pdf, last accessed 15 January 2014.

[76] For organizational structures and concrete budget spending, see www.navcen.uscg.gov/?pageName=ndgpsMain, last accessed 16 April 2014.

10.2.5.4 The Satellite Positioning Service (SAPOS)

The German Satellite Positioning Service (SAPOS) is a project led by the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (*Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland*, *AdV*) together with the German Ministry of Transport, Building and Urban Development (*Bundesministerium für Verkehr, Bau und Stadtentwicklung*). The system generates and transmits GPS correction data for cadastre and survey purposes.

One of the reasons behind the implementation of SAPOS was to comply with the legal obligation of those administrative bodies to provide an adequate infrastructure for the German surveying sector.[77] It served the purpose of improving terrestrial navigation, by increasing the limited accuracy of GPS, which, due to its former Selective Availability restrictions,[78] was insufficient for road navigation purposes.

The infrastructural network of SAPOS contains over 270 ground stations, which utilize the GPS as well as GLONASS systems, and it covers the entire territory of Germany.[79] Three main services are provided by SAPOS, with distinct specifications (see Table 10.1).

Table 10.1 SAPOS services, overview

	HEPS	EPS	GPPS
Method	Real-time	Real-time	Post Processing
Accuracy-horizontal	0,01 – 0,02 m	0,5 – 3 m	≤ 0,01 m
Accuracy-vertical	0,02 – 0,03 m	1 – 5 m	0,01 – 0,02 m
Unit	1 minute	-	1 minute
SAPOS cost per unit	0,10 €	150,- € p.a.	0,20 €

Source: SAPOS Präzise Positionierung in Lage und Höhe Prospekt (www.sapos.de/pdf/SAPOS_Prospekt+.pdf).

[77] Legal obligations that make the general modernization of surveying methods compulsory, are not made on federal, but on *Länder* (state)-level. E.g. for the *Land* Nordrhein-Westfalen the obligation is stipulated in § 4 Abs. 1, DVOzVermKatG NRW. Further information can also be found at the website of the *Institut für Geodäsie und Geoinformation*, http://hss.ulb.uni-bonn.de/2012/2784/2784.pdf, last accessed 16 April 2014, at 28.

[78] See Dodel & Häupler, *supra* n. 65, 222.

[79] See www.sapos.de/pdf/SAPOS_Prospekt+.pdf, last accessed 16 April 2014.

10.2.6 Satellite-Based Augmentation Systems (SBAS)

This section focuses on the major governmental systems, such as WAAS, EGNOS, Beidou, MSAS/QZSS, and GAGAN. Satellite-Based Augmentation Systems (SBAS) consist of a network of ground stations and a constellation of one or more satellites in a geostationary or geosynchronous orbit[80] (see Figure 10.4).

The SBAS generally follow the same methodology utilised in GBAS, namely, the Differential GPS (DGPS). Similar to the GBAS, the SBAS receives the GPS signal on the ground and uses this data to compute a corrected signal. The main difference between the systems lies in the transmission of the corrected signal. The GBAS sends the corrected signal directly to the end-users' receiver, while the SBAS sends its corrected signal via communication satellites to the receiver. Due to the shorter range of reception, the GBAS needs a comprehensive network to cover a specific region, while SBAS can operate with a lower number of ground stations.[81] The relative advantage of each system depends on the circumstances of exploitation. While major airports utilise Ground-Based Augmentation Systems, such as LAAS, due to their superior accuracy, the SBAS are often used while the aircraft is in flight and GBAS signals are not receivable.

10.2.6.1 The Wide Area Augmentation System (WAAS)

The US Wide Area Augmentation System (WAAS) is an SBAS that provides regional coverage over the North American continent. Under the supervision of the FAA, the system was developed to increase the accuracy of the GPS, as well as ensure integrity, that is, a notice of malfunction, in the case of a signal error, by default.[82] Similar to and also compatible with other SBAS, the system functions by receiving and

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[80] The EGNOS and GAGAN SBAS utilize geostationary communication satellites, while the QZSS and WAAS system have geosynchronous orbiting satellites. For more information, see Dodel & Häupler, *supra* n. 65, 220.

[81] For detailed technical descriptions concerning the GBAS and SBAS, see Bhatta, *supra* n. 4, 187–98.

[82] Other technical regulations, such as the requirements for system accuracy, integrity, continuity and availability for the intended operation are further specified in Annex 10, Chicago Convention, *supra* n. 42. However, as these regulations are primarily of a technical nature, they do not replace a clearly structured liability scheme. Despite its status as a predominant means of navigation, GNSS regulatory aspects lack a unifying international convention. This leaves various essential legal questions largely unanswered; *cf.* International Standards and Recommended Practices and Procedures for Air Navigation

Source: EGNOS-Portal (http://egnos-portal.gsa.europa.eu/discover-egnos/about-egnos/what-sbas).

Figure 10.4 Satellite-Based Augmentation Systems overview

correcting GPS signals and transmitting them, together with a signal to ensure its integrity, via an Inmarsat satellite to the receiver.[83] The system financing is provided by the US Department of Transportation.[84]

10.2.6.2 The European Geo-stationary Navigation Overlay System (EGNOS)

The European Geo-stationary Navigation Overlay System (EGNOS) represents the European counterpart to the US WAAS. The system covers the broader European continent and, just like the WAAS, complies with the ICAO standards. This service therefore complies with the prevailing technical standards of the aviation APV-I (Approach with Vertical Guidance) requirements, as defined by ICAO in Annex 10 … .[85]

Services, Annex 10, Aeronautical Telecommunications, Vol. I, Radio Navigation Aids; 6th edn., July 2006.

83 See Dodel & Häupler, *supra* n. 65, 232.

84 For further information concerning the WAAS funding, see www.gps.gov/policy/funding/2012/, last accessed 16 April 2014.

85 See International Standards and Recommended Practices and Procedures for Air Navigation Services, Annex 10, Aeronautical Telecommunications, Vol. II, Communication Procedures including those with PANS status, 6th edn., October 2001.

EGNOS contains three services:[86] an Open Service, a Safety-of-Life Service, and the EGNOS Data Access Service, EDAS. The Open Service is publicly accessible and free of charge, while the Safety-of-Life Service will only be accessible with a certified EGNOS receiver. The most recent service is the EGNOS Data Access Service, a commercial service providing access to EGNOS ground-based data, in other words access to the information collected by EGNOS's ground stations; unlike the EGNOS Safety-of-Life Service, all liabilities are disclaimed for the EDAS.[87]

The EGNOS system was developed by ESA together with the European Commission and the European Organisation for the Safety of Air Navigation (Eurocontrol).[88] The EGNOS system is owned and funded by the European Commission and vicariously operated by the European Satellite Services Provider (ESSP) until 2021.[89]

10.2.6.3 The MTSAT Satellite Augmentation System (MSAS)

The MSAS is a Japanese Satellite-Based Augmentation System with many technical similarities to the WAAS and EGNOS system. The system utilizes two geostationary Multifunctional Transport Satellites (MTSAT); the acronym MSAS is derived from MTSAT Satellite Augmentation System.

MSAS provides an air navigation service for aircraft in flight by augmenting the GPS signal, and offers a bilateral communication service.

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[86] The specific objectives of EGNOS and its services are regulated by Art. 2(5), Regulation 1285/2013, *supra* n. 24. For the three EGNOS services see http://ec.europa.eu/enterprise/policies/satnav/egnos/edasx/index_en.htm, last accessed 15 January 2014.

[87] For specific information on the EGNOS Data Access Service, see http://ec.europa.eu/enterprise/policies/satnav/egnos/files/edas-sdd_en.pdf, last accessed 15 January 2014.

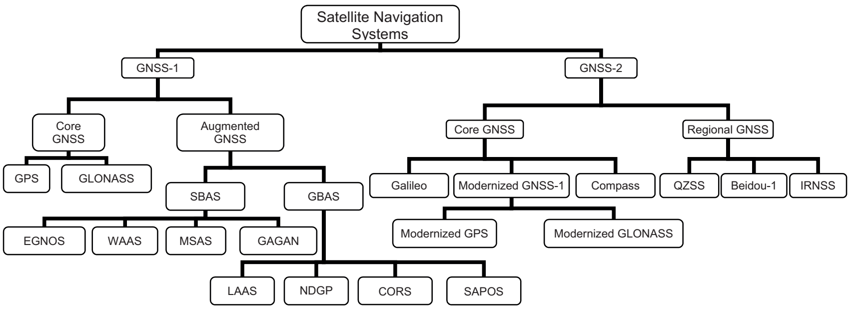
[88] See Agreement between the European Community, the European Space Agency and the European Organisation for the Safety of Air Navigation on a European Contribution to the development of a global navigation satellite system (GNSS) (hereafter Tripartite Agreement), Luxembourg, done 18 June 1998, entered into force 18 June 1998; OJ L 194/16 (1998). The details on EGNOS organizational structures contained in Regulation 683/2008, *supra* n. 27, on the further implementation of the European satellite navigation programmes (EGNOS and Galileo) have been replaced by Regulation 1285/2013, *supra* n. 24.

[89] The ESSP structures can be seen at www.essp-sas.eu/egnos_in_operation, last accessed 16 April 2014; and further information on the contract between the GSA and ESSP can be found at www.gsa.europa.eu/news/long-term-stability-egnos-secured, last accessed 16 April 2014.

The MSAS is funded and owned by the Japanese government.[90] As the Multifunctional Transport Satellites are also used for climatic analyses, they are operated by the Japan Meteorological Agency's (JMA) Meteorological Satellite Center (MSC).[91]

10.2.6.4 The GPS-Aided Geo Augmented Navigation (GAGAN) system

The Indian GPS-Aided Geo Augmented Navigation (GAGAN) system is an SBAS, expected to become operational in 2014.[92] The system will consist of two geostationary satellites and one Master Control Center (MCC). The programme's development is conducted by the Airport Authority of India (AAI) together with the Indian Space Research Organization (ISRO).[93]



Source: Revised version of the organogram of the contemporary satellite navigation systems based on that found in B. Bhatta, *Global Navigation Satellite Systems Insights to GPS, GLONASS, Galileo, Compass and Others (2010)*, 189.

Figure 10.5 Overview of the contemporary satellite navigation systems

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[90] See Dodel & Häupler, *supra* n. 65, 231.

[91] For more detailed information on the organisational structures of MSAS, see the MSC website at http://mscweb.kishou.go.jp/remark/greeting.html, last accessed 15 January 2014; as well as the MTSAT website www.jma.go.jp/jma/jma-eng/satellite/operation.html, last accessed 16 April 2014.

[92] See www.aai.aero/public_notices/aaisite_test/faq_gagan.jsp, last accessed 15 January 2014.

[93] For more information on the GAGAN organizational structure, as well as programme planning, see ISRO website, at www.isro.org/scripts/futureprogramme.aspx?Search=gagan#Satellite, last accessed 16 April 2014.

GAGAN is primarily constructed for civil aviation purposes and will be interoperable with other SBAS systems. The funding for the GAGAN programme has been approved by the Indian Cabinet Committee on Economic Affairs.[94] The system has completed its final testing phase and aims to complete and certify the system, in accordance with APV 1.0 requirements towards the end of 2014.[95]

10.3 LEGAL ASPECTS OF THE USE OF GNSS IN THE TRANSPORT SECTOR

The legal implications deriving from the use of GNSS are on a par with those involving other inherently dangerous or complex technical systems; the primary focus is on whether liability can arise for damage caused as a result of GNSS malfunction, or failure of the Signal in Space (SiS), and if so, on whom the liability falls. The increase in civilian use of GPS, as well as the development of the dedicated GNSS systems described in the first part of this chapter, has led to discussions as to whether there should be a dedicated GNSS legal regime that includes provision for any liability arising out of its operations. As yet, no final proposals have been forthcoming.[96] This point is taken up again at the end of the chapter.

This section now looks at the legal principles which, in the absence of any uniform liability system or model law for GNSS, might be considered as providing a legal basis for GNSS-induced claims for loss. While GNSS failures are likely to be rare, a system failure, with all its imponderables, cannot be fully discounted. Any unplanned interruption in GNSS services may have potentially hazardous consequences. GNSS is primarily deployed in transport-related activities, involving the safety of persons, where safety of life is of paramount concern.

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[94] See www.medianama.com/2013/01/223-indias-navigation-service-gagan-to-launch-in-2014-funding-use-cases/, last accessed 15 January 2014.

[95] See http://theflyingengineer.com/flightdeck/gagan-indias-first-step-to-a-future-air-navigation-system-fans/, last accessed 11 September 2014.

[96] See *supra*, nn. 47, 64. The subject of a Convention for Third Party Liability for GNSS remains on the Working Agenda of UNIDROIT as Item No 8, May 2013; see www.unidroit.org/english/governments/councildocuments/2013session/cd92-08-e.pdf, last accessed 15 January 2014.

10.3.1 GNSS as Global Public Systems and the Theory of 'No Cause'

Each of the GNSS systems discussed at the beginning of this chapter offers the particular service on a different basis. Whether the services are public and free of charge, whether there are issues of government immunity towards the operator, and whether the system requires compulsory service operator liability insurance, are all issues to be addressed for each separate GNSS system owner and regulator. The only regional GNSS that openly addresses the question of liability is the EU Galileo GNSS; the remaining regional systems do not (yet) cater for liability regimes. As independent public structures, there is no one supranational regulatory authority or interface responsible for their operations.

Consequently, there is no general answer as to whether liability may arise for GNSS failures. This rather depends on the system in use and the parties in question. Indeed, there may well be valid legal and policy reasons for (not) introducing such specific liability rules. The law relating to GNSS, beyond its structural governance under national or regional rules of public law, is therefore best described as still being in its early stages.

Some eminent scholars have expressed opinions, in what is best termed a 'utilitarian' view, of the use of, as well as the potential liability for, GNSS systems. According to this view, GNSS systems create benefits across all nations through their global signal coverage; however, 'the distribution of benefits' brought about by GNSS should not be seen as granting both a right to particular benefits, and a duty to make good any damage suffered in the course of its use under the relevant provisions of the Outer Space Treaty and the Liability Convention.[97] While Article I of the Outer Space Treaty stipulates that 'exploration and use of outer space … shall be carried out for the benefit and in the interests of all countries,

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[97] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967); resp. Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971). *Cf.* F. Lyall & P. B. Larsen, *Space Law: A Treatise* (1995), 404.

irrespective of their degree of economic or scientific development',[98] the right to commercial or SAR GNSS services should not be seen as including a corollary right to compensation in the case of damage. This perspective has found little attention to date. It is a reminder that technical systems support progress, but at the same time that not all systems, such as those governing radio signals, are constructed so as to include legal rights.[99]

10.3.2 Applicable Law and Forum

Given its global nature, any failure or interruption in GNSS services causing losses to persons or property may affect a vast group of people. By virtue of the technology deployed, such damage or loss may take place beyond national borders or outside the individual regional GNSS system.[100] Like all accidents or mass damage scenarios – these are likely to be the most probable type of damage arising from a GNSS failure – there may be competing interests and locations for bringing claims for compensation. Connecting factors relating to GNSS accidents can range from the location of the damage (*lex loci delicti, lex loci commisi*)[101] to

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[98] Art. I, Outer Space Treaty, *supra* n. 97.

[99] This was in part influenced by the structure devised for the LORAN-C signal transmission network. This is a long-range terrestrial radio signal navigation system that was previously in general use in a variety of states, such as the United States and Canada. Its origins date back to the Second World War. Various European states still belong to the network. However, its functions have been largely overtaken by GPS; see further *infra*, § 10.5.2.

[100] For details of the interoperability planned between GPS and Galileo, see www.gps.gov/policy/cooperation/, last accessed 15 January 2014. Art. 29, Regulation 1285/2013, *supra* n. 24, on the implementation and exploitation of Galileo provides for further international agreements with third states to be concluded according to Art 218, Treaty on the Functioning of the European Union, *supra* n. 33. This will include any further issues of interoperability.

[101] *Lex loci delicti* denotes the law applicable to where the damage occurs and not where it was caused, which is denoted by *lex loci commisi*; see the effect of Regulation of the European Parliament and of the Council on the law applicable to non-contractual obligations, No. 864/2007/EC (hereafter Rome II), of 11 July 2007; OJ L 199/40 (2007); by which the European Union opted for the *lex loci delicti*, the law of the place where the damage takes place, as the applicable rule of law; for further details, see L.J. Smith & C. Doldirina, Jurisdiction and Applicable Law in Cases of Damage from Space in Europe – The Advent of the Most Suitable Choice – Rome II, 66 *Acta Astronautica* (2010), 239–44. Under Regulation of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations, No. 593/2008/EC

the location of ground receiver stations.[102] The court hearing the action has to decide which law applies to the substance of the claim; this may not be the law of the forum (*lex fori*).[103]

In such a cross-border case, rules of national private international law determine which law forms the basis for the claim.[104] In order to determine which law has to be applied by the court, 'key' factors relating to the type of claim are examined (so-called 'qualification' of the legal obligation).[105] Legal obligations may exist by virtue of a statute; they may arise by virtue of a duty under contract or a duty imposed by the law of tort (negligence or fault-based liability). Generally, national rules determine the qualification and thereafter, which substantive law is to be applied to the international dispute. In addition, added complexities may arise where a case relating to the same issue comes before various different courts. In such a case, the doctrine of *lis alibi pendens* may be relied on to stall a decision on the claim until such time as the primary competent forum is established; this avoids diverse decisions relating to one and the same case.[106]

(hereafter Rome I); OJ L 177/6 (2008), the law applicable to cross-border contracts has been unified across the European Union for the various specified categories of contracts, insofar as the parties have not otherwise reached agreement on this.

[102] The principle of *lex rei sitae* or the law relating to the location of property can be relied on to establish the law that is to be applied to the property in question, such as duties pertaining to ownership, as well as a basis to found a domestic court's jurisdiction in that country.

[103] For an overview of international private law conventions harmonizing the law applicable to cross-border disputes, as well as the details relating to possible strategic selection of forum known as 'forum shopping' see e.g. Cheshire, North & Fawcett, *Private International Law* (14th edn., 2008). For details of international private law conventions to which the United States is a signatory, see www.state.gov/s/l/c3452.htm, last accessed 15 January 2014. It is not possible to replicate here all national private international rules or national codes of procedure to be applied by courts in the event of disputes involving claims with foreign law elements.

[104] See e.g. Art. 4, Rome I, *supra* n. 101, according to which the parties' autonomous choice of law, when contained in a binding choice of law clause, is given priority in cases of breach of contract.

[105] A general overview of the legal considerations involved in this exercise can be found in U. Drobnig & C. von Bar, *The Interaction of Contract and Tort and Property in Europe* (2004).

[106] For an overview of the use of anti-suit injunctions and the role of *lis alibi pendens*, see e.g. Cheshire, North & Fawcett, *supra* n. 103. For the position in Europe, see Arts. 21–23, Convention of 27 September 1968 on Jurisdiction and

Much work has been undertaken on a sector-specific basis to unify the conflicts of laws rules arising in cross-border disputes and it is not possible to replicate these efforts within this work. International conventions or rules of unified law provide for sector-specific solutions.[107] The main conventions governing damage arising within the various transport sectors that might be affected by GNSS malfunction are mentioned further below.[108]

The introduction of a uniform law regulating rights and duties for GNSS could be a concerted response to such potential legal conflicts, notably by stipulating the applicable law. Much has already been said about the subject, as yet with no final, wholehearted support for its introduction. Nevertheless, beyond reducing the types of conflicts between legal systems in cross-border disputes through regional harmonized solutions, the current absence of uniform law governing GNSS is a first indication that the consensus required for such a convention may not be easily reached.

10.3.3 Basis of Liability

Liability for GNSS damage arises insofar as there is a legal rule imposing liability and a defendant on whom the burden or duty to compensate falls in law.[109] In the absence of such a rule of law, there can be no liability.

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the Enforcement of Judgments in Civil and Commercial Matters (Brussels Convention), Brussels, done 27 September 1968, entered into force 1 February 1973; OJ L 299/32 (1972); as replaced by Arts. 27–30, Council Regulation on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters, No. 44/2001/EC (Brussels I), of 22 December 2000; OJ L 12/1 (2001).

[107] Some notable examples of the work of the Hague Conference on Private International Law (HCCH), are e.g. the Convention on the Law Applicable to Products Liability, The Hague, done 2 October 1973, entered into force 1 October 1977; 1056 UNTS 192, www.hcch.net/index_en.php?act=conventions.text&cid=84, last accessed 16 April 2014; the Draft Hague Principles on Choice of Law in International Contracts, 2013, www.hcch.net/index_en.php?act=text.display&tid=49, last accessed 15 January 2014, are currently under discussion. See further S. Symeonides, The Hague Principles on Choice of Law for International Contracts: Some Preliminary Comments, 61 *American Journal of Comparative Law* (2013), 873–99.

[108] See further *infra*, §§ 10.6–10.9.

[109] Sector-specific convention law has led to the creation of various strict and/or limited liability systems that provide for compensation on a non-fault basis, where damage is inherent in the system's own dangers. *Cf.* L.J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage

The grounds on which a non-sector-specific GNSS liability claim might be formulated were first analysed during the early development of the GNSS systems.[110] Previous reviewers have discussed the heads of claim that could arise between the parties involved in the GNSS operations; these relate to the legal obligations between GNSS system designers, manufacturers, operators, through to direct or indirect users, as well as unrelated third parties.[111] Other studies focused on the effect of national statutes governing state or government immunity from suit, which, in the case of the US GPS system, clearly exclude any obligations to pay compensation for its operations.[112]

GNSS services are supplied across a chain of providers and intermediaries through to the end-user. Depending on the GNSS system involved, duties of care may arise through the imposition of statutory obligations, through parties' contractual duties or other tort-based duty of

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Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 124–6, esp. §§ 97, 102. Technological advancement within systems that leads to increased risks and inevitable danger to the public may lead to the introduction of a strict system of liability and compensation. For the types of risks and structure as well as rationale of all the leading risk-based liability systems, see G. Brüggemeier, Substitution of Liability through Private and Social Insurance, in *Common Principles of Tort Law; a Restatement* (2004), 267–74; G. Brüggemeier, *Haftungsrecht im dritten Millenium; Struktur, Prinzipien, Schutzbereich* (2006).

[110] See e.g. F.G. von der Dunk, Liability for Global Navigation Satellite Services: A Comparative Analysis of GPS and Galileo, 30 *Journal of Space Law* (2004), 129–67.

[111] See *ibid.*; H.G. Bollweg, Initial Considerations regarding the Feasibility of an International UNIDROIT Instrument to cover Liability for Damage Caused by Malfunctioning of Global Navigation (Satellite) Systems, 13 *Uniform Law Review* (2008), 917–34; S.M. Carbone & M.E. De Maestri, The Rationale for an International Convention on Third Party Liability for Satellite Navigation Signals, 14 *Uniform Law Review* (2009), 35–55; U. Magnus, Civil Liability for Satellite Based Services, 14 *Uniform Law Review* (2009), 935–69.

[112] Claims raised in the United States relating to transport or airline incidents may reflect the consequences of the non-liability rule of the US GPS and therefore have a different legal basis. For a detailed treatment of the case law relating to all aspects of liability under US law, including air law and cases decided under those rules, see J.M. Epstein, Global Positioning System (GPS): Defining the Legal Issues of its Expanding Civil Use, 61 *Journal of Air Law & Commerce* (1995–6), 262–71; see also *infra*, § 10.4.4.

care, the breach of which may lead to the imposition of a duty to compensate for losses suffered.[113]

The group of persons most likely to be negatively affected by GNSS malfunction – generally known as third parties – does not fall within the category of those towards whom the law always imposes a legal duty. Consequently, there is no general duty in law or under current GNSS operations to provide compensation for third-party loss; third parties are generally members of the community who, by virtue of proximate circumstances or location at the time damage is suffered, are negatively affected. In the absence of an existing legal duty towards the injured party or parties, whether or not third party, no liability can be deemed to exist. The subject of third parties is discussed further below.[114]

10.3.3.1 The relevance of the law of outer space and liability for GNSS

The international law of outer space provides the initial structure for assessing liability for outer space activities, and with this, for GNSS malfunctions that cause damage or loss. The two UN treaties governing international state liability for damage caused by a space object are the Outer Space Treaty[115] and the Convention for International Liability for Damage caused by Space Objects, known as the Liability Convention.[116] Neither treaty directly addresses liability for damage caused by GNSS failure; the qualification for international state liability arising under the treaties is that damage is caused by a space object of a launching state.[117] These treaties do not provide a general rule of liability – in contrast to state responsibility – for outer space activities.

In the context of GNSS liability, the question whether a space object includes not only its component parts, as specifically mentioned in Article I(d) of the Liability Convention, but whether signals form part of

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[113] While courts are often willing to extend the borders of legal concepts through case law, they are not legislators and cannot therefore introduce liability for GNSS without parliamentary legislation; see L.J. Smith, Grounding Space, Liability for Commercial Space Operations, in *Liber Amicorum Gert Brüggemeier* (Eds. A. Colombi Ciacchi *et al.*) (2009), 607–28; further Brüggemeier, *Haftungsrecht*, *supra* n. 109.

[114] See *infra*, § 10.3.6; also L.J. Smith, Facing Up to Third Party Liability for Space Activities – Some Reflections, in *Proceedings of the Fifty-Second Colloquium on the Law of Outer Space* (2010), 255–64.

[115] *Supra*, n. 97.

[116] *Ibid.*

[117] See Art. VII, Outer Space Treaty, *supra* n. 97; Arts. I, II, III, Liability Convention, *supra* n. 97.

the functions of satellite as a space object, has given rise to discussions about its definition.[118] Liability can only arise where damage results from a space object; during the drafting of the space treaties, there was an implicit understanding that both the space object and the damage caused would be both material and physical.[119]

The status of a Signal in Space (SiS), however, has not been authoritatively determined in law. The description of a space object under the UN space treaties does not provide a comprehensive definition, nor does it leave much room for damage resulting from immaterial sources; the definition of damage itself refers back to that caused by a space object.[120] This makes for an important distinction between liability for damage from a space object, and liability for space activities. The latter may not fall within the scope of the Liability Convention provisions, but rather under Article VI of the Outer Space Treaty, which imposes a duty of responsibility on states to authorize and continually supervise their national space activities.[121]

As with all legal rules, the principles of interpretation offer assistance in establishing the scope and purpose of the treaties in question.[122] Firstly, the Outer Space Treaty and Liability Convention were drafted with a view to creating a binding system of effective compensation for victims of accidents resulting from space activities. Secondly, GNSS liability relates to the effects of signal failure, that is, damage resulting from the failure or interruption of an impulse deriving from radio-transmitted signals. The question of GNSS liability is therefore linked to whether the intangible parts of a space object's operations fall within the definition of a space object. Signals are an integral part of the satellite operations, without which a space object cannot operate.

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[118] See A. Kerrest de Rozavel & L.J. Smith, Article VII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 134, § 26; Smith & Kerrest de Rozavel, *supra* n. 109, 12–17, esp. § 107.

[119] See Kerrest de Rozavel & Smith, *supra* n. 118, 139–40, esp. § 51.

[120] See Smith & Kerrest de Rozavel, *supra* n. 109, 129, esp. § 113.

[121] See further on this also *supra*, § 2.3.1.1.

[122] Arts. 31–33, Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969); govern the interpretation of treaties. Although the Convention entered into force after the Outer Space Treaty, this does not otherwise affect the current interpretation of its provisions; see Kerrest de Rozavel & Smith, *supra* n. 118, 140, § 51. Art. 33, Vienna Convention on the Law of Treaties, goes so far as to exclude the interpretation of a treaty provision that would lead to an absurd result.

The focus at the original time of treaty negotiations was clearly on compensation for any damage resulting from the operations of a satellite; this led to the introduction of what remains a unique system of absolute, unlimited liability. Physical damage caused by tangible parts of a space object was of foremost concern. The delegations present at the treaty negotiations were certainly aware of what outer space operations entailed; it cannot, therefore, be said with absolute certainty that damage from intangible electromagnetic waves was not to have been included within the interpretation of the Liability Convention; the main concern for the drafters at that stage was to ensure an adequate victim-orientated compensation mechanism for satellite-induced damage.[123]

It is suggested that the question be approached pragmatically and in the light of the Liability Convention's purpose, which was to ensure sufficient compensation for victims in cases of damage to property and persons on earth. In the absence of international agreement, a shift away from this approach is not called for.[124] Further support for this line of approach can be found in two specific provisions; firstly, the issue of damage in orbit, which is governed by Article III of the Liability Convention and requires fault to impose liability; this is discussed below.[125] Secondly, the provisions of Article VII of the Liability Convention provide that national mechanisms apply to damage that takes place within a national, as opposed to international, context: Article VII excludes space-related damage to own nationals from the ambit of the international space liability regime, leaving settlement of the issue to rules of national law. Leaving national issues to the national forum, while not a response to all open questions, could certainly serve as a way forward for introducing dedicated regional, as opposed to international, GNSS liability regimes.

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[123] See e.g. F. Tronchetti, *Fundamentals of Space Law and Policy* (2013), 10–1.

[124] Judge Manfred Lachs indicated that the time may come when further action is required to develop responses to further questions of space law that may arise; see M. Lachs, *The Law of Outer Space* (2011), 130: 'Looking at the body of law now existing, it could not be claimed that the rules adopted attained all the required objectives. … Some of them demand further elaboration, while others are not free of imprecision, or leave room for improvement. Some others constitute *a bare scaffolding for the law of tomorrow, indications or merely inklings of the trend to be followed*' (emphasis added).

[125] See *infra*, § 10.3.3.2.

10.3.3.2 Absolute liability and fault liability in international space law

The Liability Convention distinguishes between two categories of liability, linking the type of state liability (absolute liability or fault liability) in each instance to the location of the damage. The Convention's distinction between absolute liability for damage on earth under Article II and fault liability for damage in orbit under Article III causes irritation;[126] the requirement of fault is seen as weakening what was designed as an effective victim-oriented compensation mechanism in the face of the increasingly hazardous environment of outer space: this distinction was not drawn in the precursor Outer Space Treaty.[127]

However, the Liability Convention is the *lex specialis* of international liability for space activities and its provisions have prior application.[128] This means that states parties must demonstrate which, if any, of the parties was at fault as between themselves. In the absence of fault, Article III provides no remedy and leaves parties to bear their own losses.[129] Article II of the Liability Convention, in contrast, imposes absolute liability (that is allowing for no exception)[130] for all damage occurring on the earth or to aircraft in flight and caused by the space object.

10.3.3.3 Measure of fault

With the increase in space traffic and resulting volumes of space debris, collision and damage in orbit are pending probabilities giving rise to concern about the loss of space-based services. While the GNSS satellites are not located in the orbits most affected by debris, debris impact remains a genuine concern and one that has not abated since the

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[126] *Cf.* A. Kerrest de Rozavel, Liability or Damage Caused by Space Activities, in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 91–111.

[127] *Cf.* Art. VII, Outer Space Treaty, *supra* n. 97, providing that 'each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth'.

[128] The liability established under Art. III, Liability Convention, *supra* n. 97, requires proof of fault, if 'damage (is) being caused elsewhere than on the surface of the Earth … by a space object'.

[129] In particular the Iridium-Cosmos in-orbit crash in 2009 highlighted the need for clear rules relating to after-life management of space craft, in particular of dysfunctional satellites.

[130] Art. II, Liability Convention, *supra* n. 97, provides: 'A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight.'

Iridium-Cosmos in-orbit collision in early 2009. Although the collision opened up separate complex aspects relating to the Liability Convention – it involved one and the same 'launching State', thereby preventing a claim from being lodged under the Convention – the measure of fault to be assessed under Article III of the Convention remains an unknown quantity.[131] A finding of fault is a challenge, particularly in the absence of recklessness and without rules imposing a clear space traffic management regime. While there has been a clear response in the form of imposition of technical standards by national licensing authorities such as the various debris mitigation guidelines, failure to comply with these technical standards has not yet been put on a par with negligence or fault, and this would have to be determined by the panel called on to hear liability claims.[132]

In the absence of a binding system of space traffic management, GNSS system failures that are caused by loss of Signal in Space (SiS) or other malfunctioning are unlikely to be seen as constituting fault.[133] They may be easily attributable to the atmospheric conditions relating to space weather or other cause of *force majeure*.

Article I(a) of the Liability Convention defines damage as 'loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of person, natural or juridical'. Under international law, *restitutio in integrum* is the measure of damages due. This allows for *damnum emergens* (loss suffered) and *damnum lucrans* (gain or profit) to be claimed.[134] There has been much discussion over the years about the extent of the above in relation to damage from outer space. Loss must be causally linked to the damage caused by the space object, whether material or immaterial, and it must not be too remote.[135] The underlying principle of Article III of the Liability Convention governing damage in orbit is that, in the absence of fault, each party carries its own losses. This is the principle on which outer space activities are undertaken,

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131 *Cf.* also *supra*, § 2.3.3.4.

132 See on the Cosmos-Iridium collision also further *infra*, § 13.2.1.

133 See Inter-Agency Space Debris Coordination Committee (IADC), Space Debris Mitigation Guidelines, 2002 (revised 2007), IADC-02-01; Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space, International cooperation in the peaceful uses of outer space, UNGA Res. 62/217, of 22 December 2007; UN Doc. A/RES/62/217, http://orbitaldebris.jsc.nasa.gov/library/Space%20Debris%20Mitigation%20Guidelines_COPUOS.pdf, last accessed 15 January 2014.

134 See Kerrest de Rozavel & Smith, *supra* n. 118, 141, § 55.

135 See *ibid.*

insofar as damage does not occur on earth or aircraft in flight. It plays a significant role in commercial practice. Given that damage in orbit in the case of commercial operators is likely to lead to loss of service and with this, financial loss, commercial satellite operators rely on solutions provided by insurance. In other words, some general consideration has to be given to the issue of whether GNSS activities automatically lead to findings of liability.

10.3.4 Obligations in Tort and Contract as an Alternative Basis for GNSS Liability

Since GNSS services are based on state or regionally organized structures, issues of public law and security arise during the licensing process. Delivery of the GNSS services involves agreements between the authorities, operators and users levels at various levels, with corresponding obligations mapped out in contract, as well as/or duties in tort. The final (end-)user, particularly if not a commercial actor, generally only has a contractual relationship with the retailer of the signal receiver and not with the selected GNSS operator.[136] In the absence of further contractual duties, direct claims in contract between the individual end-user against the system operator are therefore likely to be declared inadmissible. This leaves tort law as the only basis for imposing duties of care under the law of negligence.

While duties of care have been implemented under transport convention law, where GNSS is used in navigation, none of these conventions has sought to regulate the specific situation of GNSS-related (as opposed to general transport-related) damage. These conventions cater for the rights of injured air transport passengers and those taking other forms of transport. The sphere of tort law may, however, still force the issue of GNSS liability onto a different level. The increasing number of GNSS applications in our modern lives and the interdependency of communication systems with other tools that may suffer malfunction highlight the complexity of the technical infrastructures on which society relies and the extent to which the public has grown to take these for granted. Largely because of the prior accessibility to GPS, there is a tendency to regard GNSS as a self-understood, gratuitous public service.

Tort law is a tool for managing risk and drawing a legal balance between those operating technical operating systems and those who rely

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[136] Considerations relating to manufacturer's liability were one of the reasons leading to a revision of the original Galileo GNSS consortium in which European industry was involved; see further *infra*, § 10.4.

on them. It involves considerations surrounding notions of duties of care (such as legal protection and compensation in case of failure) towards identifiable groups. While the utilitarian view is that GNSS services entail neither rights nor obligations for those involved, there has been no clear legal discussion – beyond that in the United States[137] – as to whether a general duty of care should be owed to the public at large relating to GNSS use. Governments as owners of the GNSS systems have not addressed this openly. The balance to be drawn at a regulatory-policy level generally restricts the recognition of duties in law towards the world at large, in the absence of a specific legal interest. This debate may, however, continue in the context of increasing GNSS-integrated technology and applications.

10.3.5 Clear Limitations to Claims Based on Manufacturer's and Product Liability

Damage for outer space activities is, as a matter of principle, not regulated by either manufacturer's or product liability; outer space activities take place in space and are subject to the legal regime that apply to it. Cases may, however, be brought before domestic courts for a variety of strategic reasons, not least because the time limit of one year for raising a claim under Article X of the Liability Convention is relatively short.[138] Unlike most international rules, outer space law does not require domestic remedies to be exhausted prior to raising a state-to-state claim.[139] Nevertheless, and particularly because of its special status and the privileged position of GPS, litigants may look for alternative bases for compensation in front of domestic courts.[140]

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[137] See further *infra*, § 10.4.4.

[138] Art. X, Liability Convention, *supra* n. 97, provides in relevant part: '1. A claim for compensation for damage may be presented to a launching State not later than one year following the date of the occurrence of the damage or the identification of the launching State which is liable. 2. If, however, a State does not know of the occurrence of the damage or has not been able to identify the launching State which is liable, it may present a claim within one year following the date on which it learned of the aforementioned facts; however, this period shall in no event exceed one year following the date on which the State could reasonably be expected to have learned of the facts through the exercise of due diligence.'

[139] See Art. XI(1), Liability Convention, *supra* n. 97.

[140] GPS has a privileged status by virtue of the government's role as signal provider along with the doctrine of state immunity and the government contractor defence, see further *infra*, § 10.4.4. Claims can be brought before domestic

Claims for damages have been brought as flanking moves under the heading of manufacturer's liability, largely in the United States, relating to losses resulting from aircraft crashes, and on occasion, under the generally strict law of product liability regarding defective terrestrial receivers. This is in part related to the absence of any liability for GPS. In contrast to the inherent defect which is the basis of product liability claims, manufacturers' duties of care under tort law form the basis for claims for loss or damage, where these result from negligent failures on the part of the manufacturer with regard to the manufacturing process itself; all manufacturing involves a high degree of compliance with technical procedures and safety requirements. On proof of fault or negligence within the production process, very often in conjunction with alleviated rules of proof, the manufacturer may be held liable for the consequences of its negligence.[141]

Product liability allows any of those involved in the process of manufacture or sale (through to the retailer) to be joined in a suit for damage resulting from an inherent defect. The inherent defect is the key to such liability claims: undetectable by the human eye, a statistical probability inherent within the manufacturing process, and appearing only at the moment of damage to the detriment of the victim. Claims based on either manufacturer's or the broader-based product liability (negligence, strict liability or breach of warranty) may also offer a convenient means of overcoming the statutory limits on compensation provided within the various international (transport) conventions that are discussed further below.[142] The resort to national courts under domestic law has already been experienced in the field of oil pollution, for which distinct, but limited, international and national liability regimes are in operation. Claims before domestic courts may have the advantage of overriding any limitation of operator liability.[143]

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tribunals under Art XI(2), Liability Convention, *supra* n. 97; see further L.J. Smith, Collisions in Space: Perspectives on the Law Applicable to Damages Arising from Space Objects, in *Proceedings of the International Institute of Space Law 2012* (2013), 230–42.

[141] On the development of manufacturer's liability, see e.g. G. Brüggemeier, The Foundation of Liability, in *Common Principles of Tort Law; a Restatement* (2004), 43–90.

[142] See further *infra*, §§ 10.6–10.9.

[143] The various international conventions that impose limited operator liability such as in the field of nuclear energy generally exclude limitations on liability in the case of recklessness or gross negligence. The limitation of liability provisions can be challenged, as is currently the case in the US Gulf of Mexico BP deep water oil spill in relation to damages for oil pollution; the Fifth Circuit

The early law of product(s) liability developed through case law as a means of overcoming the rule of privity in contract and continues as a strict form of liability in many jurisdictions, covered by statute law.[144] It offers automatic remedies on a non-fault basis in the case of inherent defects leading to damage. The law imposes strict duties of care in the face of risks that manufacturers and others in the supply chain are better equipped to bear.[145] Causation and damage must be shown, but the circumstances of the defect are not for the plaintiff victim to prove. In both categories, the risk to society is deemed to be fairly spread across the various sectors of manufacturers, producers and consumers.

Claims under these headings in the space sector will be limited in practice. While it is conceivable that claims be brought in relation to navigational receiving equipment or 'hardware' that relies on GNSS software, they will not provide a reliable basis for claims based on error or malfunction of SiS.

10.3.6 GNSS and Third-Party Liability

Third parties are seen in law to be 'innocent bystanders', persons who are not immediately involved in the activities leading to the damage, be this by contract or other rules of law, but who belong to a group that is

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appeals court in New Orleans in January 2014 has upheld the lifting of initially curbed settlements to enable full-scale compensation; see http://louisianarecord.com/news/u-s-5th-circuit-court-of-appeals, last accessed 15 January 2014.

[144] US products liability is state, not federal, law and comprises claims based on negligence, strict liability and breach of warranty; see Brüggemeier, *supra* n. 141, 89–93; further www.law.cornell.edu/wex/products_liability, last accessed 16 April 2014. The EC Product Liability Directive (Council Directive on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, 85/374/EEC, of 25 July 1985; OJ L 210/29 (1985)) as amended by Directive of the European Parliament and of the Council amending Council Directive 85/374/EEC on the approximation of laws, regulations and administrative provisions of the member states concerning liability for defective products, 1999/34/EC (Product Liability Directive as amended), of 10 May 1999; OJ L 141/20 (1999) relates only to products designed for personal and not commercial use, dealing with damage caused by products to consumers and not commercial users. It forms part of the law of all member states in the European Union, and some non-EU states such as Australia have adopted its provisions in what is seen as a form of legal borrowing. Strict liability is imposed for inherent product defects.

[145] The two most famous cases relating to the duties of care in law are *McPherson v Buick Motors*, 161 A.D. 906 145 N.Y.S. 1132 1914 N.Y.; and *Donoghue v Stevenson* [1932] UKHL 32.

nevertheless negatively affected.[146] The development of rules of law extending the duty of care to the group of third parties has been a response of the general law, notably through case law, and extended by certain statutory provisions and conventions.[147] One of the major concerns relating to the lack of a dedicated legal regime for GNSS is that the group of users or those likely to be affected through GNSS operations does not stand in any form of legal (tort or contractual) relationship to the owners or operators of the systems themselves.

Even if damage is suffered by third parties, whether their legal interests are deemed too remote to be covered by general duties of law can only be addressed on a case-by-case basis. The definition of a third party is a question of law; it is linked to the concept of a 'neighbour in law', that is, a person or group which is not too remotely removed from the location of the damaging incident and for whom the risk is within contemplation or foreseeable.[148] If a claim for damages for this group is to be upheld, the prerequisites of causation and remoteness must be met.

The regional GNSS were initiated or supported by governments as navigational systems available to the public. Some systems are offered to commercial and private users alike, free of charge, while others offer differing categories of use, depending on the specific service and user community. With some exceptions relating to Galileo GNSS, the major part of GNSS services is available free of charge. Third parties are only catered for by the law within dedicated liability regimes.[149] Currently, this is the case only for those covered by transport conventions that specifically include third parties.[150] There has been concern that, among

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[146] Third parties are those not otherwise directly covered by contractual relations. Case law extended the duty of care in law to include this group of 'neighbours in law' at the forefront of those protected by the law of products liability, see *Donoghue v Stevenson*, *supra* n. 145. Nevertheless, without a statutory basis, the group is not fixed, leaving litigation to settle the issue of 'who in law is my neighbour?' as judicially explained by Lord Atkinson, in *Donoghue v Stevenson*.

[147] See e.g. Rome Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (hereafter Rome Convention), Rome, done 7 October 1952, entered into force 4 February 1958; 310 UNTS 182; ATS 1959 No. 1; ICAO Doc. 7364; further *infra*, § 10.6.4.

[148] *McPherson v Buick Motors*, *supra* n. 145; *Donoghue v Stevenson* [1932] UKHL 32, *supra* n. 145. See further, Smith, *supra* n. 114, 255–64.

[149] See Smith, *supra* n. 114, 255–6.

[150] *Cf.* e.g. *infra*, § 10.6.4.

all those potentially suffering damage through the use of GNSS, the category of third parties may therefore largely go without legal protection.

10.3.7 Liability Insurance

Liability insurance is a compulsory requirement in the authorization of space activities in some, but not all states.[151] Various forms of insurance exist to cover the risks of outer space activities, from launch insurance through to in-orbit insurance for space operations. Insurance coverage is available to commercial operators, with coverage limited to the value insured. The insured party's liability towards third parties may be covered insofar as an 'all risks' launch risk has been taken out, or within the satellite 'in-orbit insurance', where cover is included. However, since GNSS are largely operated as public systems, not all governments take out insurance, operating on a self-insurance basis. There is currently no standard insurance coverage for GNSS induced damage.[152]

Whether third-party liability insurance is taken out depends on the particular business; in the telecommunications sector, it is standard practice. Commercial satellite operators in particular ensure against financial or economic loss resulting from signal interruption in orbit. Risk and insurance for the space sector is largely conditioned by contracts that have developed into standard practice over the years. This relies heavily on waivers of recourse and hold-harmless agreements between the contractual partners and industrials operating the services. Parties, if at all, therefore seek to insure their own losses.

The lack of uniformity in national space insurance requirements and the absence of practice for the GNSS community is such that liability, certainly towards third parties, may be, but is not necessarily, covered by insurance. Whether insurance can become a future solution for all GNSS operators in regard to damage and third-party damage, is reverted to again below.[153] Some alignment in state practice could develop the context of licensing of national space activities. In practice, commercial

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151 While there is generally a compulsory insurance requirement covering the launching phase, in-orbit insurance is not a prerequisite of all national space laws; see summary of national liability insurance requirements in UK Space Agency Consultation on UK Outer Space Act, www.bis.gov.uk/ukspaceagency/news-and-events/2013/Dec/government-response-to-osa, last accessed 15 January 2014; see further *supra*, § 3.3.2.3 and *infra*, Chapter 17.

152 See for liability insurance issues in greater detail *infra*, § 17.2.

153 See *infra*, § 17.2.2.

solutions will look for a limited commercial liability insurance that is capped to a specific level in proportion to the contract volume. This may take into account any national liability guarantees that are in operation under the law.

10.4 REGIONAL AND NATIONAL GNSS: LEGAL ASPECTS

10.4.1 The EU Framework for Galileo GNSS

Galileo is the European Union's own GNSS system (ground and in-orbit segment) and was originally conceived as a PPP with the GNSS Supervisory Authority (GSA), an EU agency, acting as its public supervisory and licensing agency, originally under Regulation 1321/2004, which has since been amended.[154] Reorganization between 2006 and 2007 at that stage led to a revised governance and budgetary structure for the Galileo project, which was first contained in Regulation 638/2008, and now revised under the most recent Regulation 1285/2013.[155] These European regulations follow the legislative drafting approach of repealing and replacing the predecessor rules, but activities sanctioned under earlier legislation do not lose their validity.

Under the 2013 regime, the roles of the European Commission, ESA and the GSA are clearly spelled out. The GSA acts as a selection and accreditation authority for the GNSS operator and is responsible for ensuring regulation and certification of all services and providers. Ownership of the ground and in-orbit system is in the hands of the European Union, accompanied by sector-related legal duties, including those governing the EU's contractual and non-contractual liability for its operations. European secondary legislation contains further details of the various phases of development, deployment and exploitation of Galileo GNSS.

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[154] Council Regulation on the establishment of structures for the management of the European satellite radio-navigation programmes, No. 1321/2004/EC, of 12 July 2004; OJ L 246/1 (2004); now repealed. See further also e.g. *supra*, § 4.4.4.1.

[155] The European Commission was encouraged by the Council in Regulation 683/2008, *supra* n. 27, to prepare a proposal for amalgamating the Galileo management structure set out in Regulation 1321/2004 and Regulation 683/2008. See the most recent Regulation on the responsibilities between the various institutions, Regulation 1285/2013, *supra* n. 24.

The provisions of Articles 340(1) and 340(2) of the Treaty on the Functioning of the European Union respectively govern the contractual and extra-contractual (tort or quasi-contractual) liability of the EU institutions under EU law.[156] Under Article 12(1) of Regulation 1285/2013, the European Commission has the overall responsibility for the Galileo and EGNOS programmes during the implementation and exploitation phase, including the management and reduction of their inherent risks. The exact conditions under which the European Union, as owner of the systems and represented by the Commission may be held liable for any GNSS-related injury, remain moot.

Firstly, Galileo is the first potentially hazardous system involving space activities of which the European Union is the owner. Secondly, the GSA is responsible for selecting and accrediting the Galileo services operator in terms of the applicable procurement rules and laying down contractual terms for the operator. The European Court of Justice case law on the liability of the European Union has to date dealt with claims for damages resulting from administrative failure and negligence, as opposed to compensation for losses caused by malfunction or inherently dangerous activities such as satellite operations. In this respect, there is little doubt that the European Union is required to adhere to the rules of international space law; the provisions on liability contained in the Outer Space Treaty having in the meantime acquired the status of binding rules of customary international law.[157]

10.4.2 EU Primary and Secondary Law of Liability and the Law of Outer Space

Liability of the European Union under international space law is a complex subject; the Union has a personality separate from that of its member states under Article 47 of the Consolidated version of the Treaty on European Union. Because of its unique legislative and judicial structure, the Union views itself as a community of states rather than an international governmental organization. Neither the member states nor the European institutions have immunity from suit, at least under EU law. The European Union has competences in outer space that are shared with its member states.[158] The European Union's own resources have not yet been subjected to a major disaster claim.

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[156] See also Regulation 683/2008 *supra* n. 27.

[157] See Kerrest de Rozavel & Smith, *supra* n. 118, 135–6, § 32.

[158] The European Union has a so-called parallel space competence under Art. 4(3), Consolidated version of the Treaty on European Union, *supra* n. 25, in

With a legal personality separate from that of its member states, the question of subsidiary liability of EU member states is now extraneous. Ownership of the Galileo GNSS is with the European Union; liability, not only in terms of Regulation 1285/2013 but also in terms of general law, falls on the European Union. The Union is a subject of international law and bound by its rules, including the rules of customary international law.[159] Ownership, as in this case, of potentially dangerous systems, falls within the concept of *dominus sentit casum.* According to this principle, owners are responsible for the consequences in law pertaining to the risks, dangers or hazards of their own property or the property which is under their control. In the deployment of the Galileo system, international law may also impose specific obligations of due regard that dangerous systems do not negatively impact on other states.[160]

The initial incompatibilities between the system of international space law and EU law relate primarily to the concepts involved under the UN space treaties; these operate with the notions of 'launching State' and 'space object'. Unlike ESA, which has collaborated as the contracting and operative authority on its behalf, the European Union has not made a declaration of acceptance of the provisions of the Liability Convention.[161]

In terms of the space treaty structures, the European Union therefore poses a challenge to the concept of a 'launching State'. Technically speaking, it qualifies as having procured a launch; the funding for the Galileo system is fully allocated by the EU budget, without any supplementary member state contribution. Nevertheless, the European Union remains a group of states and, if anything, a *sui generis* 'supranational'

conjunction with Art. 189, Treaty on the Functioning of the European Union, *supra* n. 33; see further *supra*, § 4.4.3.

[159] The case law of the Court of Justice of the European Union (CJEU) has consistently confirmed the Community's and thereafter the Union's adherence to the principles of international law; see Case 22/70 *ERTA* 1971 ECR 263; 1/94 Opinion of Court, 1994 ECR I-05267; Case 366/10, *ATAA v Secretary of State for Energy*, judgment of the ECJ 21 December 2011, ECR 2011-I-0000.

[160] *Cf. Corfu Channel Case (United Kingdom v. Albania)* (Merits), International Court of Justice, 9 April 1949, I.C.J. Rep. 1949, 4.

[161] The European Union cooperates under an earlier Framework Agreement (Framework Agreement Between the European Community and the European Space Agency, Brussels, done 25 November 2003, entered into force 28 May 2004; OJ L 261/64 (2004); 53 *ZLW* 89 (2004)) with ESA, which has been extended and continues in force until 2016. See on the possibility under the Liability Convention, *supra* n. 97, to accept relevant rights and obligations as an intergovernmental organization *supra*, § 2.3.3.8.

state-like entity – where following Article II of the Registration Convention it is a 'launching State' that should register its satellites.

The European Union operates out of Brussels, so that Belgium as principal state would, in the absence of registration by ESA, be required to undertake this step.[162] Although the Union as a non-state remains unique within the structure of the outer space treaties, particularly as it does not have exclusive competence for space activities – it shares this with its member states further to Article 189 of the Treaty on the Functioning of the European Union as discussed – the applicability of international law to the European Union, be this customary or treaty law, cannot be discounted.

10.4.3 EGNOS and Galileo Risk Management

As the foregoing shows, the extent to which the European Union can be held liable for non-contractual and contractual damage under the general principles of European law relating to responsibilities for its inherently dangerous satellite navigation system Galileo, and how the secondary provisions of the Galileo Regulation interact with primary EU treaty law relating to non-contractual liability, are complex. The issue relates to the position of the European Union as owner-operator of a space system for which liability may arise independent of fault. In addition, no separate provision has been made for a strict GNSS liability regime, nor has there been any formal declaration of the European Union's acceptance of the duties under the Liability Convention.[163] The matter has, however, already been approached in practice at the contractual level between the European Union and, at the time of writing, the current EGNOS operator. Under the terms of the operator contracts, the operator is required to take out limited liability insurance coverage, to the same value as has become

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[162] Information as to registration of the Galileo satellites is not currently available.

[163] See also *supra*, n. 161. The conclusion of international agreements by the European Union is governed by Art. 216, Treaty on the Functioning of the European Union, *supra* n. 33. The CJEU can issue opinions in law on the compatibility of such agreements with EU law under Art. 218(11), Treaty on the Functioning of the European Union, see e.g. Opinion ECJ 1/94 re *WTO Agreement* [1994] ECR I-5267, 5283, in relation to the accession by the European Union to the WTO.

standard within ESA states and is prescribed by the French Law on Space Operations.[164]

10.4.4 GPS as Special Case under US Law

While the United States, like other states that have ratified the Liability Convention, is liable for objects for which it is the 'launching State', this Convention is not a source of government liability for GPS services.[165] The position of 'national' GNSS liability in the US context is therefore relevant to the discussion on GNSS liability.

The reasons for excluding liability for US GPS are twofold; firstly, given its historical development, GPS was originally a military-based system that was subsequently released for public use in 1986. It was made clear at that stage as a matter of policy that no responsibility could arise for a system that had been originally used by the US military. Secondly, under the Federal Tort Claims Act[166] and Suits in Admiralty Act,[167] separate statutes governing claims, including those at sea, there can be no liability against the US government[168] where the government contractor defence is available.[169] This holds those operating in the name of the government free from civil suit.

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[164] The level of compulsory liability insurance requirement under the French Law on Space Operations is € 60 million, as fixed by law; see Arts. 16–17, Law on Space Operations (*Loi relative aux opérations spatiales*; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453; also *supra*, § 3.3.3.1.

[165] See discussion *supra*, § 10.3.3.

[166] For further information on the origins and operations of the Federal Tort Claims Act of 1946 as amended (28 U.S.C.), see P.F. Figley, Understanding the Federal Tort Claims Act; A Different Metaphor, http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1006&context=facsch_lawrev. See further Epstein, *supra* n. 112, 243.

[167] Suits in Admiralty Act, 46 App. U.S.C. 741.

[168] *Cf.* von der Dunk, *supra* n. 110, 129–67.

[169] The government contractor defence was laid down in *Boyle v United Techs Corp.*, S. Ct 487 U.S. 500 [1988]. For details of how the commercial sector operates risks management, see generally P.L. Meredith, Space Insurance Law, a Special Focus on Satellite Launch and In-Orbit Policies, 21–4 *The Air & Space Lawyer* (2008), 13–5.

10.5 ALTERNATIVE HEADS OF LIABILITY: CERTIFICATION AND AUGMENTATION

10.5.1 The Role of Certification in GNSS Liability

Certification is a process by which a regulating authority, governmental or private, determines whether systems are of the requisite safety and security standard to perform a certain task. Where systems are safety critical, most countries require some form of certification.

The European Aviation Safety Agency (EASA)[170] and the Federal Aviation Administration (FAA)[171] are the certifying authorities for the European and US civil aviation sectors respectively. Any aircraft manufacturer, as well as any type of aircraft and its components, has to be certified by these entities according to the regulations in force; the aim is to reduce the critical risk of an aviation accident to a minimum.[172] All GNSS devices utilised as navigational means in an aircraft are required to undergo a certification process. As utilization of GNSS by an aircraft is considered to be safety-critical, any disturbance or malfunction of the signal would then be automatically transmitted as such to the receiver.[173]

It is not clear whether a certification authority can be made liable for damage or loss in the context of its certification functions. Of the claims that have been brought against the aviation authorities in the United States based on wrong certification, most have been unsuccessful; courts have denied claims brought against the federal government in its regulatory capacity under the Federal Torts Claims Act of 1946, as amended. This statute is now contained in Title 28 of the US Code under the

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[170] EASA was established by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, No. 1592/2002/EC, of 15 July 2002; OJ L 240/1 (2002), as later amended by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, No. 216/2008/EC, of 20 February 2008; OJ L 79/1 (2008).

[171] The FAA was established by the Federal Aviation Act, 23 August 1958, Public Law 85-726; 72 Stat. 731.

[172] For more specific information on EASA and FAA, see www.easa.europa.eu/the-agency/easa-explained/what-we-do, last accessed 16 April 2014; resp. www.faa.gov/aircraft/air_cert/, last accessed 16 April 2014.

[173] For more information concerning GPS integrity on aircraft, namely, the Receiver Autonomous Integrity Monitoring (RAIM), see http://www.dlr.de/kn/en/desktopdefault.aspx/tabid-7569/12812_read-32120/, last accessed 16 April 2014.

chapter governing tort claims procedure and provides only a limited waiver from the United States' immunity from suit.

It may allow claims for damages against government agencies insofar as a private person would, in the same circumstances, be liable under the law as a result of negligence or wrongful act.[174] The reasoning is based on the so-called 'discretionary function exception', by which courts ensure that litigants do not use the civil process to bring claims against government for so-called 'spot-checking', as opposed to carrying out full certifications. The authority has a discretionary function in its role as certifier and the law does not provide for a presumption of negligence on its part. The language of the courts is clear in refusing to grant claims against the public authority, the effect of which would effectively lead to the Federal Torts Claims Act being rewritten or opening the way to challenge government immunity 'through the back-door'.

In Europe, there have been single isolated cases, notably in Germany, relating to liability of a certification authority but not in the context of GNSS; a successful action was once brought in Germany relating to motor vehicle certification.[175] While interesting, the case is not indicative of a clear rule of law or trend. There, a gas engine was certified as properly installed, but later found to have been on the verge of exploding.

Cases that lead to death and loss in the context of high technology, industrial or transport systems generally lead to public investigations in which technical and state prosecuting authorities collaborate to establish facts and evidence. If there is evidence of failure to comply with statutory procedures, such a case may go to trial under public safety law. However, this type of public investigation and statutory prosecution should be distinguished from civil claims seeking compensation for loss in damages.

The foregoing is compounded by the lack of an international agreement concerning certification for previous radio-navigation systems, such as the LORAN-C.[176] Many international agreements were established for LORAN-C to ensure interoperability, covering similar aspects to the

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174 See 28 U.S.C. § 1346(b); *United States v. Varig Airlines*, 467 U.S. 797 (1984).

175 This case related to a German motor vehicle and was heard by a local appeal court, OLG Hamm, under reference number 11 U 112/08, DAR 2010,138, see www.justiz.nrw.de/nrwe/olgs/hamm/j2009/11_U_112_08urteil20090617.html, last accessed 16 April 2014.

176 See B. Kaniasuk, General Legal Issues Concerning GNSS and the Impact on Developing Countries, thesis at the Institute of Air and Space Law, Faculty of Graduate Studies and Research, McGill University, Montreal, December 1997.

contemporary GNSS interoperability agreements. However, these all omitted provisions for liability and certification. The scope of applications and technical possibilities of GNSS have altered substantially from the original capabilities of radio-navigation. As a result, there is no historical model from which to construct a regulatory prototype for a fool-proof GNSS regulatory system that includes provisions on liability.

10.5.2 Impact of Augmentation on Liability

GNSS operations may be supported technically through further so-called augmentation systems, which have been referred to previously within the present chapter.[177] The effect of these is to increase the precision and accuracy of GNSS. The augmentation system EGNOS was developed as a precursor and integral part of what was subsequently developed within the Galileo GNSS System.

It is unclear whether the existence of augmentation systems impacts on issues of liability. Causation requires to be proven, irrespective of the type of liability, whether absolute or fault based.[178] In addition, it may not necessarily be possible to determine which of the systems suffers or contributes to the malfunction; whether it was the original GNSS or the augmentation system. Such issues add to the complexity of proof in the absence of a sector-specific strict liability regime.[179]

Developments are under way in the context of certification liability within the European Union similar to those in the United States with the FAA. The first EGNOS system was certified as operator of the system by the French National Supervisory Authority (NSA), on behalf of EASA.[180] As from 2014, EASA assumes competence as certification authority for the European Union in this field. The provisions of European law thereafter apply to any issue of liability.

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[177] *Cf.* e.g. *supra*, §§ 10.2.4–10.2.6; also n. 99.

[178] *Cf.* Kerrest de Rozavel & Smith, *supra* n. 118, 141–2, §§ 56–58; Smith & Kerrest de Rozavel, *supra* n. 109, 126–8, §§ 106–9.

[179] The US courts have developed pragmatic approaches to apportioning strict statutory liabilities for particular markets where proof of the company's market share is impossible; in the field of pharmaceutical liability, the so-called 'market-share liability' was introduced in *Sindell v. Abbott Laboratories*, 26 Cal. 3d 588 (1980).

[180] For more information, see www.egnos-portal.eu/node/1911, last accessed 15 January 2014.

10.6 CIVIL AVIATION: LIABILITY FOR NAVIGATIONAL AIDS AND DEVELOPMENT OF CNS/ATM SYSTEMS

10.6.1 Introduction

The civil aviation industry has traditionally been one of the most regulated sectors of the economy, with ongoing concerns to improve its security standards, as well as navigational means. With the growing density of international air traffic, the International Civil Aviation Organization (ICAO) made its first attempt to analyse the benefits and limitations of a GNSS implementation as navigational aid for civil air traffic by establishing the Future Air Navigation Systems (FANS) committee in 1983.[181]

The FANS committee was commissioned to review possible future navigation systems from their technical, operational and institutional, as well as economical perspectives, and to elaborate a recommendation to enable a long-term projection of the potential development of these systems, including satellite navigation.[182] The evaluation of the satellite navigation system as a navigational means for air traffic highlighted the benefits of the system, and led to the development of the Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) systems.[183] The following section explains how these fit into the structure of the main designated conventions governing aviation responsibilities and liability.

10.6.2 Navigational Aids and the Chicago Convention

These CNS/ATM systems, which provide sufficient navigational aid, as well as exchange the essential information between the pilots of the aircraft and air traffic controllers, are based on GNSS systems and have been implemented to meet the ICAO requirements prescribed in Article 44 of the Chicago Convention. This provision, the main foundation for

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[181] See J. Aimar, Improved Flight Operations and Efficient Use of Airspace, Air Traffic Management Services, Boeing Commercial Airplanes Group, Aero Magazine No. 12, October 2000, 28, www.boeing.com/commercial/aero magazine/aero_12/navigation.pdf, last accessed 15 January 2014.

[182] ICAO, Council – 110th session, ICAO Doc. 9527 – C/1078 C-Min 110 & C-Min 110/9, 1983.

[183] ICAO, Report of the Fourth Meeting of the Special Committee on Future Air Navigation Systems, ICAO, Doc. 9524, FANS/4, Rec. 2/1, 1988.

the establishment of navigational aids for civil air traffic on an international level, points out that the

> aims and objectives of the Organization are to develop the principles and techniques of international air navigation… so as to: (a) Insure the safe and orderly growth of international civil aviation throughout the world; … (c) Encourage the development of airways, airports, and air navigation facilities for international civil aviation.[184]

Article 44 promotes the constant improvement of navigational means for air traffic, encouraging the contracting states to implement a satellite-based navigational system as a means of raising the safety levels. However, the Chicago Convention in its Article 28 also entrusts the contracting state with the responsibility over the navigational aid systems within its airspace:

> Each contracting State undertakes, so far as it may find practicable, to: (a) Provide, in its territory, airports, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this Convention.[185]

The dilemma which many states are facing is therefore that the most advanced navigation system is one for which they are accountable, responsible and possibly even liable in law, but one over which they do not hold control.

Although satellite-based navigation systems were non-existent and therefore not a part of the Chicago Convention's original interpretation of air navigation facilities, the Convention still constitutes the legal basis for the contemporary navigational aid systems in the civil aviation sector. This has also given rise to support for the need for an international GNSS convention. Where a state is not able to provide the 'highest practicable degree of uniformity in regulations, standards' as established through Article 37 of the Chicago Convention, many common interpretations of the Convention allow the states to delegate the implementation function to another entity, including public or private operators. The responsibility of the delegating state under Article 28, however, remains unaffected, even though the state is not in control of the actual system itself.[186]

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[184] Art. 44, Chicago Convention, *supra* n. 42.

[185] Art. 28, Chicago Convention, *supra* n. 42.

[186] See F. Schubert, Emerging Issues for Air Navigation Services, International Conference on Contemporary Issues, Skyguide, New Delhi, India, April

10.6.3 ICAO and GNSS Liability: Recent Developments

In 1992 ICAO came to its preliminary conclusion concerning the establishment of an international GNSS legal framework, indicating that such a legal framework tailored to the demands of a satellite-based system required some consideration. During the ICAO's 28th legal committee session, it further concluded that the CNS/ATM systems correspond with the terms and conditions laid down in the Chicago Convention.[187]

The ICAO's Panel of Legal Experts on the Establishment of a Legal Framework with regard to GNSS (LTEP) was involved in the elaboration of a possible legal regime that contained general provisions concerning liability options and certification processes.[188] This subsequently led to the preparation of a Charter on the Rights and Obligations of States Relating to GNSS Services, established in the ICAO Assembly Resolution A32-19 in 1998.[189] This emphasised the importance of accessibility, continuity, availability, integrity, accuracy and reliability of the signal, as well as the cooperation, but also the sovereignty of the states concerning their responsibility for navigational aid systems. However, as this Charter mainly focuses on the importance of accuracy, integrity and cooperation among states, many issues concerning certification and liability were not fully answered. ICAO's recommendation within its Assembly Resolution A32-20 concerning the establishment of 'an appropriate long-term legal framework to govern the implementation of GNSS'[190] led to the establishment of the Secretariat Study Group (SSG).

The SSG was commissioned to elaborate a contractual framework, which could serve as preliminary solution towards an international convention. Nonetheless, the 36th ICAO Assembly rejected a final convention framework, shifting the responsibility of the task to the

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2008, www.mcgill.ca/files/iasl/C06-Francis_Schubert-Framework_for_GNSS.pdf, last accessed 15 January 2014.

[187] ICAO, Report of the 28th session of the ICAO Legal Committee, ICAO Doc 9630-LC189, 1992.

[188] ICAO, Statement of ICAO policy on CNS/ATM Systems Implementation and Operation, ICAO Doc. LC/29 – WP/3-2, 1994.

[189] Charter on the Rights and Obligations of States Relating to GNSS Services, Resolutions Adopted at the 32nd Session of the Assembly, A32-19, 1998.

[190] Preamble, 3rd para., Development and Elaboration of an Appropriate Long-term Legal Framework to Govern the Implementation of GNSS, Resolutions Adopted at the 32nd Session of the Assembly, A32-20, 1998.

European Civil Aviation Conference (ECAC).[191] With the presentation of a working paper,[192] the European Civil Aviation Conference also introduced a first draft, addressing a potential contractual framework, which would involve public and private law agreements. This framework, listed under Appendix B of the working paper, provides for a two-tier approach including certification and liability on the one hand, as publicly regulated matters, and specific contractual relations among stakeholders on the other. There is currently no coherent liability structure for all levels of GNSS services and a European framework for the certification of GNSS systems is only now emerging.

The initial EGNOS augmentation system operated by the European Satellite Services Provider (ESSP) from 2006 until 2013, a consortium of seven European Air Navigation Service Providers (ANSP),[193] was originally certified as system operator by the French National Supervisory Authority (NSA), on behalf of the European Commission.[194] In its second phase of operations, the same consortium has been re-selected to operate EGNOS for the European Union for a second term.[195] The current Galileo GNSS operator during the first phase of the Galileo system is a consortium of operators, led by Germany.[196] The next incumbent is as yet unknown; at the time of writing, as the system approaches completion, further procurement is about to start at the EU level for the successor GNSS operator.[197]

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[191] ICAO, Assembly – 36th Session; Legal Commission Agenda Item 47: Work Programme of the Organization in the Legal Field, Report on the Establishment of a Legal Framework with regard to CNS/ATM Systems Including GNSS; A36-WP/140 LE/7; see also Bollweg, *supra* n. 111, 917.

[192] ICAO Doc. A35-WP/125, http://legacy.icao.int/icao/en/assembl/a35/wp/wp125_en.pdf, last accessed 15 January 2014.

[193] For more information concerning the ESSP members, see www.essp-sas.eu/company_structure, last accessed 15 January 2014.

[194] For more information on the certification process of ESSP, see www.essp-sas.eu/egnos_in_operation, last accessed 15 January 2014.

[195] The award of the long-term operations of EGNOS from 2014 to 2020 went to the first incumbent, ESSP, see http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=6768&lang=de, last accessed 15 January 2014.

[196] See Galileo: Signature of Major Contract Leading to Initial Services in 2014 European Commission, IP/10/1382, of 26 October 2010, http://europa.eu/rapid/press-release_IP-10-1382_en.htm, last accessed 15 January 2014.

[197] The procurement for the deployment phase of Galileo took place under the provisions of Regulation 683/2008, *supra* n. 27, in conjunction with the then applicable Financial Regulation. These provisions have since been repealed, see *supra*, at n. 24. The procurement relating to the exploitation phase is now contained in Regulation 1285/2013, *supra* n. 24, in conjunction with the new

10.6.4 Air Law Liability Conventions

In the absence of a dedicated international GNSS convention, two main international agreements provide the basis for compensation in the context of damage to third parties resulting from a malfunctioning GNSS signal that leads to an aircraft accident.

For the passengers on an aircraft, Article 17 of the Warsaw Convention[198] provides, in the case of loss or damage, for compensation on a fault-based liability. The Warsaw Convention was amended in 1999 on the signing of the Montreal Convention, which brought in a two-tier liability regime based on strict liability with an upper limit of 113,100 SDR,[199] where 'the damage is not due to negligence, or another wrongful act or omission on the part of the Carrier, its officials or agents'.[200] As a result, damage resulting from a faulty GNSS signal in an airline context would lead to compensation, the level of which would depend in turn on whether there had been any error or fault.

In the case of third-party damage on the ground, the Rome Convention[201] provides that '[a]ny person who suffers damage on the surface shall, upon proof only that the damage was caused by an aircraft in flight or by any person or thing falling therefrom, be entitled to compensation'.[202] In other words, the aircraft operator may be held strictly liable for any damage to a third party on the ground. An exception for this liability exists under Article 6 of the Rome Convention, if 'the person

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Financial Regulation, Regulation (EU, Euratom) of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002, No. 966/2012, of 25 October 2012; OJ L 298/1 (2012); that repeals the previous Financial Regulation, Council Regulation on the Financial Regulation applicable to the general budget of the European Communities, No. 1605/2002/EC, Euratom, of 25 June 2002; OJ L 248/1 (2002).

198 Convention for the Unification of Certain Rules Relating to International Transportation by Air (hereafter Warsaw Convention), Warsaw, done 12 October 1929, entered into force 13 February 1933; 137 LNTS 11; 49 Stat. 3000; USTS 876; UKTS 1933 No. 11; ATS 1963 No. 18.

199 SDR is not so much a currency, as it is a claim to currency, implemented by the International Monetary Fund; see www.imf.org/external/np/exr/facts/sdr.HTM, last accessed 15 January 2014.

200 Art. 19(2)(1)(b), Convention for the Unification of Certain Rules for International Carriage by Air (hereafter Montreal Convention), Montreal, done 28 May 1999, entered into force 4 November 2003; 2242 UNTS 350; ICAO Doc. 9740; 48 *Zeitschrift für Luft- und Weltraumrecht* 326 (1999), DCW Doc. No. 57.

201 Rome Convention *supra* n. 147.

202 Art. 1(1), Rome Convention, *supra* n. 147.

liable proves that the damage was contributed to by the negligence or other wrongful act or omission of the person who suffers the damage'.[203] Article 12 of the Rome Convention goes so far as to say that the liability is unlimited, if the claimant can prove that the operator of the aircraft caused the damage deliberately. The existence of these provisions contributes in part to the lack of follow-through regarding a further dedicated GNSS regime.

10.7 GNSS AND THE MARITIME TRANSPORT SECTOR

10.7.1 Introduction

The (private) maritime sector has used GNSS as navigational aid system ever since the first GNSS signal became accessible for civil purposes. The malfunctioning of a navigational aid system in the maritime sector, similar to the aviation sector, could result in a major catastrophe. The unpredictability of repercussions initially forced the International Maritime Organization (IMO),[204] which constitutes the maritime counterpart to ICAO, to adopt its 'Maritime Policy for a Future Global Navigation Satellite System (GNSS)' in 1997.[205]

This policy was contained in the IMO Assembly Resolution A.860(20) and provides basic operational and institutional requirements for GNSS in the maritime sector. In its institutional requirements, it is stated that

> [t]he future GNSS should have institutional structures and arrangements for control by an international civil organization in particular representing the contributing Governments [as] IMO itself is not in a position to provide and operate a GNSS. However, IMO has to be in a position to maintain control

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[203] Art. 6(1), Rome Convention, *supra* n. 147.

[204] The IMO was originally established as the International Maritime Consultative Organization by the Convention on the Intergovernmental Maritime Consultative Organization IMCO, Geneva, done 6 March 1948, entered into force 17 March 1958; 289 UNTS 48; TIAS 4044; UKTS 1958 No. 54; Cmnd. 589; Cmd. 7412; ATS 1958 No. 5; the Title of Convention was amended to 'Convention on the International Maritime Organization' in 1975 with effect from 22 May 1982.

[205] IMO Assembly Resolution A.860(20), Maritime Policy for a Future Global Navigation Satellite System (GNSS), 20th session, Agenda item 9, adopted on 27 November 1997.

> over … the application of internationally established, cost-sharing and cost-recovery principles; and the application of internationally established principles on liability issues.[206]

Thus, the Resolution points out the need ‘to provide ships with navigational position-fixing throughout the world for general navigation, including navigation in harbour entrances and approaches and other waters in which navigation is restricted’.[207]

With the approval of IMO Assembly Resolution A.915(22) on the ‘Revised Maritime Policy and Requirements for a Future Global Navigation Satellite System (GNSS)’[208] in 2001, the former Resolution A.860(20) was revoked. While the institutional requirements remained unaltered, the IMO recommended ‘the development and use of integrated receivers’[209] in its operational requirements for the first time. These integrated receivers could inform the operator of the vessel about a potential error or malfunctioning GNSS signal.

With the increasing importance of GNSS as the main means of navigation, IMO Assembly Resolution A.815(19) on a ‘World-Wide Radio-Navigation System’[210] was also revoked by IMO Assembly Resolution A.953(23), which states that ‘the provision and operation of a radio navigation system is the responsibility of the Governments or organizations concerned’.[211] It also lists in its appendix the operational requirements concerning the recognition of the system.

10.7.2 GNSS Requirements under Maritime Conventions

The International Convention for the Safety of Life at Sea, or SOLAS Convention, also addresses the issue of GNSS by requiring that ‘[a]ll ships irrespective of size are required to be fitted with a GNSS

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[206] *Ibid.*, 5–6.

[207] *Ibid.*, 1.

[208] IMO Assembly Resolution A.915(20), Revised Maritime Policy and Requirements for a Future Global Navigation Satellite System (GNSS), 22nd session, Agenda item 9, adopted on 29 November 2001.

[209] *Ibid.*, § 3.11, 6.

[210] IMO Assembly Resolution A.815(19), World-Wide Radio-Navigation System, adopted on 23 November 1995.

[211] IMO Assembly Resolution A953(23), World-Wide Radio-Navigation System, 23rd session, Agenda item 17, adopted on 5 December 2003.

receiver'.[212] Unlike other parts of the Convention, Chapter V on the safety of navigation is generally applicable to all ships on all voyages.[213]

In addition to the foregoing developments in the safety of passenger ships, IMO has adopted two treaties on liability and compensation in connection with passenger claims. The 1974 Athens Convention establishes limits of liability for claims such as death and injury and loss or damage to passenger's property (luggage and vehicles).[214] The 2002 Protocol to the 1974 Convention (though not yet in force) significantly increases these limits and also introduces strict liability and compulsory insurance in connection with passenger claims.[215]

The IMO Assembly, at its twenty-fifth session, adopted a resolution on guidelines on voyage planning for passenger ships operating in remote areas in response to the growing popularity of cruise ships sailing to new destinations, some of which are at considerable distances from search and rescue facilities. This new IMO initiative comes in the aftermath of the adoption of guidelines for ships operating in Arctic-ice-covered waters, by the Organization's Maritime Safety and Marine Environment Protection Committees in December 2002.

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[212] SOLAS V/19.2.1.6, § 11.1; International Convention for Safety of Life at Sea (hereafter SOLAS Convention), London, done 1 November 1974, entered into force 25 May 1980; 1184 UNTS 3, 1300 UNTS 391, 1408 UNTS 339, 1484 UNTS 442 & 1593 UNTS 417; TIAS 9700 & 10626; UKTS 1980 No. 46 & UKTS 1983 No. 42; ATS 1983 No. 22; Annex 20 – Inspection and Survey of Navigational Equipment, 11.1, https://mcanet.mcga.gov.uk/public/c4/solas/solas_v/Annexes/Annex20.htm#eleven, last accessed 15 January 2014.

[213] For more information about SOLAS, see www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-%28SOLAS%29,-1974.aspx, last accessed 16 April 2014.

[214] Athens Convention Relating to the Carriage of Passengers and Their Luggage by Sea (hereafter Athens Convention), Athens, done 13 December 1974, entered into force 28 April 1987; UKTS 1987 No. 40; Cmnd. 6326; International Transport Treaties, Suppl. 1-10 (Jan. 1986), I-229.

[215] Protocol of 2002 to the Athens Convention relating to the Carriage of Passengers and their Luggage by Sea, 1974, London, done 1 November 2002, not yet entered into force, www.gard.no/ikbViewer/Content/72411/Athens%20convention%20compilation.pdf, last accessed 16 April 2014, 12–20.

10.8 THE ROAD SECTOR AND AUTONOMOUS DRIVING SYSTEMS

10.8.1 Introduction

Automatic systems, such as automatic sliding doors or artificial pacemakers, have become commonplace in modern society, and the latest form of technology, the autonomous system, is now emerging in various fields of daily life. Not yet widely known to the public, markets are rapidly evolving around the technologies of autonomous systems in almost all industrial sectors.[216] Their use ranges from medical assistance systems (robots) through to advanced guidance weaponry.[217]

The main difference between the conventional automatic systems, which are designed to perform one specific task usually in a repetitive manner, and the autonomous systems is that an autonomous system is able to react to a vast variety of external stimuli, leading to a complex evaluation process within the system itself. This lets the system decide how to best react in a specific situation. The increasing complexities in the decision-making process, as well as the coherent range of possibilities for such systems, are accompanied by various legal and ethical questions.

As the technical complexity grows, so does the autonomy of the systems, with greater autonomous responsibilities being shifted from the human to the technical systems. Legal issues of responsibility and liability for a system that carries out autonomous, automatic processed decisions, in the absence of designated legal regimes providing for automatic liability, remain subject to the law as it currently stands. This means that the classic rules of contract, tort, manufacturer's and product liability apply to these processes.

Apart from existing statutory (strict) liability regimes for sectors such as transport and dangerous goods, and in the absence of the case stated in

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[216] Final Report 2011, Robotics and Autonomous Systems Industry, The Industrial College of the Armed Forces (ICAF), National Defense University, Washington, 2011, 4, www.ndu.edu/es/programs/academic/industry/reports/2011/pdf/icaf-is-report-robotics-autonomous-systems-2011.pdf, last accessed 15 January 2014.

[217] For more information on the different applications, see also N. McCarthy & L. Dopping-Hepenstal Freng, Are We Ready for Autonomous Systems? A Look at Some of the Hopes and Concerns for Robotic and Autonomous Technology, 45 *Ingenia* (Dec. 2010), www.ingenia.org.uk/ingenia/articles.aspx?Index=635, last accessed 15 January 2014.

favour, no further liability systems are presently under discussion. This perspective is important when considering whether there is a need for a GNSS third-party liability system.

10.8.2 Autonomous Systems and Automobiles

GNSS-guided autonomous road vehicles belong to the autonomous road application systems that have since emerged. As with airlines, safety has been a concern since the advent of the first motor vehicles driving on public roads. Throughout the history of motorization, numerous inventions have increased the safety of the occupants, by providing better control over the vehicle, such as lighting systems, rear-view mirrors and windscreen wipers. With the early introduction of automatic systems, such as anti-lock braking systems, the basic principle of control maximization has been challenged by passing a portion of control, and with it responsibility, on to an artificial system in order to increase safety. These safety processes are themselves automatic. Not all developments, however automated, qualify the automated system for use. Applications are under way for testing of positional aids, ranging from automatic landing systems for aircraft to assistance for the disabled. However, the certification and licensing process, particularly for those involved in transport, is not fully developed. Society is far from relying on fully autonomous vehicles that would depend solely on sensing and navigational information. Nevertheless, there is a clear trend to include further automatic technology as a driving aid, particularly with a view to increasing safety and reducing human error to the maximum.

10.8.3 Structure of Automated Systems and Effect in Law

The contemporary structure of aid systems for vehicles is divided into four sub-categories: (1) warning and information systems, which consist of systems that do not take direct control over the vehicle, such as conventional GNSS receivers; (2) assisted-driving systems, such as automated headlight systems, which take control over one specific part of the vehicle; (3) automated driving systems, which take control over the main function of the vehicle for specific purposes, such as automatic parking;[218] and (4) a fully-autonomous driving system, which does not require any interaction with the driver.[219]

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[218] See Technology, the Third Industrial Revolution, *Economist*, September 2013; also 'Driverless' Tests on Automatic Vehicles Undertaken for Volvo

The implementation of GNSS as a navigational aid system is conducted either actively or passively, meaning that GNSS can either operate as an independent system, by giving directions to the car directly, thereby exerting some control over the vehicle, or it can be implemented as an informational system only, as has now become commonplace. Where the GNSS receiver is used as an informational device, without having any direct influence on the car itself, the driver remains ultimately responsible in a case of accident; he retains control over the vehicle and does not necessarily rely or depend on the information it provides.[220] A more complex legal situation is created where the computed GNSS signal has a direct influence on the vehicle, for instance in the case of automated systems in the form of lane-keeping systems on long highways or autonomous systems in various situations.

10.8.4 The Vienna Convention on Road Traffic

The Vienna Convention on Road Traffic,[221] which has been signed by the majority of European states as well as many other states, provides a set of basic international rules for road traffic. The Convention stipulates that 'every moving vehicle or combination of vehicles shall have a driver',[222] thus 'every driver shall at all times be able to control his vehicle'.[223]

Though autonomous vehicles played no part in the initial considerations of the Convention drafters, the law will require a designated driver not only to have to accompany the autonomous car of the future, but also to be in a position to regain control in a critical situation. In most traffic accidents, the courts rely on statutory duties imposed under national

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Vehicles and Sailing Boats, Including Test Run in Barcelona, www.economist.com/topics/volvo, last accessed 16 April 2014.

219 See S.A. Beiker & M.R. Calo, Legal Aspects of Autonomous Driving, The Need for a Legal Infrastructure that Permits Autonomous Driving in Public to Maximize Safety and Consumer Benefit, Center for Automotive Research at Stanford (CARS), Stanford University, 2010, 2, http://me.stanford.edu/groups/design/automotive/ADP/Autonomous%20Driving%20-%20Essay%202010-12%20V0.5%28final%29.pdf, last accessed 15 January 2014.

220 *Cf.* Informal Consultation Meeting, Third Party Liability for Global Navigation Satellite Systems (GNSS), UNIDROIT 2010 Study LXXIX – Preliminary Study, March 2010, 32.

221 Vienna Convention on Road Traffic, Vienna, done 8 November 1968, entered into force 21 May 1977; 1042 UNTS 17; E/CONF.56/16/Rev.1/Amend.1.

222 Art. 8(1), Vienna Convention on Road Traffic, *supra* n. 221.

223 Art. 8(5), Vienna Convention on Road Traffic, *supra* n. 221.

legislation when considering responsibility for traffic incidents.[224] Interestingly, after Florida and Nevada, California has become the third jurisdiction to pass an autonomous car law in 2012, allowing autonomous cars to drive on public roads for scientific purposes, subject to compliance with warning signs and insurance coverage.[225]

The combination of autonomous driving systems with GNSS included in their operations does not alter the original starting position that the existing international liability conventions apply where their scope covers the type of accident. Existing liability provisions therefore currently remain unaltered by the integration of GNSS.

10.9 GNSS IN THE CONTEXT OF THE RAIL TRANSPORT SECTOR

The impact of the above uniform convention law on an accident caused by a GNSS failure is regulated for the rail transport sector in the now merged COTIF Convention,[226] an amalgam of the former CIV Convention[227] with

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[224] *Cf.* Convention on the Contract for the International Carriage of Goods by Road (CMR Convention), Geneva, done 19 May 1956, entered into force 2 July 1961; International Transport Treaties, Suppl. 1-10 (Jan. 1986), IV-1; *juncto* Protocol to the Convention on the Contract for the International Carriage of Goods by Road (CMR Protocol), Geneva, done 5 July 1978, entered into force 28 December 1980; 1695 UNTS 3; 17 ILM 608 (1978); International Transport Treaties, Suppl. 1-10 (Jan. 1986), IV-68; concerning the Electronic Consignment Note (2008); and Convention on the Contract for the International Carriage of Passengers and Luggage by Road (CVR Convention), Geneva, done 1 March 1973, entered into force 12 April 1994; International Transport Treaties, Suppl. 1-10 (Jan. 1986), IV-43.

[225] Details of insurance requirements include coverage up to US$ 5 million; further requirements relate to clearly visible notices that the autopilot is switched on. The vehicle must have a black box that can reconstruct the last 30 seconds prior to accident, and the data must be saved for three years, see http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB1298&search_keywords, last accessed 15 January 2014.

[226] *Infra*, n. 227.

[227] A train accident caused by a GNSS failure or malfunction, causing loss or damage to the passengers would fall within the Convention's scope, as Art. 2, CIV Convention (International Convention concerning the Carriage of Passengers and Luggage by Rail (CIV), Berne, done 7 February 1970, entered into force 1 January 1975, effectively incorporated and superseded by the COTIF Convention (International Convention concerning the International Transport by Rail, Berne, done 9 May 1980, entered into force 1 May 1985; International

the CIM Convention,[228] along with its series of Annexes regulating standard passenger conditions. A separate Annex A to the COTIF Convention regulates the rules applicable to cases of liability for death and damage to passengers. This is another example of a private international law convention that links the applicable law to the law of the forum of the place where any case is brought by stipulating that the national law of that legal system applies. In this respect, it reduces the possibility of forum shopping and any resulting legal conflicting results.

10.10 FEASIBILITY OF A UNIDROIT GNSS CONVENTION

As discussed, there is no one legal response applicable to the question of GNSS regulation and its liability. With the increase in types and numbers of devices containing integrated GNSS technology, the question of GNSS-related liability will continue to attract interest. Third-party 'bystanders' are seen to constitute the weaker interest group, requiring greater protection by the law than passengers, who are directly covered by convention law.

Third-party liability under GNSS has been selected within the latest discussions relating to a possible international convention, and appears as part of the 2013 work programme of UNIDROIT, the International Institute for the Unification of Private Law, based in Rome. Should deliberations at that level find international consensus, then civil liability for third parties may come to operate under a common international framework. In the meantime, until such time as a catastrophe occurs requiring governments to act and provide remedies, legal regulation of GNSS liability will not become a regulatory priority. As long as systems are publicly owned and available free of charge, the responsibilities of

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Transport Treaties, Suppl. 1-10 (Jan. 1986), V-183) as of 1 May 1985; International Transport Treaties, Suppl. 1-10 (Jan. 1986), V-133), states: 'The carrier shall be liable for the loss or damage … caused by an accident arising out of the operation of the railway and happening while the passenger is in, entering or alighting from railway vehicles'.

[228] International Convention concerning the Carriage of Goods by Rail (CIM Convention), Berne, done 7 February 1970, entered into force 1 January 1975, effectively incorporated and superseded by the COTIF Convention, *supra* n. 227, as of 1 May 1985; International Transport Treaties, Suppl. 1-10 (Jan. 1986), V-58.

states can only otherwise arise in the context of existing national and international commitments.

The Liability Convention neither excludes third parties from its scope nor does it define this group of victims as a group distinct from other victims suffering damage from outer space.[229] The provisions relating to absolute liability for damage on earth cover third-party loss, as do the provisions governing damage in outer space or in air flight, insofar as fault is established and the remaining prerequisites met. Limitations in the duty to compensate may arise where the status of 'launching State' is not given, and where third-party victims are also beyond the scope of the existing conventions. This group has yet to be identified. The European Commission is currently investigating the impact of its own Galileo GNSS in relation to this potential group of third parties, and its report is expected for the end of 2014.

The integration of GNSS within a wide range of devices and applications such as GNSS surveillance devices by police forces (security) and GNSS data traces (smartphone), all collected by service providers, will continue to challenge traditional ideas of the scope of liability and access to navigation and communication services. At the same time, they open up other issues and values as can be seen in issues such as privacy in the field of telecommunications. The interaction between mobile tracking services, the law of privacy, and data retention rules for telecommunication companies are all part of the discussion as to whether and how the combination of each system, including GNSS, can or should be separately regulated.

10.11 CONCLUSION

The foregoing highlights the complexities surrounding the regulating of GNSS. The interfaces in its operations and the sectors in which it is put to use, notably in the transport sector, all combine to maintain a sectoral diversification within its operations. This in turn contributes to the lack of development of a dedicated legal, as opposed to technical, regulatory framework. With new interactive devices that include integrated GNSS applications now entering the market, the various GNSS markets are expanding rapidly; in the absence of a dedicated legal framework, there is a fear that the system may lead to a disjunction between the various categories of end-users.

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[229] See on the Liability Convention (*supra*, n. 97), *supra*, § 2.3.3.

While the law of general and contractual obligations (contract, tort) may serve as a flanking instrument for pursuing claims stemming from the chain of distribution for GNSS operations and hardware, these do not provide a sufficient legal basis for imposing liability. The status of the Signal in Space remains undefined, and some national statutes have gone so far as to exclude it from the scope of damage from outer space activities. In addition, claims in damages for loss resulting from GNSS services require causation and damage to be proved. On this point, the interaction with augmentation systems and other natural interferences may all compound to make this an insurmountable challenge, despite the rules of *res ipsa loquitur*.

The leading conventions regulating liability in the fields of transport, nuclear power and the law of the sea, all stem from concerted agreement about the need to ensure a system of operator liability that is limited. Convention victims are to be compensated and commercial risks managed on a predictable basis, largely through insurance and with liability capped to specific limits. Of the operator liability systems existing under convention law, none excludes access to the courts of law.[230]

Currently, third-party liability resulting from GNSS is not a priority issue for regulation. The existing transport conventions make some, albeit very limited, provision for compensation for loss. The absence of a liability prototype governing radio-signal regulation has not been conducive in gaining support for a uniform regulatory framework for GNSS. If a dedicated liability system is to be introduced for GNSS in the future, limitation of liability will be required, as well as consensus between states and the operators, whether public or private.

Should such an international regulatory initiative be forthcoming, it should be on the basis of a model law to be adopted for the regional GNSS systems. Although a uniform liability regime applicable to all GNSS systems, be this Galileo, GLONASS or the Chinese Beidou, would increase the level of legal certainty, the current lack of protection under GPS, as well as the line taken by states such as France excluding liability for satellite signals from the provisions of its national space law, are clear indications that each regional system prefers to develop its own approach.

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[230] See the case brought by the government of France, including the Commune of Brittany, various citizens and companies in the case of the oil pollution on the coast of France in 1978 against the US corporation Amoco Cadiz; *In the Matter of: Oil Spill by the Amoco Cadiz*, 954 F.2d 1279 (7th Cir. 1992).

The case for a new overlay regime of strict, but limited GNSS liability remains to be stated in relation to its risk potential. Meanwhile, as the technology push moves towards increased reliance on autonomous systems, regulatory challenges remain. These can only be resolved in combination with compulsory insurance requirements, with provision for third parties. Third-party GNSS-related claims – if beyond the scope of the transport conventions – could otherwise become the focus of future class actions and joined civil claims, insofar as they are not included in compulsory insurance-based solutions for the public and/or private operators of GNSS.

11. Legal aspects of public manned spaceflight and space station operations

Carla Sharpe and Fabio Tronchetti

11.1 INTRODUCTION

Nobody would deny that mankind's first steps into space have been challenging. As a species we have been faced with, and overcome, a variety of physical and technological challenges on our quest to reach the stars. Many more, indeed, remain. However, there is another aspect of our extra-planetary endeavours that has been equally taxing: the socio-political challenge of sovereign powers and their representatives meeting in neutral, unclaimed territory. The new human frontier, which opened over 50 years ago, was initially devoid of any framework for competing or collaborating – but no longer. It is remarkable that in just a few decades, mankind developed a system of 'law' to fill the void, a framework, that still continues to evolve today alongside the progressive expansion of activities beyond the earth's orbit.

Space law, which consists of a number of legal instruments, negotiated at international, regional, and national levels, aimed at regulating human activities in outer space,[1] has been successful in preventing military confrontation in outer space and in favouring international cooperation in space projects.

Space law has developed in two stages, each of them influenced by international political and economic factors: the first phase occurred during the competitive, militarily dominated era of the Cold War, the second within the more collaborative paradigm that has emerged since the early 1990s[2] – and this is clearly illustrated in manned spaceflight, in particular in the context of space stations.

Whilst much of it is explicitly evolutionary in nature, the principle of unanimity and national voluntarism that underlies all space law, and its particular relevance for manned spaceflight in the context of highly complicated multinational, long-duration space station operations, may

1 *Cf.* more in detail *supra*, §§ 2.1, 2.2.
2 *Cf. supra*, Chapter 1, also § 2.2.1.3.

potentially make it less dynamic in practice than it was intended to be. As such, it should always be kept in mind that, in examining the law, one must not only consider *lex lata* (the law as it exists) but also *lex ferenda* (the law as it ought to be).

The International Space Station (ISS) may be considered one of the most significant examples of how the principle of international cooperation has been successfully applied.[3] In this respect, the building and operation of the ISS is an international cooperative scientific undertaking involving the major space powers (the so-called ISS Partners), with the notable exclusion of China and India, where each Partner contributes in a manner comparable to its level of technical expertise and development.

The legal rules and principles developed, *sui generis*, to govern the operation of the ISS constitute a particularly interesting sub-section of space law. They are based on and consistent with the five UN space treaties[4] but significantly expand their provisions in order to provide a legal framework capable of adequately addressing the specific issues resulting from human activities on board a manned station orbiting in low earth orbit.[5] In particular, creative solutions have been found to deal with questions of intellectual property rights, behaviour of astronauts, registration of space objects and liability. Thanks to its special features and its successful operations, the legal arrangements put in place to govern the

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[3] The ISS was first legally established through a 1988 Intergovernmental Agreement (Agreement Among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station, Washington, done 29 September 1988, entered into force 30 January 1992; Cm. 705; *Space Law – Basic Legal Documents*, D.II.4.2), which was later superseded by the 1998 Intergovernmental Agreement; the Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4.

[4] See in general terms *supra*, esp. § 2.3.

[5] For early appraisals of legal issues involved in space station operations, see *Manned Space Flight* (Ed. K.H. Böckstiegel) (1993); F.G. von der Dunk, Pandora's Box? The Basic Legal Framework for Doing Business with a Space Station: An Inventory of Problems, in *Legal Aspects of Space Commercialization* (Ed. K.J. Tatsuzawa) (1992), 114–38.

ISS activities may represent a useful precedent, if not a model, for future international cooperative endeavours in space.

The purpose of this chapter is therefore mainly to examine the (space) law applicable to the ISS in terms of how it came to be, its present state, its major implications and how it might change in the near future, partly with a view to how it may also provide useful precedents for future, similarly complicated and multinational long-duration manned space endeavours.

Thus, with the ISS as a primary example of effective space law, this chapter will consider its history, the legal framework regulating its activities, its commercial uses, in particular from a legal perspective, the suitability of existing law for utilization and exploitation of future manned space stations and celestial objects, and finally more broadly the ISS as a model for future international cooperation.

11.2 FROM SINGLE-STATE SPACE STATIONS TO THE INTERNATIONAL SPACE STATION

From a mere technical point of view the ISS is a research laboratory orbiting the earth at an altitude of between 330 and 410 km, in a so-called low earth orbit.[6] Taking advantage of the micro-gravity

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[6] For general perspectives on the ISS project see e.g. S. Rosmalen, The International Space Station Past, Present and Future – An Overview, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 9–14; E. Messerschmid & R. Bertrand, *Space Stations: Systems and Utilization* (1999), 39–53; D.M. Harland & J.E. Catchpole, *Creating the International Space Station* (2002), 163–348; M.J. Rycroft, *Beyond the International Space Station: The Future of Human Spaceflight* (2002), 13–20, 39–54; J.E. Catchpole, *The International Space Station: Building for the Future* (2008), 1–28; R. Sattler, US Commercial Activities Aboard the International Space Station, 28 *Air & Space Law* (2003), 66–82; more specifically on the legal aspects F. Lyall & P.B. Larsen, *Space Law: A Treatise* (2009), 120–2; A.D. Watson & W.G. Schmidt, Legal Issues Surrounding the International Space Station, 7 *United States Air Force Academy Journal of Legal Studies* (1996–1997), 159–76; J.E. O'Brien, The U.S./International Space Station, 15 *Journal of Space Law* (1987), 35–42; H.P. Sinha, Criminal Jurisdiction on the International Space Station, 30 *Journal of Space Law* (2004), 85–128; M.C. Devlin & W.G. Schmidt, Legal Issues Continue to Surround the International Space Station, 8 *United States Air Force Academy Journal of Legal Studies* (1997–1998), 237–54; R. Moenter, The International Space Station: Legal Framework and Current Status, 64 *Journal of Air Law and Commerce* (1998–1999), 1033–56; C. Brünner & A. Soucek, Regulating the ISS: An

environment, ISS crew members carry out experiments in biology, human biology, physics, astronomy, meteorology and other fields. Furthermore, the ISS provides an ideal environment to test the human ability to live and work in space for extended periods.

Although the assembling of the ISS only began at the end of the 1990s, interest in developing an orbital space station dates back to the origins of the space era. Already in the late 1950s and early 1960s, while competing to be the first country to send a man to space, the United States and the Soviet Union included the development of space stations among the primary goals of their respective space programmes. The Soviet Union launched the first ever space station, Salyut-1, in 1971; the United States responded by launching the Skylab Space Station in 1973.[7] These early examples of space stations were structurally different from the current ISS, in that they were constituted by only one single element or module

Interdisciplinary Essay, 60 *Acta Astronautica* (2007), 594–98; A. Farand, Commercialization of International Space Station Utilization: The European Partner's Viewpoint, 28 *Air & Space Law* (2003), 83–8; A. Farand, International Space Station Utilization: Current Legal Issues, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 387 ff.; M.H. Fonseca de Souza Rolim, USA–Brazil Implementing Arrangement on the International Space Station: Interpretation and Application, 86 *Revista Brasileira de Direito Aeronáutico e Espacial* (2003), #1754; M. Fukushima, Legal Analysis of the International Space Station (ISS) Programme Using the Concept of 'Legalisation', 24 *Space Policy* (2008), 33–41; A. Yakovenko, The Intergovernmental Agreement on the International Space Station, 15 *Space Policy* (1999), 79–86; G.P. Zhukov, Registration and Jurisdiction Aspects of the International Space Station, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 18–22.

[7] See S. David, Skylab: America's Space Station (2001); von der Dunk, supra n. 5, 114; K.H. Böckstiegel, *Space Stations: Legal Aspects of Scientific and Commercial Use in a Framework of Transatlantic Cooperation: Proceedings of an International Colloquium Hamburg* (1985); Rycroft, *supra* n. 6, 239–51; A.J. Young, *Law and Policy in the Space Stations' Era* (1989); W. Ley & W. Stoffel, Report of the 'Project 2001' Working Group on Space Stations, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 323 ff.; E.J. Steptoe, Panel Working Group on Space Stations: Remarks, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 395 ff.; also www.nasa.gov/mission_pages/skylab/index.html, last accessed 4 January 2014; more generally http://en.wikipedia.org/wiki/Space_station, last accessed 3 February 2014; further e.g. R. Neri, *Manned Space Stations* (1990); Space Stations and the Law: Selected Legal Issues, U.S. Congress, Office of Technology Assessment, 1986; *International Space Station: The Next Space Marketplace* (Eds G. Askell & M.J. Rycroft) (2000).

('monolithic' space stations) as opposed to the ISS, which consists of several elements assembled together in space at different stages (henceforth labelled 'modular space station').

Not just operationally but also legally speaking the ISS would fundamentally differ from the space stations which had hitherto orbited the earth, from the US Skylab and early Russian space stations to the Mir. The Mir was an astounding achievement, maintained in orbit for some 15 years until it had become too worn out to continue safe operations – and with Russia now changing its focus to the ISS, no more funds were made available for upkeep purposes[8] – yet it remained a single-state space station.

Therefore, the legal situation also for Mir was quite simple: following registration under the Registration Convention[9] the state of registry – first the Soviet Union, later Russia – was entitled to exercise its jurisdiction on a quasi-territorial basis on board.[10] Consequently, for all legal purposes Mir formed a floating piece of Soviet/Russian quasi-territory in the global commons of outer space – and *mutatis mutandis*, the same applies for the other space stations.

Due to economic, political, social and cultural priority changes in the 1960s, the US government imposed tremendous budget cuts on NASA. While funds were allocated to develop the Space Shuttle programme, these were not sufficient to include the building of a permanent space station. Two decades on, however, in the 1980s, then-US President Reagan supported the process for NASA to take on the objective of

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[8] See e.g. http://en.wikipedia.org/wiki/Mir, last accessed 3 February 2014; also S.A. Negoda, Legal Aspects of the Commercial Development of the Russian Segment of the ISS, 28 *Air & Space Law* (2003), 89–96; S.R. Freeland, There's a Satellite in My Backyard – Mir and the Convention on International Liability for Damage Caused by Space Objects, 24 *University of New South Wales Law Journal* (2001), 462–84; Harland & Catchpole, *supra* n. 6, 143–62, 172–88; H.J. Kramer, *Observation of the Earth and Its Environment: Survey of Missions and Sensors* (2002), 997–1000.

[9] As per Art. II, Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

[10] *Cf.* also Art. VIII, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

building a permanently manned space station. In 1984 at the G-7 meeting, Reagan called upon a number of countries to join the United States in the development and assembling of the ISS. This call for international participation was answered by Japan, Canada, and the European Space Agency (ESA), which became Partners of the ISS programme Freedom in 1985. Within the programme, building the ISS required the allocation of various tasks among the participating countries; the Partners thus agreed on development and operational responsibilities for the transportation systems and elements that they would provide.

In the 1990s, while the development of the ISS was well underway, the Clinton administration faced budget constraints which led to a restructuring of the ISS programme so as to reduce costs and increase international involvement. The main goal of this initiative was to incorporate Russia into the ISS programme. This would bring the extended Soviet and Russian expertise and technologies[11] to the project as well as solidify relations with the former competitor. Accordingly, Clinton invited Russia to join the programme. The invitation was accepted and Russia became a full ISS Partner.

The ISS Partners then established a schedule to develop, ultimately assemble and operate the ISS. A three-phase plan was envisaged; the first preparatory phase ran from 1994 through to 1998. The main objective was that of design and addressing operations in space for extended periods of time, particularly with a focus on examining the Mir programme. The second phase followed in 1998 and coincided with the beginning of the actual construction of the station; indeed, in 1998 the first control module, Zarya, was launched. The second phase was completed in 2000 when the first crew was sent to the ISS. The third phase commenced in 2000 and it was this phase that led to the completion of the assembly of the ISS.[12] Initially the ISS operational

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[11] As indicated, before joining the ISS project, Russia had built its own space station Mir. The Mir was assembled in orbit between 1986 and 1996; it remained operational until 2001 when it was de-orbited. See further e.g. W. Peeters, Utilisation Aspects of ISS, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 365 ff. (*i.a.* providing interesting comparators with Spacelab and Mir); von der Dunk, *supra* n. 5, 115; also *supra*, references at n. 8.

[12] See e.g. Rosmalen, *supra* n 6, 11–4; Ley & Stoffel, *supra* n. 7, 328–9.

programme was scheduled to end in 2015 but was later extended – so far to at least 2020.[13]

Nowadays, the ISS is an international cooperative endeavour involving the 15 Partner States that signed the Intergovernmental Agreement on 29 January 1998.[14] Each Partner[15] and Cooperating Agency[16] provides a contribution proportionate to its technological and financial resources. For example, ESA contributes the Columbus laboratory and the Automated Transfer Vehicle (ATV); Canada with the robotic arm (Canadarm-2) and the Special Purpose Dexterous Manipulator, also known as the Canada Hand or *Dextre*; Japan with the HTV logistic vehicle for servicing purposes and the Japanese Experimental Module, Kibo; Russia with the Zarya and Zvezda modules, the solar arrays, the Soyuz launch vehicles and the Proton and Soyuz capsules (currently the only means to transport crew members to the ISS); and the United States, which incurs the majority of the expenses for the ISS maintenance and operations, with the Unity and Harmony modules, solar arrays, the Destiny research laboratory, and the Cygnus and Dragon cargo vehicles

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[13] *Cf.* e.g. http://blogs.nasa.gov/bolden/2014/01/08/obama-administration-extends-international-space-station-until-at-least-2024, last accessed 17 April 2014.

[14] *Supra*, n. 3.

[15] 'Partner' is defined by Art. 3(b), Intergovernmental Agreement, *supra* n. 3, as referring to each of the four governments of Canada, Japan, Russia and the United States plus ESA on behalf of the 11 governments of the participating European states. ESA was established by means of the Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1.; the ESA contribution to the ISS was fundamentally given shape as a series of optional activities; see further on this type of programme *supra*, § 4.2.3.2.

[16] 'Cooperating Agency' is defined by Art. 4(1), Intergovernmental Agreement, *supra* n. 3, as referring to each of the Canadian Space Agency (CSA), ESA, the Russian Space Agency (RSA), and the National Aeronautics and Space Administration (NASA), whereas Japan at the time of signing the 1998 intergovernmental Agreement had yet to establish a proper national space agency; this was to occur in 2003 with the establishment of the Japanese Aerospace Exploration Agency (JAXA), as per the Law Concerning Japan Aerospace Exploration Agency (JAXA), Law No. 161 of December 12, 2002; General Provisions Law Concerning Incorporated Administrative Agency, Law No. 103 of July 16, 1999. For further analysis see S. Aoki, Regulation of Space Activities in Japan, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 201.

(respectively provided by the private companies Orbital Sciences and SpaceX).[17]

These contributions are regulated through a series of bilateral and multilateral agreements among the parties. Participants in the building of the Space Station differ from the parties to the Intergovernmental Agreement. For example, the United Kingdom has a rather peculiar status. It is one of the 11 member states of ESA which have signed the Intergovernmental Agreement and is, thus, involved in the ISS project. However, the United Kingdom does not contribute to the building of the station, but rather funds it as part of the European participation in this project, on a relatively minor scale.[18] Brazil originally joined the ISS programme as a bilateral partner of the United States via a contract with NASA to supply hardware.[19] In return, NASA would provide Brazil with access to its ISS facilities in orbit, as well as a flight opportunity for one Brazilian astronaut during the course of the ISS operational life. However, due to cost issues, the subcontractor Embraer was unable to provide the promised Express pallet, and Brazil left the programme.[20]

In recent years, further developments have affected transportation services to the Station. The United States closed down the Space Shuttle programme in 2011[21] and as such the ISS is now serviced by the Soyuz

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[17] See further on these companies as working with NASA on servicing the ISS *infra*, §§ 12.1, 12.4.3.

[18] To wit, 5.5% for the original Columbus module; see K. Madders, *A New Force at a New Frontier* (2000), 308. For more information on the participation of the United Kingdom in the ISS project and the relevance of UK law thereto see F. Lyall, British Law and the International Space Station, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 137 ff.

[19] See further www.nasa.gov/centers/johnson/news/releases/1996_1998/h97-233.html, last accessed 17 April 2014.

[20] On the termination of the participation of Brazil in the ISS project see http://openspacecraft.wikispaces.com/International+Space+Station+ISS, last accessed 4 January 2014; earlier M.H. Fonseca de Souza Rolim, The USA–Brazil Implementing Arrangement on the International Space Station: Interpretation and Application, in *Proceedings of the Forty-Fourth Colloquium on the Law of Outer Space* (2002), 87–99; J.G. Vaz & J.A. Guimaraes, Brazilian Participation in the International Space Station, with an Emphasis on Microgravity Research, in *International Space Station* (Eds. G. Haskell & M. Rycroft) (2000), 9–16; A. Fabricio dos Santos, The Flight of Brazil's First Astronaut, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 450–4.

[21] See www.nasa.gov/home/hqnews/2011/jul/HQ_11-240_Atlantis_Lands.html, last accessed 17 April 2014.

spacecraft, the Progress spacecraft, the ATV, the H-II Transfer Vehicle and the Dragon spacecraft.[22] The latter constitutes the first example of a privately owned and developed spacecraft operating cargo services to the ISS.[23]

11.3 THE LEGAL FRAMEWORK REGULATING ISS ACTIVITIES

The legal framework pertinent to ISS activities derives from two distinct sources: the general international legal framework applicable to all space activities, in particular the UN space treaties,[24] and the specific legal instruments underpinning the operations on board the ISS. The relation between these two sources is that the latter is based on and shall not contravene the former. This is not to say that the latter does not expand on or further clarify some principles of the former but merely that it does not result in a re-formulation or re-interpretation of basic principles of international space law. Such a general analysis should also be applicable to other future regimes specifically addressing space stations, following the general rule of *lex specialis derogat legi generali*.[25]

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[22] For further information see www.nasaspaceflight.com/2012/12/soyuz-tma-07m-three-new-crewmembers-iss/, last accessed 4 January 2014. The Dragon Spacecraft is owned by the private company SpaceX; SpaceX is also working on a vehicle to transport personnel to the ISS. See further www.spacex.com/dragon, last accessed 4 January 2014.

[23] See further on this *infra*, § 12.1.

[24] This is also recognized by the Intergovernmental Agreement, *supra* n. 3, itself; *cf.* Art. 2(1), explicitly mentioning the Outer Space Treaty, *supra* n. 10, Rescue Agreement (Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968)), Liability Convention (Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971)) and Registration Convention, *supra* n. 9.

[25] See in general terms: ILC Draft Articles on the Law of Treaties with Commentaries (1966), 221; R.K. Gardiner, *Treaty Interpretation* (2008), 343–5; *cf.* for the specific treaty context Art. 30(2), Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969).

11.3.1 The General International Framework Applicable to Space Activities

11.3.1.1 The Outer Space Treaty

The legal foundation for all activities in outer space is provided by the 1967 Outer Space Treaty.[26] This treaty, which lays down the main principles guiding human activities in outer space, has been ratified by over 100 states, including all the spacefaring nations.[27]

Among the fundamental principles established by the Outer Space Treaty, two in particular stand out with respect to the ISS: the prohibition to appropriate outer space[28] and the right to freely explore and use outer space.[29] According to the former, because outer space constitutes a global commons, no state can exercise legal control over any of its parts as if it were its legal territory.[30] Consequently, the ISS operates in a sovereignty-free environment. Pursuant to the latter principle, all states are granted the right to freely carry out the exploration and use of outer space. This right does find some restriction in other provisions of the Outer Space Treaty; for example, Article VI requires a state to exercise 'authorization and continuing supervision' of national activities in outer space, and Article VII establishes state liability for damage caused by space objects, even in the case of activities carried out by private entities.[31]

The main provisions of the Outer Space Treaty relevant to the ISS are included in Articles I, third sentence, and VIII. The former gives states parties the right to perform scientific research in outer space; such a provision constitutes the legal basis of any scientific undertaking in space, including the ISS. The latter makes it clear that by registering a space object, the state of registration is entitled to exercise jurisdiction on board and over personnel thereof, even if the latter is involved in extra-vehicular activities. In short, through Article VIII, the law of the state of registration is applicable to all activities related to the registered object on a quasi-territorial basis.[32]

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26 *Supra*, n. 10; more in general see *supra*, § 2.3.1.

27 See e.g. www.unoosa.org/oosa/en/SpaceLaw/treatystatus/index.html, last accessed 4 January 2014.

28 See Art. II, Outer Space Treaty, *supra* n. 10.

29 See Art. I, 2nd sent., Outer Space Treaty, *supra* n. 10.

30 See further *supra*, § 2.3.1.2.

31 See further *supra*, § 2.3.1.1.

32 Art. VIII, Outer Space Treaty, *supra* n. 10, provides in relevant part: 'A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any

Some of the principles laid down in the Outer Space Treaty were elaborated in follow-up treaties. For the purpose of our discussion, two of these treaties have specific relevance: the 1972 Liability Convention and the 1975 Registration Convention.

11.3.1.2 The Liability Convention

The Liability Convention builds upon the principle of state liability provided for in Article VII of the Outer Space Treaty.[33] Firstly, the Convention only deals with third-party liability.[34] Significantly, a distinction is made between damage caused on earth or to aircraft in flight, regulated by a regime of absolute liability,[35] and damage caused to another space object, regulated by fault liability.[36] Secondly, the Convention only deals with international liability: thus, it does not address damage caused to nationals of the 'launching State'[37] or persons being involved or merely present at the launch.[38] Thirdly, liability falls upon states, even if the damage has resulted from an activity carried out by a private entity.[39] Obviously, this principle will be applicable only if the state concerned qualifies as the 'launching State' for that private activity.[40] Finally, the Convention enables unlimited compensation to victims, and a dispute settlement mechanism, to be activated upon failure of

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personnel thereof, while in outer space or on a celestial body.' See also e.g. B. Cheng, The Extra-Terrestrial Application of International Law, 18 *Current Legal Problems* (1965), 132; B. Cheng, The Commercial Development of Space: The Need for New Treaties, 19 *Journal of Space Law* (1991), 30; R. Oosterlinck, Private Law Concepts in Space Law, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 52.

33 See more in general on the Liability Convention (*supra* n. 24), *supra*, § 2.3.3.

34 *Cf.* e.g., Arts. I, 1st sent., & VIII, Liability Convention, *supra* n. 24.

35 See Art. II, Liability Convention, *supra* n. 24.

36 See Art. III, Liability Convention, *supra* n. 24.

37 See Art. VII(a), Liability Convention, *supra* n. 24.

38 See Art. VII(b), Liability Convention, *supra* n. 24.

39 *Cf.* on this issue e.g. L.J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 114–5, 131, 168–70; C.Q. Christol, International Liability for Damage Caused by Space Objects, 74 *American Journal of International Law* (1980), 351 ff.; also A. Kerrest de Rozavel & L.J. Smith, Article VII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 129–30; 134–9.

40 Art. I(c), Liability Convention, *supra* n. 24, defines the 'launching State' as '(i) A State which launches or procures the launching of a space object; (ii) A

diplomatic negotiations to offer a satisfactory solution, is furthermore established.[41] In principle, all these provisions will also be applicable to space stations or component parts[42] thereof launched into outer space.
Notably, Article XXII of the Liability Convention permits intergovernmental organizations (IGOs), subject to a few conditions,[43] to enjoy substantially the same rights and obligations under the Convention as states parties. Actually, on a closer look, this status is a secondary one, since claims addressed to an IGO will be semi-automatically forwarded to its member states if the claim is not settled within six months.[44] Article XXII is of particular relevance to the present discussion as ESA, a Cooperating Agency to the ISS project, has deposited the relevant Declaration accepting rights and duties under the Liability Convention.[45]

11.3.1.3 The Registration Convention

The Registration Convention elaborates upon Article VIII of the Outer Space Treaty on registration and jurisdiction.[46]

As to jurisdiction, Article II includes the key provision by creating a link between the 'launching State', liable under the Liability Convention, and the registration of the space object. Indeed, pursuant to this Article, the 'launching State' is obliged to register the object that it has launched into space. Where there is more than one 'launching State', the states concerned should among themselves decide which one is going to serve as the state of registry and, consequently, to bear the obligations arising

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State from whose territory or facility a space object is launched'. See further *supra*, § 2.3.3 incl. § 2.3.3.1.

41 See for further details *supra*, § 2.3.3.2 and § 2.3.3.2.7 respectively.

42 Note that the definition of 'space object' as triggering the application of the Liability Convention, *supra* n. 24, as per Art. I(d) thereof 'includes component parts of a space object'.

43 These conditions are: (a) a majority of the member states of the organization should be party to the Outer Space Treaty (*supra* n. 10); (b) a majority of the member states of the organization should be party to the Liability Convention (*supra*, n. 24) itself; and (c) the organization should itself declare its acceptance of the relevant rights and obligations.

44 *Cf.* Art. XXII((3)(b), Liability Convention, *supra* n. 24.

45 Declaration on the Convention on International Liability for damage caused by Space Objects, 23 September 1976; *International Organisations and Space Law* (Ed. R.A. Harris) (1999), at 33; *Space Law – Basic Legal Documents*, A.III.2, at 1. See e.g. G. Lafferranderie, The European Space Agency (ESA) and international space law, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 19–22; further *supra*, § 4.2.5.1; also § 2.3.3.8.

46 See more in general on the Registration Convention (*supra* n. 9), *supra*, § 2.3.4.

out of the Convention.[47] With regard to registration, the Convention establishes a double system of registration, involving both a national registry[48] and an international register held by the UN Secretary-General.[49]

Once again, this system also pertains to space stations, which need to be registered as 'space objects' or alternatively 'component parts' thereof in accordance with the Convention, which, for example, requires as part of the international registration information on who the 'launching State(s)' is/are, any designator or registration number, date and territory or location of launch, basic orbital parameters and general function of the space object.[50]

Similar to the Liability Convention, the Registration Convention allows IGOs to accept rights and obligations provided by it. ESA has done so by means of a Declaration in 1979.[51] Where an IGO operates as a 'registration entity' under the Convention, the question arises as to how to deal with jurisdiction when it comes to registration, as an IGO does not exercise jurisdiction in the traditional public international meaning of the word.[52] Consequently, the states involved have to themselves find a solution on how to deal with this. Clearly, this is a problem that arose in connection with the participation of ESA and its member states in the ISS.[53]

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47 See Art. II(2), Registration Convention, *supra* n. 24.

48 *Cf.* Art. II, Registration Convention, supra n. 24.

49 *Cf.* Art. III, Registration Convention, *supra* n. 24.

50 See Art. IV(1), Registration Convention, *supra* n. 24.

51 Declaration of Acceptance of the Convention on the Registration of Space Objects, 2 January 1979; *International Organisations and Space Law* (Ed. R.A. Harris) (1999), at 27. See e.g. Lafferranderie, *supra* n. 45, 19–23; further *supra*, § 4.2.5.1; also § 2.3.4.3.

52 See further in general C. Archer, *International Organizations* (3rd edn., 2001), 92–107; G.I. Tunkin, *Theory of International Law* (1974), 326–35; J. Klabbers & A. Wallendahl, *Research Handbook on the Law of International Organizations* (2011), 33–55; F. Seyersted, *Common Law of International Organizations* (2008), 81–244; M. Keyes, *Jurisdiction in International Litigation* (2005).

53 See further *infra*, § 11.3.2.3.

11.3.2 The Special International Legal Framework Governing the ISS

11.3.2.1 Introduction

The Intergovernmental Agreement in its 1998 version is the cornerstone of the specific legal regime pertaining to the ISS and its related activities.[54] All other legal documents relating to ISS activities, negotiated either on a multilateral or on a bilateral basis, refer to and are based on it. Underneath the Intergovernmental Agreement there is a series of Memoranda of Understanding (MOUs) concluded between the Cooperating Agencies of the states parties.[55] The MOUs are bilateral agreements regulating the contribution of each Agency to the ISS project.[56] At a third level all further implementing arrangements between the same entities form part of the ISS legal framework. The next tier of the hierarchy consists of contracts and subcontracts needed to involve private industry. These contracts mostly deal with the commercial uses of the ISS and address issues such as intellectual property rights (IPR).

11.3.2.2 The Intergovernmental Agreement on the ISS: General remarks

The Intergovernmental Agreement was the outcome of years of negotiations, following the US proposal to build a permanent space station in the 1980s, with the original version of the Agreement signed in 1988 being amended later to accommodate the participation of Russia in the ISS project. The Intergovernmental Agreement has been accepted by 15 Partner States as well as by five Cooperating Agencies.[57] From a public

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[54] Intergovernmental Agreement, *supra* n. 3. See e.g. Ley & Stoffel, *supra* n. 7, 341–2; also Moenter, *supra* n. 6, 1033.

[55] *Cf.* e.g., on NASA's authority to conclude such agreements as MOUs, M.C. Wholley & S.A. Mirmina, Bilateral framework agreements governing international cooperation in space, in *Proceedings of the International Institute of Space Law 2008* (2009), 381–8.

[56] For example, an MOU has been concluded between the Italian Space Agency (ASI) and NASA. The MOU was signed in Washington on 6 December 1991 and later amended on 9 October 1997 and 11 January 2005. The MOU deals with the design, development, operation and utilization of three mini-pressurized logistic modules for the ISS. This cooperation is at the core of the Italian participation and utilization of the ISS, as ASI has acquired some utilization rights on board the station. *Cf.* also Arts. 1(1) & (3), 4(2) & (3), Intergovernmental Agreement, *supra* n. 3.

[57] The 15 Partner States are: the United States, Canada, Japan, Russia, and 11 members of ESA, namely Belgium, Denmark, France, Germany, Italy, the

international law point of view the Intergovernmental Agreement can be considered a 'mixed agreement'. Mixed agreements are defined as: 'Agreements with a third party to which an international organization and its members are parties, each in respect of its own competence'.[58]

The purpose of the Intergovernmental Agreement is 'to establish a long-term international cooperative framework among the Partners, on the basis of genuine partnership, for the detailed design, development, operation, and utilization of a permanently inhabited civil international Space Station for peaceful purposes, in accordance with international law'.[59] In addition, the ISS should further 'the scientific, technological, and commercial use of outer space'.[60] Several legal issues stand out in this specific legal regime governing activities on board the ISS with respect also to the legal solutions put in place by means of the Intergovernmental Agreement: registration and jurisdiction in general, criminal jurisdiction in particular, the handling of IPR and liability.[61]

11.3.2.3 Registration and jurisdiction

With regard to registration and jurisdiction the Intergovernmental Agreement follows the approaches offered by international law, in particular by the Registration Convention. The main question during the negotiation of the Agreement was whether the ISS, despite being assembled in space over an extended period of time, should be registered as one space object (the option originally favoured by the United States) or as a number of space objects, each by their own state of registration. Article 5 of the Intergovernmental Agreement makes clear that the latter option prevailed, as it states that 'each Partner shall register as space objects the flight

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Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. The five Cooperating Agencies are: the NASA, the Russian Space Agency (RSA, also known as Roscosmos), ESA, the Government of Japan (GOJ), representing different organizations responsible for various aspects of cooperation, and the Canadian Space Agency (CSA). See also Arts. 1, 3, 4, Intergovernmental Agreement, *supra* n. 3. For a detailed assessment of the Cooperating Agencies, see e.g. Ley & Stoffel, *supra* n. 7, 331–9.

[58] H.G. Schermers & N.M. Blokker, *International Institutional Law* (2003), 1756, see also ff.

[59] Art. 1(1), Intergovernmental Agreement, *supra* n. 3.

[60] *Ibid*.

[61] For a general analysis of the legal issues relating to the operation and use of the ISS see F.G. von der Dunk, The International Legal Framework for European Activities on Board the ISS, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 15–32.

elements listed in the Annex which it provides'. In this sense Article 5 reflects and does justice to the international character of the ISS project. As far as the United States, Canada, Japan and Russia are concerned, no particular problems exist: each of these states registers their own ISS modules and, consequently, is entitled to exercise jurisdiction over them pursuant to Article VIII of the Outer Space Treaty.[62] Furthermore, Article 5(2) of the Intergovernmental Agreement allows these states to exercise jurisdiction over 'personnel in or on the Space Station who are its nationals'. Some complications arise from the potential overlap of jurisdiction, for example a Russian cosmonaut working on the US module falling under both Russian and US jurisdiction. Such problems would have to be solved in a manner akin to that of issues of competing jurisdiction on earth, namely by granting (quasi-)territorial jurisdiction higher priority than personal jurisdiction.[63]

What is really special is the approach chosen to deal with the registration and jurisdiction of the European components of the ISS. Although the European states party to the Intergovernmental Agreement are sovereign states as they signed the Agreement, they have jointly appointed ESA not only as their collective Cooperating Agency, but also as representing the 'European Partner'.[64] Consequently, the European modules have been registered by ESA which, as described above, under Article VII of the Registration Convention, has acquired the right to operate as the 'State of registration'.[65]

As ESA however, is not a sovereign state, the exercise of 'jurisdiction', a prerogative usually exclusively of sovereign states, requires further arrangements.[66] These arrangements are not to be provided for by the ISS agreements as they are essentially an internal matter for the ESA member states participating in the ISS, with the exception of two key areas which were of enough immediacy to require being dealt with in the Intergovernmental Agreement itself: criminal jurisdiction and jurisdiction regarding IPR.

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62 See further *supra*, § 2.3.4.

63 See K.M. Clermont, *Civil Procedure: Territorial Jurisdiction and Venue* (1999); M. Akehurst, Jurisdiction in International Law, 46 *British Yearbook of International Law* (1972), 157 ff.; also e.g. von der Dunk, Pandora's Box?, *supra* n. 5, 125–6.

64 See Arts. 3(b), 4(1), Intergovernmental Agreement, *supra* n. 3.

65 See also Art. 5(1), Intergovernmental Agreement, *supra* n. 3.

66 See further e.g. Seyersted, *supra* n. 52. *Cf.* also Art. II(2), Registration Convention, *supra* n. 9, more broadly calling for such arrangements as between various 'co-launching States'.

11.3.2.4 Criminal jurisdiction

As far as criminal jurisdiction is concerned, personal jurisdiction is the prevalent factor: ISS Partner States exercise criminal jurisdiction over personnel who are their nationals. The same principle applies to the European Partner States, which 'may exercise criminal jurisdiction over personnel in or on any flight element who are their respective nationals'.[67] However, it may be that damage occurs to a flight element of a Partner State other than the one whose national is involved: in such a case, the other Partner State is also entitled to exercise jurisdiction on the basis of the registration of the flight element, subsidiary to the first state *de jure* or *de facto* agreeing to such an exercise of jurisdiction.[68]

Clearly, no reference is made here to the European Partner; consequently, the status of the European module, which does not qualify as 'the flight element of a Partner State' might seem unclear. However, as the potential problem of absence of any criminal jurisdiction on the part of ESA has been skirted by the references to the nationality of individual personnel – where there is no such thing as 'ESA nationality'[69] – even in cases where the ESA module is involved as the site of the misconduct at issue, any primary or subsidiary criminal jurisdiction simply reverts to a European Partner State involved, as appropriate.

11.3.2.5 Intellectual property rights

Intellectual property attributes the owner with an economic right which is related to the commercial value of the invention, design, innovation or other work. It gives the owner a positive and a negative right: on the one hand, the owner has a monopoly to exploit such right over a certain period of time; on the other hand, the owner is entitled to prevent others from using, manufacturing, or benefiting in any way from its work. In the event that the owner's rights are violated, it may take legal action against the violator.[70]

As regards the ISS and more broadly space stations in general, analysis should focus in particular on patent rights, in view of the major envisaged role of space stations in the development of future products, for example

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[67] Art. 22(1), Intergovernmental Agreement, *supra* n. 3.

[68] See Art. 22(2)(b), Intergovernmental Agreement, *supra* n. 3; Art. 22(2)(a) furthermore also allows the Partner State of nationality of the victim of any 'misconduct on orbit' to exercise criminal jurisdiction on such a subsidiary basis.

[69] This, notwithstanding the fact that European crew members qualify as 'ESA crew', rather than as crew members of their individual states of nationality; *cf.* also Art. 11, Intergovernmental Agreement, *supra* n. 3.

[70] See in greater detail *infra*, Chapter 18.

in the realm of medicine, pharmaceuticals and new materials development.[71] Other types of IPR, such as copyright, trademarks, and software or database rights could also come to play a role at some time in the future, but currently do not seem to be of major importance.[72]

National patent laws are applicable only to the territory of a specific state; consequently, the question arises how their applicability can be extended to outer space due to the absence of sovereignty in the space environment.[73] As regards the ISS, the Intergovernmental Agreement does not lay down a specific solution to the issue of IPR: as a state retains jurisdiction and control over objects it sends into outer space, the easiest solution would be to make patent laws applicable and enforceable for objects in outer space that fall under the jurisdiction and control of a given state. Thus, based on the link between registration and jurisdiction, the Intergovernmental Agreement allows for the application of national law, including the ISS Partners' national intellectual property laws, and Article 21(2) merely provides the jurisdictional framework, by establishing that the patent laws of the ISS Partner State having registered the flight element in which an invention has taken place may be made to apply to the patenting of that invention.[74]

The situation concerning the ISS thus consists of a mix of nationally owned space elements in which different national laws are in place; different intellectual property laws apply to each flight element of the

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[71] *Cf.* for the ISS Arts. 1, 9 (on utilization), Intergovernmental Agreement, *supra* n. 3; M. Belingheri, A Policy and Legal Framework for Commercial Utilisation, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 33–46; R.P. Veldhuyzen & T.L. Masson-Zwaan, ESA Policy and Impending Legal Framework for Commercial Utilisation of the European Columbus Laboratory Module of the ISS, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 47–62, on commercial utilization as an expansion of (more) scientific, exploratory and experimental activities.

[72] *Cf.* e.g. A.M. Balsano & J. Wheeler, The IGA and ESA: Protecting Intellectual Property Rights in the Context of ISS Activities, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 69–76.

[73] See in greater detail *infra*, §§ 18.2, 18.3.

[74] Art. 21(2), Intergovernmental Agreement, *supra* n. 3, states that 'for purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred only in the territory of the Partner State of that element's registry, except that for ESA-registered elements any European Partner State may deem the activity to have occurred within its territory'.

ISS. For example the United States adopted this principle and made patent law applicable to space objects under its jurisdiction and control, including the US-registered ISS modules.[75]

The regulation of IPR relating to activities on board the European Partner's flight elements then again required some specific solution, in light of the fact that ESA has no 'jurisdiction' on IPR issues either. As ESA represents the ESA member states which participate in the ISS activities and act together as 'European Partner', ESA registers the flight elements on behalf of the European Partner States and acts as the 'State of registry'. An activity occurring in or on ESA elements could thus be deemed to have taken place in all European Partner States simultaneously – and this is indeed what the Intergovernmental Agreement provides,[76] making it conceivable that the various laws of those states could be applicable to activities occurring in or on the European ISS module.

In this respect, each European Partner State individually decides how IPR are to be protected in their jurisdiction. Up to now, only Germany and Italy have taken specific actions to make their relevant IPR legislation applicable to inventions created on board of the European module.[77] Consequently, such inventions should first be registered under German or Italian IPR law to obtain the applicable protection – which then, by virtue

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[75] This was achieved by way of the Patents in Outer Space Act, Public Law 101-580; 35 U.S.C. 10; 104 Stat. 2863, extending the scope of existing US patent law to inventions made on board US-registered space objects; see also *infra*, 18.3.4; further e.g. Balsano & Wheeler, *supra* n. 72, 66; Lyall & Larsen, *supra* n. 6, 125–6; P.S. Dempsey, Overview of the United States Policy and Law, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 389; H.L. van Traa-Engelman, *Commercial Utilization of Outer Space: Law and Practice* (1993), 296–300; C.J. Cheng, *The Use of Airspace and Outer Space for All Mankind in the 21st Century* (1995), 84–5; S. Bhat, Inventions in Outer Space: Need for Reconsideration of the Patent Regime, 36 *Journal of Space Law* (2010), 1–18.

[76] See Art. 21(2), Intergovernmental Agreement, *supra* n. 3.

[77] See e.g. Balsano & Wheeler, *supra* n. 72, 67–9; K.F. Nagel, German Policy with Regard to ISS Utilization, in *Project 2001 – Legal Framework for the Commercial Use of Outer Space: Proceedings of the Project 2001 – Workshop on the International Space Station* (2000), 137 ff.; L.J. Smith, Legal Aspects of Commercial Utilization of the International Space Station: A German Perspective, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 153–80; V. Iavicoli, Italy and the Commercial Utilization of the International Space Station, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 181–202.

of international treaties (and in this case also EU law) is accepted by, thus extended to, most other countries in the world, including all European ones.[78]

With regard to the possible infringement of IPR in or on a European ISS module, Article 21(4) of the Intergovernmental Agreement then includes a provision aimed at preventing one act of infringement from being raised in different procedures in different ESA member states. Accordingly, this clause provides that where intellectual property is protected in more than one European Partner State the owner of the right may not recover in more than one such state for the same act of infringement of the same intellectual property right. Nevertheless, the owner of the right can select the state whose intellectual property law offers the most advantage. This creates the potential for forum shopping and legal uncertainty within the parameters of international copyright conventions and EU law harmonizing at least to a considerable extent applicable national regimes.[79]

11.3.2.6 Liability

The Intergovernmental Agreement provides a rather special regime concerning liability. Article 17 makes clear that the liability solutions within the ISS project do not derogate from the existing international liability framework.[80] This means that if a part of the ISS were to cause damage to a third state compensable under the Liability Convention, that state would address its claim to the relevant 'launching State' pursuant to the Liability Convention. Notably, this also applies if damage is caused to a space object of an ISS Partner State as long as that space object is not part of the ISS project – for that purpose, the Partner State would qualify as a third state.[81]

Article 16 sets forth the legal regime applicable to activities undertaken within the ISS and the damage possibly arising in that context as a *lex specialis* to the *lex generalis* of the Liability Convention.[82] The scope of

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78 *Cf.* further *infra*, § 18.3.1.

79 *Cf.* again further *infra*, § 18.3.1.

80 See Art. 17(1), Intergovernmental Agreement, *supra* n. 3.

81 *Cf.* Art. 16(3)(a), Intergovernmental Agreement, *supra* n. 3, requiring for application of the Agreement's special regime on liability that 'the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations'.

82 Note that Art. XXIII, Liability Convention, *supra* n. 24, specifically recognizes the sovereign right of states parties to the Convention to apply different liability rules as between themselves.

the liability regime is rather wide: indeed, it extends to all damage suffered in the context of the 'Protected Space Operations', which are defined as 'all launch vehicle activities, Space Stations activities, and payload activities on Earth, in outer space, or in transit between Earth and outer space in implementation of this Agreement, the MOUs, and implementing arrangements'.[83] Furthermore, they include research, design, development, test, manufacture, assembly, integration, operation, or use of launch or transfer vehicles, the ISS itself, or a payload, as well as related support equipment and facilities and services; plus all activities related to ground support, test, training, simulation, or guidance and control equipment and related facilities or services.[84]

The basic idea applicable to Protected Space Operations is that of a general cross-waiver: this approach was chosen to encourage participation in the exploration, exploitation, and use of outer space through the ISS.[85] The cross-waiver is broadly structured and only cases concerning bodily injury, wilful misconduct or IPR are excluded from it. The cross-waiver also extends to all entities related to different Partner States and between such entities of one Partner State and another Partner State itself. 'Related entities' include all contractors and subcontractors of a Partner State at any tier, all user or customers of a Partner State, and all contractors and subcontractors of a user of a Partner State. For the purpose of Article 16 of the Intergovernmental Agreement, ESA is included as if a 'Partner State', as the Cooperating Agency of 11 Partner States.[86]

11.4 THE LEGAL FRAMEWORK REGULATING ISS ACTIVITIES

11.4.1 General Remarks

ISS development and operations are, and will likely remain, the primary responsibility of the ISS Partners. However, along with the use for governmental (publicly funded) research, the commercial utilization of the ISS, in particular privately funded research, constitutes an important component of the ISS structure, albeit one that is still in its infancy. The

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[83] Art. 16(2)(f), Intergovernmental Agreement, *supra* n. 3.

[84] See Art. 16(2)(f)(1) & (2), Intergovernmental Agreement, *supra* n. 3.

[85] See Art. 16(3)(a), Intergovernmental Agreement, *supra* n. 3.

[86] *Cf.* Art. 16(2)(a), Intergovernmental Agreement, *supra* n. 3, referring to the Cooperating Agencies of Partner States.

involvement of the private sector is important to sustain the ISS project and to enable it to run beyond 2020.[87]

From a purely legal point of view, neither the Intergovernmental Agreement nor the various MOUs explicitly refer to the commercial utilization of the ISS. This is a direct consequence of the fact that, at the time of the drafting of the Agreement, the use of the ISS for publicly funded scientific research was the primary goal, while the involvement of the private sector was expected to be marginal at best.[88] Nevertheless, the Intergovernmental Agreement and the MOUs leave the door open for commercial activities and, in particular, the involvement of private entities. Indeed, they give each Partner an extended measure of freedom to use their ISS utilization share in a manner of their own choosing: they establish that each Partner may use equipment and facilities in or on each other Partner's elements in accordance with their respective 'utilization rights', which are detailed in Article 9 of the Intergovernmental Agreement. This provision states that Partners providing ISS user elements (not required for keeping the ISS in operational state and, thus, completely oriented towards research[89]) maintain the use of those elements (for example, for Europe, the Columbus laboratory), whilst Partners providing resources and infrastructure elements to operate and use the ISS elements (such as the Canadarm) in exchange receive a fixed share of the use of other Partner's user elements.

In short, each Partner may use and choose users for its allocations for any purpose consistent with the objectives of the Intergovernmental Agreement and is allowed to barter or sell any portion of its allocation to Partners or even non-Partners.[90] The terms and conditions of any barter or sale shall be determined on a case-by-case basis by the parties to the transaction. However, these transactions are subject to two conditions: any transfer of ownership of ISS elements or of equipment requires prior

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[87] See e.g. T. Malik, International Space Station Gets Life Extension Through 2024, www.space.com/24208-international-space-station-extension-2024.html, last accessed 17 April 2014; K. Koenig-Muenster, White House Approves Space Station Extension until 2024, www.msnbc.com/the-cycle/if-you-saw-gravity-youll-news, last accessed 17 April 2014; J. Foust, Four More Years, www.thespacereview.com/article/2434/1, last accessed 17 April 2014; further Ley & Stoffel, *supra* n. 7, 327–8, 330–1, 339–41; G. Catalano-Sgrosso, Applicable Jurisdiction Conflicts in the International Space Station, in *Proceedings of the Forty-Third Colloquium on the Law of Outer Space* (2001), 179–80.

[88] *Cf.* e.g. Farand, International Space Station Utilisation, *supra* n. 6, 391–2.

[89] See e.g. Veldhuyzen & Masson-Zwaan, *supra* n. 71, 50.

[90] See also e.g. Belingheri, *supra* n. 71, 37–40; Veldhuyzen & Masson-Zwaan, *supra* n. 71, 49–51; Ley & Stoffel, *supra* n. 7, 342–4.

notification to the other Partners[91] and any transfer of equipment to any non-Partner or private entity under the jurisdiction of a non-Partner shall receive the prior consent of the other Partners.[92] The providers of user elements (such as ESA's laboratories) are under the obligation to give other Partners a relevant share (49 per cent) of the utilization rights attached to those elements, maintaining the remaining 51 per cent for their own use (which they may also barter or sell).[93]

Since only the use of user elements has been explicitly addressed in the Intergovernmental Agreement, the commercial utilization of resources elements and other elements is certainly allowed, along with the so-called 'non-conventional use', such as merchandizing, sponsorship, publicity or space tourism. The agreements in place also enable protection of proprietary and commercially sensitive information.[94]

Each ISS Partner decides on its own policy of commercial utilization: nevertheless, it is important that a certain level of harmonization among Partners exists. With regard to the ESA Partner, the goal is to allow 30–45 per cent commercial use of the total utilization capacity. The 1998 US Commercial Space Act[95] allows privatization/commercial utilization of part of its ISS utilization activities, and the revenues gained are re-invested for NASA space development research. NASA offers 30 per cent of its access rights for commercial exploitation. In Russia, due to problems of public financing, there is a clear and positive approach towards commercial use and private investments. As will be seen, this led to the promotion of space tourism to the ISS. Canada also has a positive attitude towards commercialization, offering 50 per cent of its utilization rights for that purpose. Japan has a more restrictive approach and makes only 30 per cent of its share available for commercial utilization.[96]

As indicated above, it is important that Cooperating Agencies harmonize their commercialization policies. In this respect, several multilateral

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[91] See Art. 6(3), Intergovernmental Agreement, *supra* n. 3.

[92] See Art. 6(4), Intergovernmental Agreement, *supra* n. 3.

[93] See e.g. Veldhuyzen & Masson-Zwaan, *supra* n. 71, 50.

[94] *Cf.* also e.g. Belingheri, *supra* n. 71, 42–6; Veldhuyzen & Masson-Zwaan, *supra* n. 71, 49 ff.

[95] Commercial Space Act, Public Law 105-303, 105th Congress, H.R. 1702, 27 January 1998; 51 U.S.C. 50101; 112 Stat. 2843 (1998). See specifically on its impact vis-à-vis the ISS, T. Kosuge, US Commercial Space Act of 1998 and Its Implications for the International Space Station, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 28–34.

[96] See e.g. Veldhuyzen & Masson-Zwaan, *supra* n. 71, 51; Ley & Stoffel, *supra* n. 7, 332, 335, 337.

mechanisms laid down in the MOUs enable a coordinated implementation of commercial utilization projects. An important role is played, at a multilateral level, by the User Operations Panel (UOP) and the Systems Operations Panel (SOP), whose tasks are to prepare the long-term utilization resources and accommodation allocations to the Partners as well as a five-year Consolidated Operations and Utilization Plan (COUP). The COUP is approved by the Multilateral Control Board (MCB), in which every Partner is represented.[97]

The MCB has the task to 'coordinate approaches to commercial activities aboard the ISS and acts as the focal point of coordination among the partnership on commercial projects to foster the greater commercial development of ISS'.[98] Among the first tasks for the MCB was the drafting of a list of principles on 'commercial guidelines' to govern ISS commercial activities. These guidelines are intended to harmonize and coordinate commercial activities of the Partners, while respecting the individual commercial activities of each agency. The guidelines apply, in particular, to market sectors such as research and development, sponsorship, merchandizing, advertising and entertainment, and space flight participation.[99]

11.4.2 Intellectual Property Rights

One of the preferred options to increase the economic value of the ISS project is to put in place an adequate legal and commercial environment for the creation, use, transfer and protection of IPR. The presence of such an environment is likely to favour new commercial activities, innovation, products and services.[100] It is only with the help of a legal system assuring protection against unauthorized use, copying, and other exploitation, of original products or inventions that private investments can be attracted by a specific business sector.[101]

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[97] On these aspects, see Veldhuyzen & Masson-Zwaan, *supra* n. 71, 51 ff.; also Farand, International Space Station Utilisation, *supra* n. 6, 387–9.

[98] Veldhuyzen & Masson-Zwaan, *supra* n. 71, 51 ff.

[99] For a description of the 2002 MCB Recommended Guidelines, see M. Uchitomi, Open Up International Space Station to the Commercial Fields, *ISTS-r-25* (2004), 1; also e.g. Veldhuyzen & Masson-Zwaan, *supra* n. 71, 53.

[100] On this point see Balsano & Wheeler, *supra* n. 72, 63–86; A. Farand, Jurisdiction and Liability Issues in Carrying out Commercial Activities in the International Space Station (ISS) Programme, in *The International Space Station – Commercial Utilisation from a European Perspective* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 87–95.

[101] See Belingheri, *supra* n. 71, 37 ff.; also *infra*, § 18.3.

As far as ISS activities are concerned, an essential requirement for private investment is the presence of applicable legislation, internationally structured and applicable in outer space and on earth with an adequate enforcement mechanism for protecting IPR. An example of commercial activity in the context of the ISS is the branding, sponsorship and general use of the ISS image to inspire and promote business on earth through the media.

However, according to some scholars the goal of achieving an efficient intellectual property legal regime can be best served through the establishment of best practices, rather than seeking to change the laws.[102] In their view, best practices can contribute to the fundamental goal of harmonization of intellectual property regimes applicable to IPR related to ISS activities. The term 'best practices' refers to the best way of doing something, using a specific technique or technology; in this case, it means to establish standards that might lead to the most efficient use, protection and dissemination of intellectual property for products or inventions of any kind related to the ISS.

Among the recommended best practices would be (1) a clear identification of ownership and traceability of intellectual property, as this enables more efficient protection and dissemination; (2) any contract and subcontract clearly addressing the issue of ownership of intellectual property; (3) putting in place a structure to manage IPR and, in particular, to ensure that all relevant risks are identified and dealt with; and (4) allowing the imposition of conditions on the commercialization of resulting intellectual property. In the case of (in part or in whole) industry-funded activities, an entity should evaluate whether the ownership of, or rights to, the intellectual property or the benefits should be shared, and whether the imposition of conditions may work as a disincentive to the use and commercialization of the intellectual property.

As to the ISS, for the purpose of IPR Article 21 of the Intergovernmental Agreement establishes a connection between the state of registration of an ISS module and its national law. Accordingly, each state shall consider inventions made in its registered elements as having taken place in its territory.[103] Nevertheless, some key issues arising from the protection of intellectual property of inventions made on board the ISS remain. Indeed, intellectual property protection, if obtained, is in the

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[102] See Balsano & Wheeler, *supra* n. 72, 79 ff.; *cf.* also Ley & Stoffel, *supra* n. 7, 349; Steptoe, *supra* n. 7, 401.

[103] See further e.g. Ley & Stoffel, *supra* n. 7, 347–8; Balsano & Wheeler, *supra* n. 72, 66 ff.; Catalano-Sgrosso, *supra* n. 87, 184–5; von der Dunk, *supra* n. 5, 130–2.

first instance limited to the territory of the state that granted the patent, and a certain lack of protection could arise if the patent were to be used in an element under a different jurisdiction. Not all these issues are solved by the general, quasi-global harmonization and mutual acceptance achieved by international treaties ranging from the 1883 Paris Convention[104] to the 1967 Stockholm version thereof[105] and the 1970 Patent Cooperation Treaty[106] – or, limited to European states, the 1973 European Patent Convention.[107]

Patent systems adopted by the ISS Partner States differ and this could lead to difficulties in obtaining protection in different states. For example, the United States intellectual property system is based on the 'first-to-invent' principle, according to which whoever can prove to be the first to have made an invention may obtain a patent, even if someone else has already registered it.[108] Instead, Europe and Japan follow the 'first-to-file' principle. This system enables greater certainty in ascertaining who has priority, but it also requires the research to be carried out with great discretion.[109]

Among the issues relating to intellectual property protection, the possible conflicts of laws establishing different protection systems and procedures are worth mentioning. The automatic recognition of patents is only possible among European Partner States who as yet have not established procedures to implement the Intergovernmental Agreement's

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[104] Convention for the Protection of Industrial Property as Modified by Additional Act of 14 December 1900 and Final Protocol (Paris Convention), Paris, done 20 March 1883, entered into force 6 July 1884; 828 UNTS 305; USTS 379; UKTS 1907 No. 21; ATS 1907 No. 6.

[105] Paris Convention for the Protection of Industrial Property of 20 March 1883 as revised, Stockholm, 14 July 1967, entered into force 19 May 1970; 828 UNTS 305; TIAS 6923, 7727; 24 UST 2140; UKTS 1970 No. 61; Cmnd. 3474; ATS 1972 No. 12; 6 ILM 806 (1967).

[106] Patent Cooperation Treaty, Washington, done 19 June 1970, entered into force 24 January 1978; 1160 UNTS 231; TIAS 8733; 28 UST 7645; Cmnd. 4530; UKTS 1978 No. 78; ATS 1980 No. 6; 9 ILM 978 (1970).

[107] Convention on the Grant of European Patents (European Patent Convention), Munich, done 5 October 1973, entered into force 7 October 1977; 1065 UNTS 199; UKTS 1982 No. 16; Cmnd. 8510. See more in general *infra*, § 18.3; also e.g. Catalano-Sgrosso *supra* n. 87, 182–5; C.H. Walker, Potential Patent Problems on the ISS, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 60–70.

[108] *Cf.* A. Piera, Intellectual Property in Space Activities: An Analysis of the United States Patent Regime, 29 *Air and Space Law* (2004), 42.

[109] *Cf.* Balsano & Wheeler, *supra* n. 72, 67–71.

provisions concerning inventions made in the ESA laboratory. Furthermore, a system ensuring complete secrecy of information, including those obtained on board and subsequently transmitted to the ground, is not guaranteed. Lastly, issues related to property rights over technical information acquired in a joint venture project remain.

Interesting solutions regarding IPR protection can be found in the contracts signed by the Cooperating Agencies with the users. In the case of the contracts signed by ESA, if research is carried out by Agency staff, the latter is the owner of the results, and it is under an obligation to disclose them to its member states for further research and the strengthening of European industry competitiveness.[110]

If research in the ESA laboratories, with regard to mandatory or optional programmes,[111] is performed by public or private organizations, such organizations become the owner of the inventions and must protect them under Article 37(1) of the General Clauses and Conditions for ESA Contracts.[112] However, after a brief period of priority over the results, the owner must disclose the data and information to the Agency, and the member states participating in the programme may use them under free and irrevocable licences. In any case, the ownership of data deriving from work undertaken in the ISS and the resulting possibility to obtain exclusive licences will be decided by specific collaboration schemes agreed by ESA and its customers.[113]

As far as NASA is concerned, two types of agreements are signed by the Agency with commercial users wishing to use ISS resources: the Space Act Agreements and the Cooperative Research and Development

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[110] See J.F. Mayence, Quelle est la politique de l'Agence spatiale européenne en matière de propriété intellectuelle? La politique de la propriété intellectuelle dans les contrats de l'Agence spatiale européenne, in *Droit & Technologies* (2008), 9, www.droit-technologie.org/upload/dossier/doc/164-1.pdf, last accessed 17 April 2014.

[111] See for mandatory and optional programmes *supra*, §§ 4.2.3.1 and 4.2.3.2.

[112] General Clauses and Conditions for ESA Contracts, ESA/C/290, rev.5, http://emits.sso.esa.int/emits-doc/reference/docrefe.pdf, last accessed 4 January 2014.

[113] See *International Space Station – ISS*, European Users Guide to Low Gravity Platforms, UIC-ESA-UM-0001, Issue 2, Rev. 0, at 92, http://wsn.spaceflight.esa.int/docs/EuropeanUserGuide/chapter_7_iss.pdf, last accessed 17 April 2014; also Farand, *supra* n. 88, 93; Balsano & Wheeler, *supra* n. 72, 76–8.

Agreements.[114] Agreements can be reimbursable or non-reimbursable, depending on the user's financial contribution to NASA expenses. In the latter case, data and inventions resulting from joint activities are owned by the relevant parties. NASA ensures confidentiality of the data and agrees with the contractors about the modalities of their disclosure. Inventions made by participants under a reimbursable Space Act Agreement, which was thus paid for by NASA, are entirely owned by the participants, unless the invention was made by NASA employees.[115]

Within this general framework, it appears that the patentability of inventions made on board the ISS, where various states cooperate and public and private entities participate in the research, is still an open issue. The potential incompatibility of rules derives from different protection systems around the world, which may adopt diverging criteria for priority, novelty and applicability of intellectual property. The question of the harmonization of regulation and mutual recognition opens the way for a solution that, most likely, could only be reached at international level. Anyway, some practical solutions can be found in the agreements between the Cooperating Agencies and private users. This type of agreement addresses the issue of ownership of intellectual property, alongside the timing for disclosure of information and a compulsory licence system.

An additional question concerning the commercialization of ISS activities and research is the protection and secrecy of data.[116] In this respect, the ISS Crew Code of Conduct[117] contains provisions to protect classified information. Crew members shall protect registered data and avoid diffusion of any non-protected data, which shall only be used in the performance of their duties. Moreover, confidential information obtained

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114 See e.g. Catalano-Sgrosso, *supra* n. 87, 185; D. Bloch & R. Gray, *Intellectual Property in Government Contracts: Protecting and Enforcing IP at the State and Federal Level* (2012), 185 ff.; E.M. Berman, Chapter 10 Cooperative Research and Development Agreements, in *Technology Transfer and Public Policy* (Ed. Y.S. Lee) (1997), 159 ff.; M.L. Katz, An Analysis of Cooperative Research and Development, in 17 *The RAND Journal of Economics* (1986), 527–43.

115 See e.g. Bloch & Gray, *supra* n. 114, 187–9; Catalano-Sgrosso, *supra* n. 87, 185.

116 *Cf.* also Art. 19(3)(b), Intergovernmental Agreement, *supra* n. 3.

117 Code of Conduct for the International Space Station Crew (hereafter Crew Code of Conduct), 1 October 2000; 14 C.F.R. Pt. 1214; 65 Fed. Reg. No. 246, 80302-8, of 21 December 2000, www.spaceref.com/news/viewpr.html?pid=3418, last accessed 5 February 2014.

by an ISS crew member during ISS activities shall only be used for official purposes and not for his/her personal interests.[118]

Additionally, the ISS Crew Code of Conduct establishes some requirements for Partner States. Accordingly, they shall take measures to guarantee confidentiality of utilization data passing through the Space Station Information System,[119] respect the confidentiality of data and goods to be transported on its space transportation system[120] and protect data and goods to be exchanged.[121]

11.4.3 Orbital Space Tourism

'Space tourism' can be loosely defined as space travel for recreational and leisure purposes.[122] 'Space tourists' are thus non-professionally trained astronauts who, so far, have consisted of wealthy people paying for an expensive ticket to experience travelling in outer space.[123] Space tourism is usually divided into two categories: orbital space tourism and sub-orbital space tourism, where the former involves a 'tourist' reaching a space object in low earth orbit such as the ISS and spending an amount of time on board. Such activities have to be properly integrated, *inter alia* in a legal sense, into the broader and more public ISS project and activities as a whole.[124]

11.4.3.1 The development of orbital space tourism

Towards the end of the 1990s, MirCorp, a private venture that was then managing the Mir space station, began advertising the possibility for private passengers to visit the station. Such a move was the direct consequence of the budget cuts suffered by the Russian space programme and the need to find alternative ways to cover the station's costs.[125] Dennis Tito, an American businessman, became their first candidate. When the decision to de-orbit Mir was made, Tito managed to switch his

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[118] See Crew Code of Conduct, *supra* n. 117, Sec. II – General Standards, (c) – Use of position.

[119] See Art. 13, Crew Code of Conduct, *supra* n. 117.

[120] See Art. 12, Crew Code of Conduct, *supra* n. 117.

[121] See Art. 19, Crew Code of Conduct, *supra* n. 117.

[122] See on this definitional issue further *infra*, § 12.2.1.

[123] See further *infra*, §§ 12.1, 12.2.1.

[124] The other aspects of orbital space tourism, that is those not directly concerning the ISS but either transportation to and/or from the ISS or alternative 'destinations' in outer space altogether, are addressed *infra*, §§ 12.4.3, 12.4.4.

[125] *Cf.* e.g. www.space.com/11480-space-tourists-russia-space-station-mir.html, last accessed 4 January 2014.

trip to the ISS. Despite strong initial opposition by NASA, Tito arrived at the ISS on 28 April 2001 and stayed for seven days, becoming the first 'fee-paying' space tourist at a ticket price of US$ 20 million. In the following eight years, six millionaires followed in Tito's steps.[126] Space Adventures, which meanwhile had subsumed MirCorp,[127] thus became the only company so far to have sent paying passengers to space. In conjunction with the Russian Space Agency and Rocket and Space Corporation Energia, Space Adventures facilitated the flights for all of the world's first private space explorers.

On 3 March 2010, Russia announced that, due to the increased permanent crews of professional astronauts aboard the expanded ISS, space tourism was temporarily put on hold.[128]

11.4.3.2 The legal status of 'space tourists'

One of the most significant issues relating to the increasing participation of private/non-professional individuals in space flights concerns the legal status of such individuals.[129] This question is relevant mostly for two

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[126] See e.g. G. Catalano-Sgrosso, Application of the Rules of the Code of Conduct to the First Crews on Board the International Space Station, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 80–1; also further *infra*, § 12.1, at nn. 3 and 4, and literature referenced there.

[127] *Cf.* e.g. F.G. von der Dunk, Passing the Buck to Rogers: International Liability Issues in Private Spaceflight, 86 *Nebraska Law Review* (2007), 404–5; also A. Thorpe, *The Commercial Space Station: Methods and Markets* (2007), 70–1.

[128] See e.g. D. Solovyov, Russia Halts Space Tours as U.S. Retires Shuttle, 3 March 2010, www.reuters.com/article/2010/03/03/us-space-russia-idUSTRE6223VF20100303, last accessed 17 April 2014; also http://en.wikipedia.org/wiki/Space_tourism, last accessed 17 April 2014.

[129] Generally, on the question of the legal status of space tourists see: S.R. Freeland, Up, Up and … Back: The Emergence of Space Tourism and its Impact on the International Law of Outer Space, 6 *Chicago Journal of International Law* (2005), 1–22; F.G. von der Dunk, Space for Tourism? Legal Aspects of Private Spaceflight for Tourist Purposes, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 18–28; von der Dunk, *supra* n. 127, 400–38; C.E. Parson, Space Tourism: Regulating Passage to the Happiest Place off Earth, 9 *Chapman Law Review* (2006), 493–526; V.S. Vereshchetin, Elaborating the Legal Status of Astronauts, 7 *Hastings International and Comparative Law Review* (1984), 501–7; Y. Hashimoto, The Status of Astronauts toward the Second Generation Space Law, in *Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space* (1994), 206–10.

reasons: international space law lacks a clear and uncontroversial definition of 'astronauts', yet they are entitled to special protection.[130] The absence of a clear-cut definition of what an 'astronaut' is stems from the fact that, at the time the UN space treaties were negotiated, the involvement of private paying passengers in a space flight was a matter of science fiction. Nowadays, however, that situation has of course drastically changed, due to the orbital tourism destined for the ISS and the impending advent of sub-orbital tourism.

The existing provisions included in international and national space law documents do not help clarify the issue. Article V of the Outer Space Treaty speaks of 'astronauts', while the Rescue Agreement uses both the terms 'astronauts'[131] and 'personnel of a spacecraft'.[132]

The ISS Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers distinguish between a professional astronaut/cosmonaut, namely a person who has undergone special training and has been qualified as such by the space agency of one of the ISS Partners, and a spaceflight participant, who is an individual sponsored by one of the agencies for a temporary assignment as visiting scientist, commercial user or tourist.[133] Also US national law speaks of both 'crew' and 'flight

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[130] See more in detail further *supra*, § 2.3.2.1; also *infra*, § 12.5.1. *Cf.* also G. Catalano-Sgrosso, Legal Status of the Crew in the International Space Station, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 39 ff.

[131] See 1st para., Preamble, Rescue Agreement, *supra* n. 24.

[132] See Arts. 1–4, Rescue Agreement, *supra* n. 24.

[133] *Cf.* Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers' signed by representatives from NASA, Roscosmos, JAXA, CSA and ESA providing that: 'A professional astronaut/cosmonaut is an individual who has completed the official selection and has been qualified as such at the space agency of one of the ISS partners and is employed on the staff of the crew office of that agency.' Thus: 'Spaceflight participants are individuals (e.g. commercial, scientific and other programs; crewmembers of non-partner space agencies, engineers, scientists, teachers, journalists, filmmakers or tourists) sponsored by one or more partner(s). Normally, this is a temporary assignment that is covered under a short-term contract', Section III – Definitions, November 2001, www.spaceref.com/news/viewsr.html?pid=4578, last accessed 4 January 2014. For an analysis of these Principles see http://chapters.nss.org/policy-cmte/files/ISS-CREW_202.pdf, last accessed 4 January 2014; *cf.* also ESA/C/IGA-CC (2001), of 7 September 2001, Outcome of the meetings held in Montreal, Canada, of the Multilateral Coordination Board (MCB), on 17 July 2001, and of the Heads of the ISS Cooperating Agencies, on 18 July 2001, and its Annex 4.

participants'.[134] As mentioned above, the question of what an 'astronaut' is becomes important in view of the special benefits and protection accorded under international space law to astronauts. Could clients of a space tourist enterprise be considered as 'astronauts' and thus be entitled to such special treatment?[135]

Looking at the existing law, any feasible definition of 'astronaut' would seem to require two components: an element of training and selection and a journey on board of a space object. As to the former, until recently all astronauts were trained professionals and members of either military or civilian governmental space agencies. In the case of space tourists travelling to the ISS, an element of training, both physical and technical, was still required. Based on these factors there is room to argue that such space tourists could be viewed as astronauts, at least for flights of extended duration.

The situation is more problematic, however, for paying passengers or 'spaceflight participants' on a sub-orbital flight. Unlike traditional astronauts and even tourists travelling to the ISS, spaceflight participants are not expected to undergo any form of physical and technical training before their (short) journey in outer space. For example, Virgin Galactic advertises that the training for participants to its sub-orbital flights will be rudimentary, with a health check being more relevant. Thus, it appears problematic to attribute to spaceflight participants the status of 'astronauts' based on the criteria of training and technical capability. The different nature, and arguably also the different legal position, of spaceflight participants compared to traditional astronauts also appears in the

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See further e.g. Ley & Stoffel, *supra* n. 7, 345–6; Veldhuyzen & Masson-Zwaan, *supra* n. 11, 53–5; Catalano-Sgrosso, *supra* n. 130, 36–7; Catalano-Sgrosso, *supra* n. 126, 77–8.

[134] See e.g. 51 U.S.C. Sec. 50902(2) & (17), defining both terms respectively as 'any employee of a licensee or transferee, or of a contractor or subcontractor of a licensee or transferee, who performs activities in the course of that employment directly relating to the launch, reentry, or other operation of or in a launch vehicle or reentry vehicle that carries human beings' and 'an individual, who is not crew, carried within a launch vehicle or reentry vehicle'. Also US Federal Aviation Administration: Human Space Flight Requirement for Crew and Space Flight Participants: Final Rule (2006), 71 Fed. Reg. No. 241, 75616-45; 14 C.F.R. Pts. 401, 415, 431, 440 & 460, as amended.

[135] See, for extended analyses and different opinions on this, e.g. M.J. Sundahl, The Duty to Rescue Space Tourists and Return Private Spacecraft, 35 *Journal of Space Law* (2009), 163–200; M. Chatzipanagiotis, *The legal status of space tourists in the framework of commercial suborbital flights* (2011), esp. 5–38. *Cf.* also Ley & Stoffel, *supra* n. 7, 349; further *infra*, § 12.5.1.

already-mentioned FAA Rules for space tourists, which distinguish between 'crew' and 'spaceflight participant'.[136]

Due to these distinctions some scholars argue that spaceflight participants should not be deemed astronauts, and especially not 'envoys of mankind'; consequently, they should not enjoy the respective benefits.[137] On the other hand, other scholars argue that, even if one accepts the distinction between 'crew' and 'spaceflight participants', both might be the 'personnel of a spacecraft' in terms of the Rescue Agreement, where one assumes that the sub-orbital flight vehicle is a spacecraft.[138] In short, all on board a space vehicle would be considered astronauts, because the term 'personnel' does not distinguish between civilian and military. This approach would entitle private passengers to all benefits attributed to astronauts by the Rescue Agreement. Additionally, others argue that the duty to help space tourists in distress is provided for by reasons of humanity.[139]

Even recourse to the second criterion, namely the participation in a journey on board a space object as determined by its intended altitude, does not help in solving the question of which subjects should be entitled to enjoy the benefits attributed by international space law to 'astronauts': among the most debated issues related to private manned sub-orbital flights is the choice of the law applicable to sub-orbital journeys and the status of sub-orbital vehicles. As to the first issue, in the absence of a demarcation between airspace and outer space,[140] the issue of the

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[136] See the definitions quoted *supra*, n. 134.

[137] So e.g. S. Gorove, Legal Problems of the Rescue and Return of Astronauts, 3 *International Lawyer* (1968–1969), 898–902; I.H.P. Diederiks-Verschoor, Search and Rescue in Space Law, in *Proceedings of the Nineteenth Colloquium on the Law of Outer Space* (1977), 17; Hashimoto, *supra* n. 129, 208–9.

[138] So e.g. R. Cargill Hall, Rescue and Return of Astronauts on Earth and in Outer Space, 63 *American Journal of International Law* (1969), 205; *Report of UN/Republic of Korea Workshop on Space Law*, Daejon, South Korea, 2003, A/AC.105/814, at para. 37. *Cf.* also Y. Ling, Does the Rescue Agreement Apply to Space Tourists, in *Proceedings of the International Institute of Space Law 2011* (2012), 192–201. For the Rescue Agreement (*supra* n. 24) in general, see *supra*, § 2.3.2.

[139] So e.g. M.J. Sundahl, Rescuing Space Tourists: A Humanitarian Duty and Business Need, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 204–14; *cf.* however also F.G. von der Dunk, A Sleeping Beauty Awakens: The 1968 Rescue Agreement after Forty Years, 34 *Journal of Space Law* (2008), 433–4.

[140] See on this issue also *supra*, § 2.2.1.3.

applicable law to the sub-orbital journey remains. It has been argued that: (1) air law should govern the sub-orbital journey because the vehicles to be used for sub-orbital flight are sufficiently similar to aircraft;[141] (2) space law, with appropriate amendments, should be applicable to the entire journey on the grounds of the proposed function of the spacecraft carrying tourists, that is: to fly, although briefly, in outer space;[142] and/or (3) air law should be applied to the combined vehicle until the moment of separation and then space law should be applied to the spacecraft from the moment it is launched until its return to the earth.

The status of the vehicles utilized in the course of a sub-orbital flight remains uncertain. Indeed, depending on the categorization of these vehicles as aircraft or space objects, the procedure according to which they should be registered as well as the rules applicable to them and to people on board would change. Although an internationally agreed definition of 'space object' is still missing, this term can be interpreted as 'any man-made artifact that is intended to be launched into outer space'.[143] Arguably, many of the vehicles being developed for sub-orbital flights would qualify as aircraft for the purpose of triggering the application of air law. Certainly this is the case for the combined vehicle utilized by Virgin Galactic, which has the characteristics of an aircraft in terms of technical functions, and where, until separation, the space vehicle represents merely an additional cabin. However, there are valid arguments to deem SpaceShipTwo a space object, because of its intention to reach outer space and of the fact that, after separation, it does not derive support in the atmosphere from the reactions of the air.[144] If this

[141] See e.g. J.B. Marciaq *et al.*, Accommodating Sub-Orbital Flights into the EASA Regulatory System, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2010), 187–212; R. Abeyratne, Space Tourism – Parallel Synergies Between Air and Space Law?, 53 *Zeitschrift für Luft- und Weltraumrecht* (2004), 184; further *infra*, § 12.3.2 and literature referenced there.

[142] See e.g. B. Cheng, International Responsibility and Liability for Launch Activities, 20 *Air and Space Law* (1995), 299; further *infra*, § 12.3.3 and literature referenced there.

[143] *Cf.* F.G. von der Dunk, Beyond What? Beyond Earth Orbit?, 43 *California Western International Law Journal* (2013), 269; further *supra*, § 2.3.3.3.

[144] This refers to the 'standard' definition of 'aircraft' as per Annex 7 to the Chicago Convention, Aircraft Nationality and Registration Marks, 5th edition, July 2003, Definitions; Annex 8, Airworthiness of aircraft, 10th edition, April 2005, Definitions; *cf.* further *infra*, § 12.3.2..2. See S. Hobe, Legal Aspects of Space Tourism, 86 *Nebraska Law Review* (2007), 443. Note, however, that this generally acknowledged definition refers to vehicles which *can* derive support in

assumption is accepted, these spacecraft could also be registered as 'space objects' under the 1975 Registration Convention.[145]

To summarize, if space law is applicable to all or part of the sub-orbital journey and the sub-orbital vehicle is registered as a space object, there might be room to argue that all on board this vehicle should enjoy the advantages that international space law attributes to astronauts. In any case, the status of private spaceflight participants remains uncertain. Thus, in the years to come, the international legal community might be faced with the task of redefining legal categories of individuals involved in spaceflights.

Before concluding, it is worthwhile highlighting the benefits that the space treaties confer on astronauts. The bottom line is that astronauts shall receive special assistance and protection when facing emergency or distress. In this respect, Article V of the Outer Space Treaty establishes a duty for the states parties to give assistance to astronauts in an emergency, accident or distress when found in the territory of another state party or on the high seas.[146] This duty is extended to emergencies occurring in outer space and on celestial bodies.[147] The provisions of Article V of the Outer Space Treaty are elaborated and further specified in the 1968 Rescue Agreement, which was indeed intended to develop the duties imposed on parties of the Outer Space Treaty in its call for rendering all possible assistance to astronauts in the event of accident, distress or emergency landing and the prompt and safe return of astronauts to the launching authority.[148]

It should be pointed out that the Rescue Agreement focuses on assistance to astronauts on earth, while rescue and return operations in space remain largely unaddressed, mostly due to the technical difficulties that this kind of operation would entail. In any case, even if private spaceflight participants are attributed the status of astronauts, the question of how rescue operations should be undertaken and who should bear the costs still needs to be addressed.

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the atmosphere from the reactions of the air – requiring neither actual *use* thereof, nor support for the *whole* flight.

145 On these issues see extensively *infra*, § 12.3.3.3.

146 See Art. V, 1st sent., Outer Space Treaty, *supra* n. 10.

147 See Art. V, 2nd sent., Outer Space Treaty, *supra* n. 10.

148 For an analysis of the 1968 Rescue Agreement, *supra* n. 24, see C.Q. Christol, *The Modern International Law of Outer Space* (1982), 152–212; von der Dunk, *supra* n. 139, 414–38; further *supra*, § 2.3.2.

11.5 MILITARY USES OF THE INTERNATIONAL SPACE STATION

An interesting aspect of the ISS project is the possibility to use the Space Station for military purposes. The station, like many major space projects, has an inherent dual-use nature with the capability to execute both civil and military operations. Indeed, the presence of humans in space may be utilized both to perform scientific research and to employ advanced technological capabilities for military applications. Significantly, a state does not have to launch a military crew into earth orbit in order to obtain militarily useful information from a crewed mission.[149] For example, in the case of photo-reconnaissance, '[d]epending upon the sensing or photographic equipment onboard a space mission, even a civil crew … could obtain and deliver highly valuable military information'.[150]

The prospect of military use of the ISS raises questions related to the admissibility of military activities within the limit of the 1998 Intergovernmental Agreement that established the ISS partnership. These questions are linked to the much broader issue of the lawfulness of military activities in outer space.[151]

Pursuant to the 1998 Intergovernmental Agreement, the ISS is a 'civil space station' to be used for 'peaceful purposes' in order to 'enhance the scientific, technological, and commercial use of outer space'.[152] However, the Intergovernmental Agreement does not provide any indication of how the expression 'peaceful purposes' should be interpreted in the context of the ISS.

The Outer Space Treaty and, in particular, its Article IV,[153] partially demilitarizes outer space by: (1) banning the use of nuclear weapons

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[149] See S.E. Doyle, *Civil Space Systems: Implications for International Security*, UN Institute for Disarmament Research (1994), 79.

[150] *Ibid*.

[151] See on the latter *supra*, Chapter 6.

[152] Art.1(1) & Art. 14(1) respectively, Intergovernmental Agreement, *supra* n. 3.

[153] Art. IV, Outer Space Treaty, *supra* n. 10, reads as follows: 'States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner. The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other

anywhere in outer space; (2) prohibiting the stationing of weapons of mass destruction in orbit around the earth, moon or any other celestial body, or otherwise installing such weapons on the moon or any other celestial body; (3) restricting use of the moon and other celestial bodies for exclusively peaceful purposes; and (4) expressly forbidding military manoeuvres, the testing of weapons, or the establishment of military bases, installations or fortifications on celestial bodies. However, there is no express prohibition on military uses in the 'void' of outer space, as long as these uses are consistent with the general principles of international law. This has direct implications for the possibility of using the ISS for military applications. The key to understanding why outer space can be used for non-offensive military purposes is to ascertain the meaning of the expression 'for peaceful purposes', as used in Article IV of the Outer Space Treaty.

The adjective 'peaceful' appears in the majority of the UN space-related documents but none of them contains an authoritative interpretation thereof.[154] The phrase 'peaceful purposes' as used in the 1967 Outer Space Treaty was originally adopted from the 1959 Antarctic Treaty.[155] In this context, 'peaceful' means 'non-military', because the Antarctic Treaty substantially demilitarizes the Antarctic continent.[156]

Based on this interpretation there are those who have sought to equate 'peaceful', as it pertains to outer space, with 'non-military',[157] by arguing, thus, that all military activities should be banned in outer space.[158] Such a restrictive interpretation of the word 'peaceful', however, does not find confirmation in state practice. Instead, a broader understanding of 'peaceful' according to which this term is equated with 'non-aggressive', and military activities in outer space are allowed as long as consistent with the UN Charter, has emerged and progressively

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peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.'

[154] *Cf.* e.g. I.A. Vlasic, The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space, in *Peaceful and Non-Peaceful Uses of Outer Space* (1991), 37.

[155] See Arts. I, IX, Antarctic Treaty, Washington, done 1 December 1959, entered into force 23 June 1961; 402 UNTS 71; TIAS 4780; 12 UST 794; UKTS 1961 No. 97; Cmnd. 913; ATS 1961 No. 12.

[156] So e.g. A.A. Cocca, Historical Precedents for Demilitarization, in *Maintaining Outer Space for Peaceful Purposes* (Ed. N. Jasentuliyana) (1984), 41–2.

[157] *Cf.* Vlasic, *supra* n. 154, 41.

[158] *Cf.* B. Cheng, *Studies in International Space Law* (1997), 650–1.

been accepted.[159] Indeed, since the beginning of the space era the United States has championed this approach;[160] even though the Soviet Union was officially opposed to such an approach, it is also true that already in the early 1960s both the United States and the Soviet Union used satellites for reconnaissance purposes.[161] It is equally relevant that a consensus has developed within the United Nations that 'peaceful' more specifically equates to 'non-aggressive'.[162] Nevertheless, the precise scope and substance of the notion of 'peaceful use of outer space and celestial bodies' remains one of the main sources of controversy surrounding space activities.[163] And perhaps nowhere is this uncertainty more clearly exemplified than in the context of the ISS.

Under international space law, states are free to establish space stations in outer space, even if they are devoted exclusively to military purposes, provided they comply with the limitations of the Outer Space Treaty.[164] Also, there is no restriction on the use of military personnel in outer space.[165] In fact, the Outer Space Treaty expressly provides that military personnel are even permitted to perform certain 'peaceful' activities, such as scientific research, on the moon and other celestial bodies.[166]

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[159] See N. Jasentuliyana, The Moon Treaty, in *Maintaining Outer Space for Peaceful Purposes* (Ed. N. Jasentuliyana) (1984), 128; S. Gorove, Article IV of the Outer Space Treaty and Some Alternatives for Further Arms Control, in *Maintaining Outer Space for Peaceful Purposes* (Ed. N. Jasentuliyana) (1984), 77, 82.

[160] See B. Cheng, The Status of Outer Space and Relevant Issues: Delimitation of Outer Space and Definitions of 'Peaceful Use', 11 *Journal of Space Law* (1983), 89 ff.; A. Morgan, Military Use of Commercial Communication Satellites: A New Look at the Outer Space Treaty and 'Peaceful Purposes', 60 *Journal of Air Law & Commerce* (1994), 353–5.

[161] See e.g. Vlasic, *supra* n. 154, 42, 45.

[162] *Cf.* esp. Art. 51, UN Charter (Charter of the United Nations, San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1), recognizing the inherent right of self-defence as the most fundamental exception to the prohibition on the use of armed force. See further Morgan, *supra* n. 160, at 303; Vlasic, *supra* n. 154, 38, 42.

[163] *Cf.* also e.g. M. Lachs, Views from the Bench: Thoughts on Science, Technology and World Law, 86 *American Journal of International Law* (1992), 673, 686.

[164] See of course Art. IV, 1st sent., Outer Space Treaty, *supra* n. 10.

[165] *Cf.* Vlasic, *supra* n. 154, 50.

[166] See Art. IV, para. 2, Outer Space Treaty, *supra* n. 10.

While the 1998 Intergovernmental Agreement calls for a 'civil international space station' to be operated 'for peaceful purposes', it does not provide any explicit restrictions on the use of the ISS for military purposes. Importantly, in 1988, during talks between the United States and the European Partner States, the chief US negotiator declared that

> the United States has the right to use its elements, as well as its allocations of resources derived from the Space Station infrastructure, for national security purposes … [and that further, w]ith respect to such uses of these elements and resources, the decision whether they may be carried out under the Agreement will be made by the United States.[167]

The European delegates further made it clear that by 'peaceful purposes' they meant civil, non-military projects,[168] thereby linking the concepts of 'peaceful' and 'scientific' purposes, while at the same time dispelling any notion that 'operational space applications' might include systems used for purposes of national defence.

Nevertheless, during the negotiations of the Intergovernmental Agreement the US view prevailed, and was ultimately incorporated into the 1998 Agreement. Once more, Article 9.3(b) provides: '[T]he Partner providing an element shall determine whether a contemplated use of that element is for peaceful purposes, except that this subparagraph shall not be invoked to prevent any Partner from using resources derived from the Space Station infrastructure'.

If by 'peaceful purposes' the Partners had, in fact, meant 'civil, non-military purposes' then Article 9(3)(b) of the Intergovernmental Agreement would seemingly be superfluous. Furthermore, under the Agreement each ISS Partner retains jurisdiction and control over the ISS elements it provides,[169] and the determination of whether a contemplated use of an ISS element is for 'peaceful purposes, in accordance with international law' is expressly removed from the scope of the ISS 'consensus management' regime.[170] Thus, each Partner is essentially free to decide how best to utilize its respective 'user elements' according to its

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167 B. Cheng, The Commercial Development of Space: the Need for New Treaties, 19 *Journal of Space Law* (1991), 17, quoting an Exchange of Notes of 19/20 September 1988 between the Chief US Negotiator and the Head of the European Governments' Delegation to the International Space Station Negotiations.

168 See Cheng, *supra*, n. 167, 29.

169 See Art. 5(1), Intergovernmental Agreement, *supra* n. 3.

170 Art. 1(3) & Art. 7(1), Intergovernmental Agreement, *supra* n. 3; see also Memorandum of Understanding Between the National Aeronautics and Space

interpretation of international law principles,[171] which, consequently, can lead to military applications of the ISS where a Partner considers such applications to fall within the definition of civil and peaceful uses.

In conclusion, despite ambiguities in the understanding of the expression 'exclusively for peaceful purposes', the ISS can also be used for military purposes insofar as such actions are non-aggressive and consistent with international law. Ultimately, it is how states utilize the space station which is the key factor in determining its civil or military potential.[172]

11.6 THE FUTURE OF THE INTERNATIONAL SPACE STATION

Originally, the ISS was supposed to remain in service until 2015. However, due to delays in the assembling process and the willingness of the ISS Partner States to utilize the Station at its full operational capacity, the ISS project has been funded until 2020. This decision was the outcome of a meeting held in Canada in March 2012 of the ISS Partners, resulting in a renewed pledge to maintain the ISS until at least 2020.[173]

NASA reports that it is still committed to the principles of the mission but also to use the International Space Station in new ways, which were not elaborated upon. CSA President Steve MacLean stated his belief that the ISS's Canadarm will continue to function properly until 2028, alluding to Canada's likely extension of its involvement beyond 2020.[174] In any case a willingness among the ISS Partners to keep the ISS in operation until 2028 is emerging.[175]

What will happen at the end of the lifetime of the ISS still remains uncertain. One possibility is the building of a third-generation modular space station by using some of its existing parts. According to a 2009

Administration and the European Space Agency Concerning Cooperation on the Civil International Space Station, done in Washington, 29 January 1998.

[171] See Arts. 7(3); 9(3), & Art. 1(1), Intergovernmental Agreement, *supra* n. 3.

[172] See S.E. Doyle, Civil Space Systems: Implications for International Security, UN Institute for Disarmament Research 1994.

[173] See www.nasa.gov/home/hqnews/2012/mar/HQ_12-066_ISS_HOA_Statement.html, last accessed 17 April 2014.

[174] See http://nasawatch.com/archives/2012/02/, last accessed 17 April 2014.

[175] See www.space-travel.com/reports/ISS_could_be_used_for_satellite_assembly_until_2028_999.html, last accessed 4 January 2014.

report,[176] Space Corporation Energia is considering methods to remove from the station some modules of the Russian Orbital Segment when the end of mission is reached and use them as a basis for a new station, known as the Orbital Piloted Assembly and Experiment Complex (OPSEK). The modules under consideration for removal from the current ISS include the Multipurpose Laboratory Module (MLM), scheduled for launch in 2014, with other Russian modules currently planned for attachment to the MLM before 2015. Neither the MLM nor any additional modules attached to it will have reached the end of their useful lives in 2016 or 2020. The report foresees OPSEK remaining in operation for a period of 30 years. The proposal would use OPSEK to assemble components of manned interplanetary spacecraft destined for Mars, the moon, and possibly Saturn. The returning crew would also recover on the station before landing on earth. Such space stations could form part of a deep space network, supporting manned exploration of the solar system.[177]

It is interesting to point out that China, a major spacefaring state, seems likely to remain outside of this project and other initiatives aimed to extend the lifetime of the ISS. Instead, China has its own contemporary manned space programme, Project 921, and has carried out cooperation and exchanges with countries such as Russia and Germany in manned and unmanned space projects. China launched its first experimental space station Tiangong-1 in September 2011 and has officially initiated the permanently manned Chinese space station project.[178] Accordingly, built and launched entirely by China, it will combine indigenous designs with international compatibility as a third-generation modular space station, comparable to the Soviet/Russian Mir, the Russian OPSEK and the ISS. Operations will be controlled from the Beijing Aerospace Command and Control Centre in China. The planned launching date is around 2020.[179]

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[176] See Russia To Save ISS Modules, news.bbc.co.uk/2/hi/science/nature/8064060.stm, last accessed 17 April 2014; also www.russianspaceweb.com/opsek.html, last accessed 4 January 2014.

[177] See http://en.wikipedia.org/wiki/OPSEK, last accessed 17 April 2014.

[178] For information on the Chinese Manned Space Station Programme, see http://en.cmse.gov.cn/list.php?catid=64, last accessed 17 April 2014.

[179] See www.space.com/21774-china-manned-space-station-next.html, last accessed 17 April 2014; www.theatlantic.com/infocus/2013/07/chinas-manned-space-program/100549/, last accessed 4 January 2014.

11.7 CONCLUSION: THE INTERNATIONAL SPACE STATION AS A MODEL FOR FUTURE COOPERATION IN SPACE ACTIVITIES?

One of the most significant and unique features of the ISS project is the high level of structured international cooperation among the Partner States. A series of multilateral and bilateral legal instruments have developed into an elaborate framework that has enabled the shared management and costs of the ISS and ultimately contributed to make the station a successful example of large-scale international cooperation in outer space.

The ISS project has thus provided a successful legal platform for potential future manned exploration and use of outer space. It has shown that governments can collaborate on technological, financial, political and legal levels to produce successful projects that provide for the benefit of all with little dispute and operational difficulty.[180]

Similarly, plans for manned exploration and use of the solar system, such as the exploration of Mars or habitation of the moon or of another celestial body, would require the participation of many entities, both of a governmental and of a non-governmental nature. In February 2011, NASA Administrator Charlie Bolden stated: ‘Any mission to Mars is likely to be a global effort.’ Cooperation would not only be required for the technical management of a potential lunar or Mars station, but also for the establishment of an international legal regime to govern the exploration, use and exploitation of the natural resources contained therein.[181]

The extraction and use of natural resources from celestial bodies and the eventual colonization of other planets constitute some of the most fascinating goals in the realm of space activities. These plans are driven not only by governments, but also by private companies. Planetary Resources is a company whose mission is to apply commercial, innovative techniques to explore space.[182] The intention is to develop low-cost robotics to explore and mine asteroids for resources that may be utilized by space-based and terrestrial customers. Planetary Resources is not the

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180 See e.g. E. González Ferreiro & A. Azcárraga, Orbital Space Ports: Their Operating Procedures and Legal Frame, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 160–77.

181 See further on this issue *infra*, e.g. § 14.3.

182 See www.planetaryresources.com/, last accessed 18 February 2014.

only company investigating asteroid mining, and others are proposing such mining activities on the moon.

The legal regime applicable to activities on celestial bodies is provided for in the 1967 Outer Space Treaty and in the 1979 Moon Agreement.[183] The former establishes fundamental principles applicable to all kinds of space activities, including those on celestial bodies, and has been ratified by all spacefaring states. The latter, which lays down specific provisions dealing with manned scientific and commercial operation on celestial bodies, has been ratified by only 15 states, not including any of the leading space powers.[184]

The presence of mankind on celestial bodies beyond short-duration visits creates a series of legal issues that become evident, such as the legal status of permanent stations on a celestial body's surface, of personnel on board, of liability for damage caused by activities on such celestial bodies, and the legal rules governing the removal and use of natural resources contained therein.

One possible way to approach some of these issues could be to use some of the legal solutions currently in force in the context of the ISS as a model. The Intergovernmental Agreement provides for unique legal solutions to some issues of IPR and criminal jurisdiction, as well as for a very extended inter-party waiver of liability and the fundamental application of the concept of time-sharing in terms of usage of the manned facilities part of the ISS. Overall, the ISS offers an example of how to manage international cooperation with respect to long-duration manned missions in outer space.

Instead, the development of a regime to govern the commercial exploitation of extraterrestrial resources would likely require new legal solutions that also take into account the expectations and needs of private companies. In any case, it is possible to foresee the utilization of the ISS regime as a model for cooperation and utilization, and it has shown itself to be a robust and evolving framework.

Problems will arise not when governments extend their reach to landing on Mars or collecting samples from asteroids but when questions related to the ownership of revenues generated from extraterrestrial mining activities, especially when private entities are involved, are addressed. Can those who can afford the trip be awarded the rights to the spoils? If profits are earned and resources used by the few, is the Outer

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[183] For a detailed description of the legal regime applicable to extraterrestrial resources, see *infra*, § 14.4.

[184] See www.unoosa.org/oosa/en/SpaceLaw/treatystatus/index.html, last accessed 17 April 2014; also *supra*, § 2.3.5.

Space Treaty's declaration of outer space as a province of mankind for the benefit of all thereby nullified? Follow-on questions then include who has the right to allocate space resources, what the allocation criteria will be and who will enforce the allocations and usage in space.

In particular the involvement of private entities and their requirement for economic returns requires awareness of the considerations and parameters within which the international community must stay. It must be ensured that such new developments in space-based activities do not endanger fundamental space law principles, such as the exploration and use of outer space for the benefit of all mankind. Another challenge, in order to allow sustainable private participation in future projects, is to address the legal regime governing the extraction and commercial use of resources from celestial bodies.

Many challenges await the international community. However, if nations can maintain the same level of collaboration and willingness to cooperate that has characterized the ISS experience, it is likely that future outer space endeavours would be structured in a cohesive way leading to success.

12. Legal aspects of private manned spaceflight

Frans von der Dunk

12.1 INTRODUCTION

'Private commercial human spaceflight', also often loosely and imprecisely known as 'space tourism', is quite likely the type of space activity having raised most enthusiasm with the public at large ever since the Apollo moon landings of 1969 through 1972 – and at the same time may present the largest challenge to the existing body of (international) space law yet.

As early as 1990 a Japanese journalist, the first professional non-career cosmonaut, visited the then-Soviet Mir station to write daily newspaper reports of what it meant to be in orbit, soon to be followed by an English engineer.[1] Yet, it was the launch of Dennis Tito to the Russian part of the International Space Station (ISS)[2] in 2001 which gave birth to the phenomenon of 'space tourism' – he flew for no other reason than his desire to fly in outer space and happening to have the money privately available to pay the price quoted to him (some US$ 20 million) for fulfilling that desire.[3] So far, Tito has been followed to the ISS by another six orbital tourists, including one woman, Anousheh Ansari, and

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[1] See S.A. Negoda, Legal Aspects of the Commercial Development of the Russian Segment of the ISS, 28 *Air & Space Law* (2003), 90–1; Y. Hashimoto, The Status of Astronauts toward the Second Generation Space Law, in *Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space* (1994), 208; A. Lele, Security Connotations of Space Tourism, 11 *Astropolitics* (2013), 219.

[2] See on the ISS *supra*, esp. §§ 11.3–11.6.

[3] See e.g. F.G. von der Dunk, Passing the Buck to Rogers: International Liability Issues in Private Spaceflight, 86 *Nebraska Law Review* (2007), 404–5; S.R. Freeland, Up, Up and … Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space, 6 *Chicago Journal of International Law* (2005), 2–3.

one of the others actually taking the trip twice – against, generally, rising prices.[4]

While at the time of writing such space tourism adventures on board the ISS are temporarily halted due to the prioritization of other ISS flights,[5] they have not been banned in principle and may be resumed at any time once new extraordinarily wealthy individual clients show their interest in such flights.

Almost equally sensational as Tito's first flight were the events that unfolded in 2004. In October of that year a Scaled Composites-built carrier aircraft (the WhiteKnightOne) flew to some 55,000 ft above the Mojave desert in California and released a rocket-powered vehicle (the SpaceShipOne) with a pilot and room for two passengers to an altitude of over a 100 km – and repeated the event within three weeks, thus winning the US$ 10 million purse made available by the Ansari family (yes, the same of the first female space tourist) coveted by dozens of other competitors for the X-Prize.[6] One of the closest competitors to the victors immediately established Virgin Galactic, teaming up with Scaled Composites to build larger versions of the two-stage vehicle (SpaceShipTwo allowing for two pilots and six passengers) and start flying paying passengers (to the tune of some US$ 200,000 per ticket) into the edge of outer space and back – a feat now expected to happen in 2015 or so.[7]

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[4] See e.g. T. Brannen, Private Commercial Space Transportation's Dependence on Space Tourism and NASA's Responsibility to Both, 75 *Journal of Air Law & Commerce* (2010), 642–3, 653; S. Chaddha, U.S. Commercial Space Sector: Matured and Successful, 36 *Journal of Space Law* (2010), 34–6.

[5] See *supra*, § 11.4.3.1.

[6] See e.g. *Suborbital Reusable Launch Vehicles and Emerging Markets*, FAA, February 2005, 1, 4–5; further von der Dunk, *supra* n. 3, 405–6; Freeland, *supra* n. 3, 1–2; Chaddha, *supra* n. 4, 35–6; Brannen, *supra* n. 4, 644; V.J. Vissepó, Legal Aspects of Reusable Launch Vehicles, 31 *Journal of Space Law* (2005), 195. Officially, some 26 contenders entered the race for the X-Prize; see *The U.S. Commercial Suborbital Industry: A Space Renaissance in the Making*, FAA, 2; also e.g. T.R. Hughes & E. Rosenberg, Space Travel Law (and Politics): The Evolution of the Commercial Space Launch Amendments Act of 2004, 31 *Journal of Space Law* (2005), 8–9. The 100 km altitude was generally referred to as the lower boundary of outer space; see on this issue *supra*, § 2.3.1.3.

[7] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, FAA, February 2013, www.faa.gov/about/office_org/headquarters_offices/ast/media/Annual_Compendium_of_Commercial_Space_Transportation_2012_February_2013.pdf, last accessed 10 March 2014, 27, 134; also http://en.wikipedia.org/wiki/Virgin_Galactic, last accessed 2 January 2014.

Moreover, Virgin Galactic will likely be followed, possibly closely, by several competitors having devised different operational and technological concepts.[8] For example, XCOR is developing a single-stage-to-space Lynx vehicle, taking off and landing like an aircraft and destined to transport passengers to outer space and back in cooperation with SXC also in 2015 or so, possibly from Curacao.[9] Blue Origin, by contrast, aims to launch passengers into those regions with its New Shepard vehicle using a vertical take-off and vertical landing concept.[10]

Finally, though attracting considerably less attention than ISS tourism and nascent sub-orbital tourism, within the United States two more important developments occurred and continue to occur which may result in further revolutionary developments in private manned spaceflight. On the one hand, private operators already in the business of operating or developing unmanned launch services turned to developing manned spaceflight capability as well, strongly supported by NASA following a redirection of the latter's focus from low-earth-orbit to deep space.[11] Notably this concerned SpaceX[12] and Orbital Sciences;[13] in addition

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[8] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 23–30; also M. Gerhard, Space Tourism – The Authorisation of Suborbital Space Transportation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 264–5; Brannen, *supra* n. 4, 654–6; F.G. von der Dunk, The Integrated Approach – Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventure Tourism, 92 *Acta Astronautica* (2013), 200–4; M. Chatzipanagiotis, *The Legal Status of Space Tourists in the Framework of Commercial Suborbital Flights* (2011), 2; Hughes & Rosenberg, *supra* n. 6, 2–3; specifically with a view to the spaceports from which they should operate M.C. Mineiro, Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges, 73 *Journal of Air Law & Commerce* (2008), 761.

[9] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 28, 133; http://en.wikipedia.org/wiki/XCOR_Aerospace, last accessed 2 January 2014. *Cf.* further also F.G. von der Dunk, Sun, Sea, Sand … and Space: Launching Tourists into Outer Space from the Dutch Caribbean, in *Proceedings of the International Institute of Space Law 2010* (2011), 349–50.

[10] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 25, 134; http://en.wikipedia.org/wiki/Blue_Origin, last accessed 2 January 2014.

[11] See e.g. www.space.com/17856-nasa-deep-space-station-moon-farside.html, last accessed 15 January 2014.

[12] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 33, 141; http://en.wikipedia.org/wiki/SpaceX, last accessed 2 January 2014.

Sierra Nevada Corporation (SNC) also aims for orbital servicing activities with its Dream Chaser, a concept similar to the Lynx in its appearance – but, to be launched vertically, this time going for orbital velocities, altitudes and operations.[14]

On the other hand, driven partly by the X-Prize competition and its successful conclusion in 2004, Bigelow Aerospace is testing inflatable scale models of future hotels in outer space, ultimately aiming to have a fully equipped orbital hotel operational by 2015 or shortly thereafter.[15] The first major step, the launch of an inflatable unmanned module Genesis-I, has already taken place in July 2006, and was apparently such a success that the next step, sending up Genesis-II, a copy of Genesis-I carrying mementos for the public, was soon taken as well.[16] Yet further steps are to follow. Following the lead of the X-Prize, moreover, Bigelow has dedicated 'America's Space Prize' of US$ 50 million for the first fully privately funded orbital space vehicle, in order to enhance the possibilities for actually visiting the orbital hotel-to-be.[17]

In describing these various projects the key notions are 'private', 'tourism' and 'spaceflight'; in order to allow for a thorough evaluation of how current space law addresses and/or future space law should address such new developments it is therefore necessary first to define those terms to some extent.

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[13] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 33, 140; http://en.wikipedia.org/wiki/Orbital_Sciences_Corporation, last accessed 2 January 2014.

[14] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 34–5, 142; http://en.wikipedia.org/wiki/Sierra_Nevada_Corporation, last accessed 2 January 2014; also Lele, *supra* n. 1, 223–4.

[15] *Cf.* e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 36; http://en.wikipedia.org/wiki/Bigelow_Aerospace, last accessed 2 January 2014; further B. Perlman, Grounding U.S. Commercial Space Regulation in the Constitution, 100 *The Georgetown Law Journal* (2012), 938–9. See, also, for earlier plans, e.g. L. Billings, Exploration for the Masses? Or Joy-Rides for the Ultra-Rich? Prospects for Space Tourism, 22 *Space Policy* (2006), 162–3; R.D. Launius & D.R. Jenkins, Is It Finally Time for Space Tourism?, 4 *Astropolitics* (2006), 261; von der Dunk, *supra* n. 3, 408–9. For a possible competitor, Galactic Suite Ltd., see Brannen, *supra* n. 4, 655.

[16] See http://en.wikipedia.org/wiki/Bigelow_Aerospace, last accessed 2 January 2014.

[17] See http://en.wikipedia.org/wiki/America's_Space_Prize, last accessed 10 March 2014; also Brannen, *supra* n. 4, 644–5; S.H. Bromberg, Public Space Travel–2005: A Legal Odyssey into the Current Legal Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier, 70 *Journal of Air Law & Commerce* (2005), 658.

12.2 THE KEY DEFINITIONAL ISSUES

12.2.1 'Private Manned Spaceflight' Versus 'Space Tourism'

The most fundamental definitional issue concerns the 'private' character of the various new developments briefly indicated above, in particular with a view to the traditionally state-oriented character of space activities and (especially international) space law.[18] 'Private' as the opposite of 'public' refers to the legal character of the actors involved, and essentially equates with 'non-governmental', that is referring to persons or entities not formally part of the state's official bodies and usually therefore acting for personal motivations – of which the profit motive is of course the most prominent one in the highly costly space sector.[19]

Also in the original phases of the space age, private industry did play a role, even in the context of manned spaceflight – but exclusively as manufacturers of hardware or software to be used for the actual spaceflight operations (from launch to landing, and including flight control, living and working on board space stations, moon walks and other extra-vehicular activities) which remained the exclusive domain of governmental space agencies and one intergovernmental European Space Agency.[20] Thus, if the epithet is to have any distinguishing value, 'private spaceflight' should refer to more substantial involvement of private actors than only in the purely terrestrial manufacturing phases.

This is also where the phrase 'space tourism' becomes not only imprecise but also confusing[21] as this focuses on the *motive* for going

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[18] See e.g. F.G. von der Dunk, As Space Law Comes to Nebraska, Space Comes Down to Earth, 87 *Nebraska Law Review* (2008), 500–2; *cf.* also *supra*, § 2.2.2.3; F.G. von der Dunk, The Origins of Authorization: Article VI of the Outer Space Treaty and International Space Law, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 5–9.

[19] *Cf.* also US National Space Policy, of 28 June 2010, www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf, last accessed 12 January 2014, at 10: 'The term "commercial," for the purposes of this policy, refers to space goods, services, or activities provided by private sector enterprises that bear a reasonable portion of the investment risk and responsibility for the activity, operate in accordance with typical market-based incentives for controlling cost and optimizing return on investment, and have the legal capacity to offer these goods or services to existing or potential nongovernmental customers.'

[20] *Cf.* also more generally *supra*, § 2.2.2.3.

[21] *Cf.* e.g., the 'official' definition of 'tourism' in general offered by the World Tourist Organization (UNWTO) and the UN Statistical Committee in

into space. Legal analyses should thus be careful in using the concept of 'space tourism', where for example in aviation for legal purposes no difference is made between *tourist* passengers and *business* passengers on board the same aircraft. Furthermore, several prospective sub-orbital operators have indicated that they would see the launching of small satellites or other carriage of scientific payloads as another potentially profitable business, which clearly is not 'tourism' in any normal sense of the word.[22]

The most appropriate definition of 'private manned spaceflight' therefore would be 'flights of humans intended to enter outer space (a) at their own expense or that of another private person or private entity, (b) conducted by private entities, or (c) both'. This double criterion is formulated to exclude scenarios where governments or intergovernmental organizations pay for the flight of a particular human *and* undertake the actual flight operations, in which case the flight is legally speaking still comprehensively 'public' in nature. Flights such as carried out by private operators on behalf of NASA, however, are still included by virtue of criterion (b), whereas flights such as those of Tito remain included by virtue of criterion (a).

12.2.2 'Sub-Orbital' Versus 'Orbital' – and the Definition of 'Outer Space' Revisited

Essentially, the four most visible and topical versions of private spaceflight highlighted earlier under that definition can be further subdivided into 'sub-orbital' and 'orbital', the latter comprising private visits to the

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1994, as quoted by Launius & Jenkins, 255, *supra* n. 15, which reads: 'The activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes', where in particular the last four words constitute a counter-intuitive addition since it would effectively equate 'tourism' with *all* travel, taking away any distinctive common-sense meaning.

[22] *Cf.* e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 24 ff. The discussion of what 'space tourism' means is moreover further complicated by some 'definitions' including non-space hyperbolic flights; see on this von der Dunk, *supra* n. 3, 402–3, quoting S. Hobe & J. Cloppenburg, Towards a New Aerospace Convention? – Selected Legal Issues of 'Space Tourism', in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 377: 'space tourism' encompasses 'any commercial activity offering customers direct or indirect experience with space travel'; so also Freeland, *supra* n. 3, 6; *cf.* further Chatzipanagiotis, *supra* n. 8, 3. See for the plans to launch scientific payloads e.g. Brannen, *supra* n. 4, 653.

ISS, servicing the ISS as a private operation and plans for private hotels in orbit. Thus, at a second level the differences between, and definitions of, 'sub-orbital' and 'orbital' become important, even if currently those might seem self-evident.

'Sub-orbital' strictly speaking refers to the technical/operational feat of 'not completing one orbit' around the earth.[23] Thus, for instance in the context of the International Civil Aviation Organization (ICAO) a 'sub-orbital flight' has been loosely defined as 'a flight up to a very high altitude which does not involve sending the vehicle into orbit'.[24] However, whilst as for manned flights perhaps for the near future these may only concern short and easily distinguishable 'up-and-down' missions, in the somewhat further future they may well come to encompass aviation-like point-A-to-point-B transportation, both A and B being somewhere on earth.[25] While the assumption with point-A-to-point-B transportation is, of course, that still not a single orbit is completed even though the outer-space part of the trajectory on such (presumably transcontinental) flights may span major parts of the globe, the trajectories may well come to overlap or closely approximate true orbital trajectories.[26]

It is important to realize, therefore, that ultimately 'sub-orbital' may turn out not to be a very helpful distinguishing criterion for legal purposes of, *inter alia*, regulating such flights. In practice it is often, consciously or unconsciously, equated to remaining *below* a certain

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[23] Note, however, that strictly speaking *every* trajectory that post-launch is determined only by gravitational and drag forces follows an ellipsoid orbital trajectory (in other words, a natural parabola) around one virtual centre-point and two virtual foci (see http://en.wikipedia.org/wiki/Ellipse, last accessed 3 April 2014) – *in the case of a 'sub-orbital' trajectory it is just an orbit which intersects with the earth*. As R. Simberg explained (e-mail in possession of the author): 'It's basic orbital mechanics', and '[t]he only reason it's an incomplete ellipse is because the earth gets in the way'; even parabolic flights in weightless aircraft follow such elliptical trajectories effectively qualifying as 'sub-orbital'. *Cf.* also e.g. M. Benkö & E. Plescher, *Space Law – Reconsidering the Definition/Delimitation Question and the Passage of Spacecraft Through Foreign Airspace* (2013), 8 ff.

[24] As quoted in P. van Fenema, Suborbital Flights and ICAO, 30 *Air and Space Law* (2005), 405.

[25] See also von der Dunk, *supra* n. 3, 403, 406–8, on Virgin Galactic's announced plans in this respect.

[26] At the same time, it is this character of aviation-like across-the-globe transportation which has given rise to numerous comparisons with aviation also for legal purposes; see further *infra*, § 12.3.2.1, esp. n. 46.

altitude (that of 'an orbit') – or, by contrast (and rather confusingly), *above* a certain altitude (namely as being in outer space).[27]

Another issue is whether hyperbolic flights are subsumed under the concept of 'sub-orbital' – which strictly speaking would be correct, since clearly not achieving orbital velocity, yet neither reaching an altitude by any means to be considered 'outer space'. The FAA defines 'suborbital trajectory' as 'the intentional flight path of a launch vehicle, reentry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the Earth', which does not refer to 'outer space' or any minimum altitude to be aimed for.[28] As a 'suborbital *rocket*' is then defined with reference to being 'rocket-propelled', obviously *aircraft* on hyperbolic trajectories are excluded from the application of these regulations.[29] The FAA launch licensing regulations alternatively refer to 'suborbital launch *vehicles*' and 'suborbital *rockets*'[30] – yet the FAA reports define 'suborbital reusable vehicles' as 'commercially developed reusable space vehicles that travel just beyond the threshold of

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[27] An example of the former would be Sec. 1, 12th bullet, Space Affairs Act (South African Space Affairs Act), 6 September 1993, assented to on 23 June 1993, No. 84 of 1993; Statutes of the Republic of South Africa – Trade and Industry, Issue No. 27, 21–44; *National Space Legislation of the World*, Vol. I (2001), at 413; which defines 'launching' as 'the placing or attempted placing of any spacecraft into a sub-orbital trajectory *or* into outer space' (emphasis added); the use of 'or' suggesting a dichotomy between 'outer space' and 'sub-orbital'. An example of the latter would be Van Fenema, *supra* n. 24, 396, referring to 'the launch of an object or objects into outer space without that object or such objects completing one or more orbits around the earth'. See further for an extended discussion on the definition of 'sub-orbital', and whether it means actually remaining *below* any boundary referenced by way of 'orbital' (as 'sub' means 'below'), as meaning *not* arriving even in the lowest regions of outer space, or reaching *above* such a boundary as long as not achieving a single full orbit (as 'sub-orbital' means exactly that whilst generally assuming outer space is still reached), including examples of various implicit interpretations/definitions, F.G. von der Dunk, Beyond *What*? Beyond *Earth Orbit*?…! The Applicability of the Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight, 43 *California Western International Law Journal* (2013), esp. 285–9; further V. Nase, Delimitation and the Suborbital Passenger: Time to End Prevarication, 77 *Journal of Air Law & Commerce* (2012), 748–9; Gerhard, *supra* n. 8, 263, n. 2; Chatzipanagiotis, *supra* n. 8, 2; Benkö & Plescher, *supra* n. 23.

[28] Sec. 50902(20), 51 U.S.C.; 14 C.F.R. § 401.5. Note that, e.g., deep space probes do not even *have* a 'vacuum instantaneous impact point'.

[29] *Cf.* 14 C.F.R. § 401.5.

[30] *Cf.* 14 C.F.R. Chapter III, Subch. C, at various instances.

space, about 100 km (62 miles) above the Earth', adding '[w]hile traveling through space'.[31]

Effectively, the FAA, the single governmental authority worldwide so far having addressed these issues from a regulatory perspective, thus uses two *alternative* criteria in determining the craft subject to launch licensing, with the result that also certain flights not reaching or even intending to reach outer space are licensed under the Commercial Space Launch Act, thereby skirting the definitional issue.[32]

On the one hand, the FAA defines such a launch vehicle as 'a suborbital rocket', where the technology – rocket propulsion versus airlift – serves as the key criterion distinguishing between sub-orbital flights regulated under launch licensing regulations and 'other' flights regulated under aviation regulations, regardless of where the flight takes place or is intended to take place.[33]

On the other hand, 'launch vehicle' can also refer to 'a vehicle built to operate in, or place a payload or human beings in, outer space'.[34] The reference to 'outer space' in itself would make this a geographic criterion, but at the same time the reference to the vehicle being '*built to* operate in' – as opposed to 'operating in' – outer space even allows inclusion of non-rocket vehicles as long as they can be characterized as still being part of an undertaking ultimately targeting outer space.[35]

For the present analysis, sub-orbital flights could thus be further subdivided into 'sub-orbital space flights' (the ones aiming to achieve altitudes of 100 km or higher, as reflected by the perhaps not *de jure* but *de facto* approach of the FAA by way of its reports), and 'other

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31 *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 24.

32 For a brief survey of the Commercial Space Launch Act in general see further *supra*, § 3.3.1.1; also *infra*, §§ 12.3.4.2 and 12.3.4.3; *Cf.* also Hughes & Rosenberg, *supra* n. 6, 30–3, 50–1; on international ramifications of US/FAA approaches in this context, 76–7.

33 See Sec. 50902(8) (B), 51 U.S.C. This allows the FAA also to license e.g. test flights of vehicles or component parts thereof ultimately destined for use in outer space, but as such not necessarily aiming themselves to enter outer space – wherever that begins.

34 Sec. 50902(8) (B), 51 U.S.C.

35 This allows the FAA also to license e.g. certain high-altitude balloon flights such as contemplated by Paragon, which aim at an altitude of 'only' 30 km; see letter FAA to P.L. Meredith, 26 September 2013, at www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/interpretations/data/interps/2013/meredith-zuckertscoutt&rasenberger%20-%20(2013)%20legal%20interpretation.pdf, last accessed 18 April 2014.

sub-orbital flights' which do not aim for such altitudes yet still use rocket technology and hence also happen to be regulated by the FAA under its (space) launch licensing regime.[36]

Further analysis here will then focus only on the former, as only these constitute *space*flight in the real sense of the word, namely as intended to reach outer space – hyperbolic flights to altitudes of 30 or 40 km never leave air space, hence never trigger the applicability of space law to the extent that it has a geographical, 'spatialist' basis.[37] And even if some of them may use rocket technology, and thus presently fall within the scope of the FAA's launch regime, qualification of such vehicles as 'space objects', the main trigger of application of international space law *outside* of outer space itself, becomes doubtful as not even the intention to reach outer space is there.[38] Of course, this once more raises the issue of the lower 'geographical', spatialist boundary of outer space – as this is often equated with the lowest possible or actual altitude at which a satellite can still maintain an orbit around the earth.[39]

It also means that the distinction between 'sub-orbital' and 'orbital' spaceflight ultimately cannot be drawn that sharply, to the extent both types of spaceflight make use of the same geographical realm of outer

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[36] See further *infra*, § 12.3.4.3.

[37] This refers esp. to Art. VI, Outer Space Treaty (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967)), and all other elements of international space law applicable to the global commons of outer space following therefrom; see *infra*, § 12.3.3.1; further *supra*, § 2.3.1.2.

[38] Note esp. Art. VII, Outer Space Treaty, *supra* n. 37; Liability Convention (Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971)); and Registration Convention (Convention on Registration of Objects Launched into Outer Space, New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975)), applicable to 'objects launched into outer space' and 'space objects' respectively, where the definition of such objects crucially hinges on the intention to launch such objects into outer space; see *infra*, § 12.3.3.2; further *supra*, § 2.3.3.3.

[39] See the extended analysis in von der Dunk, *supra* n. 27, 280 ff., arriving at the conclusion that this would or at least very well could – again – point to an altitude of some 100 km above sea level; see also *supra*, § 2.3.1.3.

space. It is only with this broader perspective in mind that one can address the currently relevant manned ‘sub-orbital’ flights, which reach the lower edge of outer space only for a short time span,[40] as a subset of space flights whereas the fact that 95 per cent of the activity takes place in the realm of air space (as generally perceived) makes discussion of actual applicability or possible application of some parts of air law also relevant.

Mirror-wise, of course similar definitional problems play in the realm of private ‘orbital’ manned spaceflight. While the concept of ‘orbital’ is clear (any object achieving sufficient escape velocity to allow itself to complete at least one full orbit around the earth earns itself that epithet[41]) *any* space object has to first traverse some airspace or other before arriving at such orbital altitudes, which almost by definition are in outer space (and to the extent manned spaceflight is at issue, of course also during its return should do so).

While in the future travel beyond (low) earth orbit qualifying as ‘orbital’ – even if the ultimate destination (such as the moon) may be ‘beyond’ any earth orbit – could be envisaged, again for the time being analysis could limit itself to addressing the operations in (low) earth orbit falling within the scope of ‘private spaceflight’, which concern transportation to or from space stations, whether governmental or private as Bigelow Aerospace is developing them. Thus, the present chapter will first address the legal aspects of sub-orbital and orbital private manned spaceflight separately, and then address some aspects of private manned spaceflight in principle applicable to both categories.

12.3 LEGAL ISSUES OF PRIVATE SUB-ORBITAL MANNED SPACEFLIGHT

12.3.1 Introduction: Space Law Versus Air Law

The overarching special issue concerning regulation of private sub-orbital manned spaceflight concerns the question of whether this indeed, legally speaking, concerns *space*flight, or is more akin to aviation of a special character. Further to the spatialist-versus-functionalist dichotomy,[42] this

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[40] Note, however, that ‘sub-orbital’ as such would also encompass sounding rockets going to much higher altitudes; see. e.g. Benkö & Plescher, *supra* n. 23.

[41] See for a basic technical/operational analysis of orbital velocity for the purpose of legal discussions von der Dunk, *supra* n. 27, 282–3.

[42] See *supra*, § 2.3.1.3; also e.g. Chatzipanagiotis, *supra* n. 8, 7–17.

question bifurcates into two sub-questions: to what extent does, would or should air law apply because the activities (largely) take place in airspace? And to what extent does, would or should it apply because they are conducted with what could be determined to be aircraft? The mirror-sides to these questions obviously focus on space law and the concepts of 'outer space' and 'space objects'.

12.3.2 The Applicability of Air Law

12.3.2.1 The issue of 'airspace'

The most fundamental rule of air law is the sovereignty of states over their national airspace, defined as the airspace over 'the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State' – but without any upper limit indicated.[43] As a consequence, states are individually entitled to determine the legal regime applicable basically to *any* craft flying in such national airspace, albeit that by signing up to the Chicago Convention and other international treaty arrangements (including notably the bilateral agreements between sovereign states on commercial aviation) most states have agreed to certain international standards and practices and/or specific cross-border aviation operations.[44]

Consequently, states *inter alia* retain full responsibility for the safety of aviation within their national airspaces, which includes the provision of appropriate air traffic services – although not necessarily liability for any damage suffered as a consequence of deficient provision of such services.[45] It also includes responsibility for clearing specific parts of

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[43] Arts. 1, 2, Convention on International Civil Aviation (hereafter Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947; 15 UNTS 295; TIAS 1591; 61 Stat. 1180; Cmd. 6614; UKTS 1953 No. 8; ATS 1957 No. 5; ICAO Doc. 7300.

[44] The International Air Services Transit Agreement (Two Freedoms Agreement), Chicago, done 7 December 1944, entered into force 30 January 1945; 84 UNTS 389; 59 Stat. 1963; UKTS 1953 No. 8; Cmd. 6614; ATS 1957 No. 5; ICAO Doc. 7500, and (in particular) the International Air Transport Agreement (Five Freedoms Agreement), Chicago, done 7 December 1944, entered into force 8 February 1945; 171 UNTS 387; 59 Stat. 1701; ICAO Doc. App. IV-2187, represented efforts to establish a world-wide regime of access to aviation markets; due to the limited partisanship esp. to the Five Freedoms Agreement, however, most of those arrangements were realized through bilateral air service agreements.

[45] *Cf.* Art. 28, Chicago Convention, *supra* n. 43; also e.g. Arts. 12, 22, 25. See further F.P. Schubert, An International Convention on GNSS Liability: When

airspace surrounding a launch event (both in space and in time), but so far this has remained – and for the near future will likely remain – a matter of *national* (air) law, without any real need or formal requirement for international regulation.

From this perspective, certainly the currently envisaged sub-orbital flights would have much in common with aviation: they will often use airports for take-off and landing, will only for a small, upper part of the hyperbolic flight profile leave what is commonly referred to as 'airspace', and will consequently also interfere with normal aviation taking place in the same three-dimensional area. At a later stage, furthermore, flights are envisaged to provide point-to-point aviation-like transportation across the globe. In all these cases, the outer-space part of the trajectory is more like a helpful incident than a main target or a crucial element of the flight.[46]

12.3.2.2 The issue of 'aircraft'

Technologically speaking the comparison essentially hinges on the definition of an 'aircraft' as 'any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface'.[47] As the use of the word 'can' points out, with the exception of craft which can *only* operate in a completely ballistic mode, all envisaged vehicles for private human spaceflight

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Does Desirable Become Necessary?, 24 *Annals of Air and Space Law* (1999), 252–4; M. Bartkowski, Responsibility for Air Navigation (ATM) in Europe, 21 *Annals of Air & Space Law* (1996), 46 ff.; Chatzipanagiotis, *supra* n. 8, 144.

[46] Also historically, many similarities to aviation have been referenced; *cf.* in general e.g. Hobe & Cloppenburg, *supra* n. 22, 378–81; Van Fenema, *supra* n. 24, 399–403; R. Abeyratne, Space Tourism – Parallel Synergies Between Air and Space Law?, 53 *Zeitschrift für Luft- und Weltraumrecht* (2004), 184 ff.; Gerhard, *supra* n. 8, 268–78; Vissepó, *supra* n. 6, 173; somewhat naïvely (e.g. repeatedly referring to angel investors as 'altruistic billionaires' – *without* any quotation marks), Bromberg, *supra* n. 17, 639 ff.; for a critical appraisal of this approach, von der Dunk, *supra* n. 8, 200–8; also with reference to XCOR/SXC's plans, F.G. von der Dunk, Trying to Fit a Square Peg into a Round Hole? Applying Air Law to Manned Commercial Spaceflight – the Case Study of Curacao, 12 *Aviation & Space Journal* (2013), 23–31.

[47] E.g. Annex 7 to the Chicago Convention, *supra* n. 43, Aircraft Nationality and Registration Marks, 5th edition, July 2003, Definitions; Annex 8, Airworthiness of aircraft, 10th edition, April 2005, Definitions. See also Vissepó, *supra* n. 6, 185–9.

would fit the bill, and hence entail application of the regimes that the existence and operation of aircraft trigger.[48]

It is for those reasons that both the International Civil *Aviation* Organisation[49] and the European *Aviation* Safety Agency (EASA)[50] started considering the development, at a global and European-regional level respectively, of regulation as requisite for sub-orbital flights. ICAO, however, though acknowledging the applicability of the general definition of 'aircraft' to most of the vehicles currently being designed for private sub-orbital flight, has decided to desist (at least for the time being) from developing Standards and Recommended Practices (SARPs) for such sub-orbital vehicles or the operations conducted with them.[51]

EASA at first intended to develop an appropriately specific certification regime for the craft to engage in sub-orbital flights (at least to the extent that these qualify as 'aircraft') and, once that regime would be sufficiently developed, start addressing attendant safety issues such as those related to crew and passenger licensing and certification, but those efforts currently have been put on hold.[52]

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48 Strictly speaking, it is not even necessary for a vehicle to actually 'derive' such 'support' for any portion of the flight to qualify as an aircraft, as long as it would at least have (had) the option to do so. Note the various technologies used as indicated *supra*, § 12.1. See further e.g. Chatzipanagiotis, *supra* n. 8, 19–20; Gerhard, *supra* n. 8, 264–5, 268–9.

49 ICAO was established by way of Arts. 43–90, Chicago Convention, *supra* n. 43, to develop an international regime for the safety of aviation, essentially through the development of many SARPs by way of continuously updated Annexes (*cf.* Arts. 37 & 38). See also Van Fenema, *supra* n. 24, 396, 400–3.

50 EASA was established as a special agency of the European Union to develop EU-wide rules on aviation safety, in particular through certification of aircraft; *cf.* Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, No. 1592/2002/EC, of 15 July 2002; OJ L 240/1 (2002); later amended by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, No. 216/2008/EC, of 20 February 2008; OJ L 79/1 (2008).

51 See Working Paper on Concept of Suborbital Flights, ICAO Council, 175th Session, 30 May 2005, C-WP/12436. *Cf.* also in general Hughes & Rosenberg, *supra* n. 6, 76–7; Vissepó, *supra* n. 6, 179–85.

52 See e.g. J.B. Marciacq *et al.*, Towards Regulating Suborbital Flights: An Updated EASA Approach, Paper IAC-10-D2.9.5, 61st International Astronautical Congress, Prague, 2010, 2, not published in the *Proceedings of the International Institute of Space Law 2010* (2011); J.B. Marciacq *et al.*, Accommodating

12.3.2.3 Applicability and application of international air law

Generally, the applicability and/or application of international air law and, following, the sovereign jurisdiction of individual states over their national airspaces as well as over aircraft registered nationally,[53] national air law to sub-orbital spacecraft and space flights hinges on those two concepts of airspace and aircraft. Thus, the application of the international contractual liability regimes of air law, effectively requiring states parties to the respective conventions to establish or alternatively harmonize national law requiring aircraft operators to compensate damage caused to passengers and cargo on board aircraft in the course of transportation by such aircraft (or during embarkation or disembarkation) in accordance with whatever terms the relevant treaty regime prescribes, is made contingent upon transportation of passengers on board aircraft.[54]

The same essentially applies to third-party liability: as far as regulated on the international level, the 1952 Rome Convention[55] as later amended by the 1978 Montreal Protocol[56] apply to damage caused (on the ground) by aircraft. As a 2009 Convention[57] has not yet entered into force and the number of states parties to the Rome Convention and the Montreal

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Sub-Orbital Flights into the EASA Regulatory System, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2010), 187–212; also Gerhard, *supra* n. 8, 269–79.

53 *Cf.* Arts. 17–21, Chicago Convention, *supra* n. 43.

54 These regimes range from the Warsaw Convention (Convention for the Unification of Certain Rules Relating to International Transportation by Air, Warsaw, done 12 October 1929, entered into force 13 February 1933; 137 LNTS 11; USTS 876; UKTS 1933 No. 11) to the Montreal Convention (Convention for the Unification of Certain Rules for International Carriage by Air, Montreal, done 28 May 1999, entered into force 4 November 2003; 2242 UNTS 350; ICAO Doc. 9740; 48 *Zeitschrift für Luft- und Weltraumrecht* (1999), at 326); see e.g. Art. 17, Warsaw Convention; Art. 17(1), Montreal Convention. *Cf.* further e.g. Hobe & Cloppenburg, *supra* n. 22, 378–80; Chatzipanagiotis, *supra* n. 8, 86–95.

55 Rome Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (hereafter Rome Convention), Rome, done 7 October 1952, entered into force 4 February 1958; 310 UNTS 181; ATS 1959 No. 1; ICAO Doc. 7364.

56 Protocol to Amend the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface Signed at Rome on 7 October 1952 (hereafter Montreal Protocol), Montreal, done 23 September 1978, entered into force 25 July 2002; ICAO Doc. 9257.

57 Convention on Compensation for Damage Caused by Aircraft to Third Parties, Montreal, done 2 May 2009; not yet entered into force; ICAO Doc. 9919.

Protocol is fairly limited, however, mostly national law would be applicable directly.[58]

The application of criminal air law even rests upon a combination of the applicability of the concepts of 'aircraft' and 'airspace'. The first treaty to address the issue was the 1963 Tokyo Convention, which provided that the state in whose airspace an aircraft registered with another state is flying is the primary state entitled to exercise its 'criminal jurisdiction over an offence committed on board' an aircraft – although the former state should not do so unless other criteria apply.[59] Additional treaties and protocols, such as the 1970 Hague Convention,[60] generally followed the same approach.

In other words, once and to the extent that the vehicles intended for use by private human spaceflight are considered aircraft and/or to the extent they use airspace (provided of course the various other requirements for application of the respective conventions were equally fulfilled) their respective regimes would also apply on board those private human spaceflight vehicles.[61]

Unfortunately, this as such neither provides in itself a clear-cut regime – in view of the various technologies being developed for sub-orbital flights and the uncertainties surrounding the geographical definitions of 'airspace' and 'outer space' respectively[62] – nor excludes the simultaneous applicability of space law, which consequently has to be analysed next from the same perspective.

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[58] *Cf.* also e.g. Chatzipanagiotis, *supra* n. 8, 141–7.

[59] Namely, if '(a) the offence has effect on the territory of such State [being overflown]; (b) the offence has been committed by or against a national or permanent resident of such State; (c) the offence is against the security of such State; (d) the offence consists of a breach of any rules or regulations relating to the flight or manoeuvre of aircraft in force in such State; [or] (e) the exercise of jurisdiction is necessary to ensure the observance of any obligation of such State under a multilateral international agreement'; Art. 4, in conjunction with Art. 1(2), Convention on Offences and Certain Other Acts Committed on Board Aircraft (hereafter Tokyo Convention), Tokyo, done 14 September 1963, entered into force 4 December 1969; 704 UNTS 219; 2 ILM 1042 (1963); ICAO Doc. 8364. See e.g. Abeyratne, *supra* n. 46, 190–3; Chatzipanagiotis, *supra* n. 8, 43–4.

[60] Convention for the Suppression of Unlawful Seizure of Aircraft (hereafter Hague Convention), The Hague, done 16 December 1970, entered into force 14 October 1971; 860 UNTS 105; TIAS 7192; 22 UST 1641; UKTS 1972 No. 29; Cmnd. 4577; ATS 1972 No. 16; 10 ILM 133 (1971); ICAO Doc. 8920.

[61] For the case study of Curacao from this perspective, see von der Dunk, *supra* n. 46, 24 ff.

[62] See *supra*, § 12.2.2, also § 2.3.1.3.

12.3.3 The Applicability of Space Law

12.3.3.1 The issue of 'outer space'

The applicability of space law along similar lines as air law hinges firstly upon the definition of 'outer space'. 'Outer space' has provisionally been defined as the area from a terrestrial perspective beyond 100 km above sea level following an analysis that an international customary legal rule seems to be emerging that such altitude would present the most sensible and logical boundary between the sovereign realm of airspaces and the global commons of outer space.[63]

For the current analysis, it may be added that indeed the prospective sub-orbital projects all refer to that same altitude as their 'aim', their main sales argument, and that the number is increasingly being referenced even in US documents addressing sub-orbital spaceflight licensing.[64] From that perspective there can be little doubt that under most analyses the sub-orbital flights envisaged by Virgin Galactic, XCOR/SXC and their likes would at least top out in the lowest area of 'outer space', and to that extent would trigger application of space law.

12.3.3.2 The issue of 'space objects'

The relevance of the definition of 'space objects' for private sub-orbital spaceflight is akin to, and actually mirroring, that of the definition of 'aircraft' as analysed above.

The original problem encountered here is that space law does not really define 'space object', other than by virtue of the partly circular '[t]he term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof'.[65] This 'definition' firstly makes clear that, for example, the WhiteKnight aircraft carrying SpaceShips would, as 'launch vehicles', also qualify as 'space objects' once the SpaceShips themselves so qualified – even though the WhiteKnights

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[63] See *supra*, § 2.3.1.3.

[64] See e.g. *Suborbital Reusable Launch Vehicles and Emerging Markets*, *supra* n. 6, 1, 4, 15–27; *2011 U.S. Commercial Space Transportation Developments and Concepts: Vehicles, Technologies, and Spaceports*, FAA, January 2011, www.faa.gov/about/office_org/headquarters_offices/ast/media/2011%20 Dev Con%20Report.pdf, last accessed 10 March 2014, 27–33; *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 24–9, 132, 137–8; also *supra*, § 12.2.2.

[65] See Art. I(d), Liability Convention, *supra* n. 38, and Art. I(b), Registration Convention *supra* n. 38.

would equally continue to qualify as aircraft under the Chicago Convention's definitions.[66]

Secondly, however, the reference to 'launch' does provide a further pointer as to what a 'space object' should be taken to refer to. General opinion now holds 'space object' to refer essentially to any man-made artefact 'launched' into outer space, which to start with then begs the question what the word 'launch' refers to.[67] The underlying assumption by and large used to be that a launch constituted a kind of vertical departure aiming at entering outer space while using rocket engines.

Any such assumption, however, has now been 'corrupted' firstly by air launches conducted, for example, by Pegasus.[68] In such cases, the spacecraft proper was released from underneath an aircraft in mid-air where the very first part of the trajectory essentially is a horizontal one – activities still legally defined as 'launches' at least for the purpose of, for example, the Liability Convention.[69]

More broadly, there is no single, generally accepted legal definition of 'launch'; the most sensible and comprehensive approach would be to rise above any technological variations and to simply consider any object (attempted to be) brought into outer space by that token 'launched'. Which of course brings the question back to what 'outer space' refers to – so that for the present purposes a 'space object' equates with any man-made artefact intended to be flown to an altitude of at least 100 km above sea level, which would then include all vehicles currently being developed for sub-orbital (space)flight.[70]

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[66] *Cf. supra*, § 12.3.2.2.

[67] *Cf.* also e.g. B. Cheng, *Studies in International Space Law* (1997), 324–6, esp. 464, 493–5; Hobe & Cloppenburg, *supra* n. 22, 381; as applied in particular to sub-orbital vehicles Chatzipanagiotis, *supra* n. 8, 20–7; Gerhard, *supra* n. 8, 282–3; Benkö & Plescher, *supra* n. 23.

[68] See e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 8; also http://en.wikipedia.org/wiki/Orbital_Sciences_Corporation, last accessed 2 January 2014.

[69] Pegasus as a US company operating from US territory also required licences under the Commercial Space Launch Act (now codified as 51 U.S.C. Chapter 509 – Commercial Space Launch Activities) for such activities; see www.faa.gov/data_research/commercial_space_data/launches/?type=license, last accessed 12 January 2014.

[70] See again *supra*, § 12.2.2 and § 2.3.1.3.

12.3.3.3 Applicability and application of international space law

Generally, the applicability and/or application of international space law and, to the extent fitting within that framework, national space law[71] to sub-orbital spacecraft and spaceflight hinges on those two concepts of 'outer space' and 'space object'. Applicability of the concept of 'outer space' in particular gives rise to the international responsibility of states for any activities in that realm as long as these can be qualified as 'national activities' of the state in question, consequently obliging them – at least if they are held to be the 'appropriate State' to do so – to undertake proper 'authorisation and continuing supervision' of such activities.[72]

Whilst these clauses refer to 'national activities *in outer space*',[73] it may be noted that also for national activities *below* the geographical threshold of outer space states remain internationally responsible, in particular with respect to those taking place within *national* airspaces, in accordance with the general public international law concept of 'state responsibility'.[74] From that perspective, crossing any boundary into outer space may not seem to be of much relevance with a view to regulating those flights. The main difference, however, which is of key importance in the context of private manned spaceflight in particular, is that under general state responsibility states are only directly and fully responsible for their *own* activities, whereas under space law responsibility they are equally responsible for non-governmental, read private activities.[75]

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[71] See on national space law in general *supra*, Chapter 3. A case for applying space law comprehensively to sub-orbital flights is made e.g. by B. Cheng, International Responsibility and Liability for Launch Activities, 20 *Air & Space Law* (1995), 299 ff.

[72] Art. VI, Outer Space Treaty, *supra* n. 37; see also *supra*, § 2.3.1.1.

[73] Art. VI, Outer Space Treaty, *supra* n. 37 (emphasis added). *Cf.* also the discussion on what constitutes 'outer space', *supra*, § 2.3.1.3.

[74] See e.g. Draft Articles on the Responsibility of States for Internationally Wrongful Acts, adopted in August 2001; Report of the ILC on the Work of its Fifty-third Session, UN Doc A/56/10(2001), p. 26 ff.; *cf.* also Art. 28, Chicago Convention, *supra* n. 43.

[75] Art. VI, Outer Space Treaty, *supra* n. 37, states in relevant part: 'States Parties to the Treaty shall bear international responsibility for national activities in outer space … whether such activities are carried on by governmental agencies *or by non-governmental entities*' (emphasis added). See for an extended analysis of this issue e.g. F.G. von der Dunk, Liability versus Responsibility in Space Law: Misconception or Misconstruction?', in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 363–71.

This constitutes one angle from which individual states have found it necessary to establish national space laws and regulations for cases where such national activities in outer space are undertaken by non-state actors, read essentially private commercial operators. In particular with respect to private human spaceflight, however, the space treaties did not provide much relevant detail. Therefore it was – and still is – largely up to such national law and regulation to address the specifics of this novel type of space activities.[76]

Applicability of the concept of 'space object' in turn most notably triggers application of international space law's regimes on liability and registration-*cum*-jurisdiction. The Liability Convention, addressing third-party liability, applies to damage caused by space objects, and holds liable for such damage the states qualifying as 'launching State(s)' under the applicable provisions.[77] As this liability also applies for non-governmental space objects causing damage (including sub-orbital vehicles), states have started to implement national legal regimes addressing derogation from such liabilities (in whole or in part) and related insurance requirements. As international space law, however, again has addressed liability in general terms only – certainly from the perspective of private sub-orbital manned spaceflight – most national laws remain fairly general in their elaboration.[78]

Also the Registration Convention principally focuses on 'space objects' as the object of the relevant registration obligations.[79] Formally, the Convention even limits itself to space objects 'launched into Earth orbit or beyond',[80] which is assumed by many to *ipso facto* exclude sub-orbital spacecraft. However, upon closer view it appears that this formal limitation was mainly intended to exclude one-off sounding rocket launches and deep space probes, (semi-)failed launches and launches of intercontinental ballistic missiles, and should not be seen as making it principally impossible to register sub-orbital vehicles under the Registration Convention's terms.[81]

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[76] See for a more detailed analysis e.g. von der Dunk, *supra* n. 8, 200–2; *cf.* also *supra*, §§ 3.1, 3.2. For the US case, see also *infra*, § 12.3.4.

[77] See Arts. I(c), II–V, Liability Convention, *supra* n. 38.

[78] *Cf.* in general also *supra*, §§ 3.2.3, 3.3. For the US case, see also *infra*, §§ 12.3.4.2, 12.3.4.3.

[79] *Cf.* Arts. II–IV, Registration Convention, *supra* n. 38.

[80] Arts. II(1), V, Registration Convention, *supra* n. 38.

[81] See the detailed analysis in von der Dunk, *supra* n. 27, 278 ff., esp. 334–5, 339–40.

Especially once the next paradigmatic step is taken of moving from A-to-A sub-orbital tourist excursions to A-to-B space-transiting traffic (which may certainly also come to include traffic to and from the space station, as NASA is currently developing in cooperation with the private sector[82]), an international space traffic management system would no longer be a luxury but a necessity.[83]

At that point, the Registration Convention would provide an appropriate first starting point for an embryonic international space traffic management system handling all objects reaching outer space, which could later be transformed into a separate and more tailor-made regime. The equation of its key terminology 'into Earth orbit or beyond' with the more generic term 'outer space' and the convergence of opinion on a 100 km altitude as the lower boundary of outer space would allow for an easy and coherent elaboration of the first vestiges of such a system.[84] Such elaboration, moreover, could generally follow the US approach to licensing private manned commercial sub-orbital spaceflight.[85]

12.3.4 The US Regime Regarding Private Sub-Orbital Manned Spaceflight

12.3.4.1 The role of US national legislation on private sub-orbital manned spaceflight

As discussed, under international law not even the very fundamental question of the extent to which private sub-orbital manned spaceflight is, should be or could be regulated by air law, space law, both, or neither, could be solved satisfactorily, partly because of the novelty of these developments vis-à-vis the air law and space law treaties that could or would possibly apply or be made to apply.

This means that the situation in the United States, not only the major country involved in the various advanced projects to start sub-orbital flights on a private basis, but also the only one so far having drafted

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82 See further *infra*, § 12.4.3.1.

83 See for an early and broad perspective on such a space traffic management system *Cosmic Study on Space Traffic Management*, IAA, 2006; also e.g. Vissepó, *supra* n. 6, 191–3.

84 Following that approach, it could also relatively easily overcome the unspoken equation of a space object with its launch for registration purposes, as the craft developed for private manned commercial sub-orbital spaceflight will be intended for multiple and frequent reuse. *Cf.* von der Dunk, *supra* n. 27, 323–4, 335–6.

85 As discussed in detail in von der Dunk, *supra* n. 27, 334 ff., esp. 337–9.

specific national legislation on the issue, is of crucial importance. To the extent some other states are at least discussing or envisaging the development of similarly dedicated national legislation, the US example would likely serve as the first and main precedent to look to for further guidance.[86]

From the perspective of the above discussion on air law versus space law, it is therefore relevant as well that the United States has opted basically to approach sub-orbital manned spaceflight as, indeed, a version of *space*flight to be regulated under existing *launch* legislation and regulation, even if by way of adaptation, rather than a version of aviation to be regulated under air transport legislation and regulation.

12.3.4.2 The 1984/1988 Commercial Space Launch Act

When in the 1980s the US government decided to stimulate private involvement in the launch service sector – exclusively targeting unmanned launches at the time, as private *manned* spaceflight did not yet constitute a viable proposition – it enunciated the Commercial Space Launch Act in 1984,[87] fine-tuning in particular the liability regime by way of Amendments in 1988.[88] With a view to the later regulatory developments addressing private manned spaceflight, the key elements of the resulting regime could be summarized under seven headings.

Firstly, the Commercial Space Launch Act provided for an obligation for any private company with US nationality or launching from US territory[89] to obtain a licence for each intended individual launch of an object into outer space from the licensing agency, which was the Office of the Associate Administrator for Commercial Space Transportation (now AST) within the FAA.[90] Also, it provided for a similar obligation

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[86] See also F.G. von der Dunk, Mixing US and Dutch Approaches: Towards Curacao's Legislation on Private Commercial Spaceflight, 62 *Zeitschrift für Luft- und Weltraumrecht* (2013), 740–56.

[87] Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law – Basic Legal Documents*, E.III.3. See further e.g. Hughes & Rosenberg, *supra* n. 6, 11–3; also *supra*, § 3.3.1.1.

[88] Commercial Space Launch Act Amendments, Public Law 100-657, 100th Congress, H.R. 4399, 15 November 1988; 49 U.S.C. App. 2615; 102 Stat. 3900; *Space Law – Basic Legal Documents*, E.III.3, 13 ff. See further e.g. Hughes & Rosenberg, *supra* n. 6, 14–8, 56–7.

[89] See Sec. 50904(a), 51 U.S.C.

[90] *Cf.* 14 C.F.R. §§ 401.1, 401.3.

for any private company intending to operate a launch site on US territory.[91]

Secondly, a number of conditions were imposed before a licence would be granted, related to such general public interests as national security and abidance by international obligations incumbent upon the United States.[92] Those conditions were phrased in general and broad terms; the details could and would either be provided in implementing regulations[93] or as per individual licences in view of the idiosyncrasies often accompanying specific prospective launch activities.

Thirdly, amongst the licence requirements figured prominently an obligation to insure, up to an amount to be calculated using a rather complex process, against third-party liability claims for damage caused by the space objects to be launched, and to make sure *inter alia* that, in the event that the US government would be obliged to pay international compensation under the Liability Convention, it would be reimbursed up to that amount.[94] Alternatively, licensees could show 'financial responsibility' up to the same amount for compliance here.[95]

This clause not only operated in the context of an international liability claim addressed against the United States under the Liability Convention,

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[91] See Sec. 50904(a), 51 U.S.C. Further in great detail Mineiro, *supra* n. 8, 759–805; also e.g. P. Vorwig, Regulation of Private Launch Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 415–16.

[92] See Secs. 50905(a), 51 U.S.C.

[93] In the US case this elaboration was realized by way of 14 C.F.R. Chapter III.

[94] The process called for the calculation of the 'Maximum Probable Loss' (MPL) potentially resulting from an accident of the space object (at least during its first phase), which would determine the reimbursable amount unless that MPL was either higher than US$ 500 million or higher than 'the maximum liability insurance available on the world market at reasonable cost'; in which cases the lower of the two latter amounts will constitute the reimbursable amount; Sec. 50914(a), (c), Commercial Space Launch Act as amended in 1988, *supra*, n. 88. In actual fact, the highest amount ever quoted as a cap in a licence concerned US$ 261 million for Atlas-V and Delta-IV launches; *cf.* FAA-OCST, Financial Responsibility Requirements as Determined by the Maximum Probable Loss (MPL) Process as of January 9, 2012, slide 3, at www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/mpl_values/media/MPL_Values_2012.pdf, last accessed 18 April 2014. See further e.g. A. Kerrest de Rozavel & F.G. von der Dunk, Liability and Insurance in the Context of National Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 141–50; Vorwig, *supra* n. 91, 411–3; Hughes & Rosenberg, *supra* n. 6, 17–8.

[95] Sec. 50914(a) (3), (4), 51 U.S.C.

but also in the context of a national liability claim in US courts, where it effectively worked the other way around: the US government promises in principle to reimburse the licensee for any third-party claims above the maximum amount calculated as indicated, albeit only up to a maximum of US$ 1.5 billion *above* the amount the licensee was required to compensate.[96]

Fourthly, as to inter-party liability to start with a similar licensing requirement pertained to damage which might be inflicted on US government property in the course of such activities, which in particular looked at the use of federal launch sites by private launch operators.[97] Whilst the first launch licence was granted by the FAA in 1989 and as of now well over 200 licences have followed,[98] the first launch site licence was granted in 1996 with the current tally standing at eight[99] – so far the overwhelming majority of private launches has indeed taken place at US government-owned launch sites.

Fifthly, with regard to remaining scenarios for inter-party liability, the Commercial Space Launch Act imposed an obligatory cross-waiver of

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[96] *Cf.* Sec. 50915(a) (1), 51 U.S.C. This amount is to be adjusted for inflation as of 1 January 1989-dollars, meaning the current value would be in the range of US$ 3.0 billion. Of course, this 'promise' of 'limited' US government contributions to a liability claim (as the clause states: 'To the extent provided in advance in an appropriation law or to the extent additional legislative authority is enacted providing for paying claims in a compensation plan') does not have any effect under the Liability Convention, where state liability applies at an unlimited level; *cf.* Arts. I(c), II–V, XII, Liability Convention, *supra*, n. 38. See further S. Hobe, Legal Aspects of Space Tourism, 86 *Nebraska Law Review* (2007), 453–4; Vorwig, *supra* n. 91, 412–3; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 492–3.

[97] See Sec. 50914(a) (1) (B), (3) (A) (ii), 51 U.S.C. In this case, the same formula was followed as referred to *supra*, n. 94; only the maximum cap on liability in this context was established at US$ 100 million. In actual fact, this amount was quoted as a cap in a licence for various Atlas-V launches; *cf.* FAA-OCST, Financial Responsibility Requirements as Determined by the Maximum Probable Loss (MPL) Process as of January 9, 2012, slide 3, at www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/mpl_values/media/MPL_Values_2012.pdf, last accessed 18 April 2014. *Cf.* also e.g. Mineiro, *supra* n. 8, 760 ff., incl. 796–7.

[98] See for a full list and further details www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/licensed_launches/historical_launch/, last accessed 14 January 2014.

[99] See *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 38. Also e.g. Brannen, *supra* n. 4, 657–8; on the spaceports available for private manned launches, Mineiro, *supra* n. 8, 761–5, 792–3.

liability between the launch service provider and any other contractual party (as a form of contractual (non-)liability):

> A launch or reentry license issued or transferred under this chapter shall contain a provision requiring the licensee or transferee to make a reciprocal waiver of claims with its contractors, subcontractors, and customers, and contractors and subcontractors of the customers, involved in launch services or reentry services under which each party to the waiver agrees to be responsible for property damage or loss it sustains, or for personal injury to, death of, or property damage or loss sustained by its own employees resulting from an activity carried out under the applicable license.[100]

A similar waiver was to be arranged for as between the licensee and any executive agency of the US government and its contractors.[101]

Sixthly, there was no reference in the Act to mandatory requirements regarding the certification of the hardware involved or the licensing of operating personnel involved in the launch activities (although this could, in theory at least, be inserted in an individual licence). This clearly represents a different approach from international aviation, where an extended regime calls for mandatory certificates of airworthiness (and licences of personnel).[102]

Finally, in cases where other states are fundamentally involved in a particular launch activity outside US territory to be licensed, the application of the US licensing regime and attendant requirements may depend on an agreement between the United States and the other state concerned, *de facto* allowing the former to avoid 'double licensing' to the extent considered unnecessary or unwanted from the US perspective.[103] The extent to which the licensing authorities would allow for abstention from the exercise of US jurisdiction to impose a licence obligation may be subject to rather severe constraints, in view of, for example, the

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[100] Sec. 50914(b)(1), 51 U.S.C. See also e.g. Hughes & Rosenberg, *supra* n. 6, 61–4; Mineiro, *supra* n. 8, 794–6.

[101] See Sec. 50914(b)(2), 51 U.S.C.

[102] See Arts. 31, 32, Chicago Convention, *supra* n. 43, as further elaborated in Annexes 6, Operations of aircraft, and 8, Airworthiness of aircraft. *Cf.* further e.g. specifically on Europe, Gerhard, *supra* n. 8, 272–7.

[103] Sec. 50904(a)(3), 51 U.S.C., applies US jurisdiction *in the absence of* an agreement to the contrary with another state, whereas vice versa Sec. 50904(a)(4) *requires* a relevant agreement to exist for the US regime to apply regarding relevant activities outside any state's territory.

extensive US export controls regarding security-sensitive dual-use technology,[104] but at least the possibility is there in principle.

12.3.4.3 The adaptation as per the 2004 Commercial Space Launch Amendments Act

A first step towards adapting the Commercial Space Launch Act to the possibility of private manned spaceflight operations was taken in 1998, when the Commercial Space Act[105] purportedly was 'amended … to address liability and government indemnification concerns and to address licensing authority for RLVs [reusable launch vehicles]', thus allowing the FAA to start licensing re-entry operations in addition to launches.[106] Then, when the 2004 deadline for the X-Prize contest came close, and with it the chance that somebody would actually (try to) win it, US legislators kick-started a process of regulation for allowing such flights on an appropriate basis, even though they were clear that legislation and regulation addressing this impending new activity should remain confined to a minimum level required to protect key public interests so as not to stifle this about-to-be-born industry.[107]

This overarching approach to private manned spaceflight for the FAA also translated into limiting oversight with respect to the operator, with a temporary ban on safety regulation and certification of the vehicle – so far 'the operator holds the "ticket" not the vehicle'.[108] Generally, 'regulatory standards governing human space flight must evolve as the

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[104] As per respectively the Arms Export Control Act of 1976; 22 U.S.C. 2751; and the implementing International Traffic in Arms Regulations (ITARs); and the Export Administration Act of 1979; Public Law 96-72, 96th Congress; 50 U.S.C. 2401; 93 Stat. 503; and the implementing Export Administration Regulations (EARs). See further *supra*, § 6.6.3, § 7.5.1.4, § 7.5.2.3.

[105] Commercial Space Act, 27 January 1998, Public Law 105-303, 105th Congress, H.R. 1702; 51 U.S.C. 50101; 112 Stat. 2843 (1998). The Act was enunciated for addressing several and rather varied issues of space commercialization and the resulting involvement of private entities in space operations; *cf.* e.g. P.S. Dempsey, Overview of the United States Space Policy and Law, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 389–90.

[106] Hughes & Rosenberg, *supra* n. 6, 4, see also 19–24, incl. references to FAA regulations drafted in consequence (14 C.F.R. § 401.5 (2000)).

[107] *Cf.* Sec. 50901(b), 51 U.S.C.; see extensively Hughes & Rosenberg, *supra* n. 6, 4–75; also M.J. Kleiman, J.K. Lamie & M.V. Carminati, *The Laws of Spaceflight* (2012), 83–4, 107; von der Dunk, *supra* n. 3, 417–9; Gerhard, *supra* n. 8, 295–6; Hobe, *supra* n. 96, 445; Brannen, *supra* n. 4, 651; Bromberg, *supra* n. 16, 659–62; *cf.* also Vissepó, *supra* n. 6, 214–5.

[108] Hughes & Rosenberg, *supra* n. 6, 71; see also Sec. 50905(c)(2) & (3), 51 U.S.C. At the time of writing, this temporary ban has been extended to 1

industry matures so that regulations neither stifle technology development nor expose crew or space flight participants to avoidable risks as the public comes to expect greater safety for crew and space flight participants from the industry'.[109] Only once a considerable number of flights had been undertaken could it be expected that relevant failure modes would become visible, and hence that it would make sense to start addressing them by way of regulation.

With the victory of Scaled Composites in the X-Prize contest[110] and the ensuing establishment of Virgin Galactic this process quickly gave rise to the conclusion that the most appropriate way to handle such flights on a more consolidated basis in the future would be to adapt the regime of the Commercial Space Launch Act, which had regulated launch activities precisely for similar reasons of public interests (notably safety-, liability- and national security-related) to the specifics of launches with humans on board, rather than develop a separate regime from scratch or adapt aviation regulations.[111] The result was the 2004 Commercial Space Launch Amendments Act[112] amending the 1984/1988 Act to achieve such goals, followed by further legal measures as part of the Code of Federal Regulations.[113]

Most fundamentally, the licensing obligation was now also applied to re-entry, whereas formerly it only applied to launches.[114] Interestingly this allowed the FAA to *de facto* regulate the whole sub-orbital trajectory at least as far as the near-term projects are concerned, and as far as public

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October 2015; see Sec. 50905(c)(3) as amended by Sec. 827, Public Law 112-95; 126 Stat. 133.

109 Sec. 50901(a)(15), 51 U.S.C. *Cf.* further e.g. Hughes & Rosenberg, *supra* n. 6, 44–8; Perlman, *supra* n. 15, 936.

110 Note that the FAA proactively and *de jure* prematurely licensed the first-ever private flight into the edge of outer space of Scaled Composites' SpaceShipOne on 1 April 2004 using the Commercial Space Launch Act as amended in 1988, *supra* n. 88, although an experimental airworthiness certificate under 14 C.F.R. parts 21 and 91 was also required; see Hughes & Rosenberg, *supra* n. 6, 37–8, also 66–7.

111 See e.g. Hughes & Rosenberg, *supra* n. 6, 21 ff.; Van Fenema, *supra* n. 24, 399–400.

112 Commercial Space Launch Amendments Act, Public Law 108-492, 108th Congress, 23 December 2004, 49 U.S.C.; 118 Stat. 3974.

113 To wit 14 C.F.R. Chapter III, Commercial Space Transportation, Federal Aviation Administration, Department of Transportation.

114 *Cf.* the definitions of Sec. 50902, 51 U.S.C., notably *sub* (4) & (13), also Sec. 50904(a). See furthermore Secs. 50904, 50905, 51 U.S.C., for the general licensing requirements. Further e.g. Hughes & Rosenberg, *supra* n. 6, 21 ff.

safety is directly at issue. Notoriously, the FAA has not been given explicit 'on-orbit jurisdiction' by the US Congress, and more specifically was authorized only to license launch and re-entry[115] – but as long as sub-orbital flights do not provide transportation services across major sections of the globe, the launch more or less seamlessly transitions into the re-entry, so that effectively the comprehensive flight is thus regulated.

Once, by contrast, A-to-B sub-orbital transportation became a feasible reality, however, it would become doubtful whether the more or less horizontal middle part of the trajectory, between launch proper and re-entry proper, would still fall under the FAA's competence to license. This would be all the more relevant in view of the complexity resulting from the unpredictability of human behaviour in longer flights and the lack of an automatic safety component to such behaviour, which would bring in the public safety-focused jurisdiction of the FAA: the 'range of in-space activity' of the spacecraft would not anymore be 'pre-ordained' as humans 'make mistakes, commit violence, develop afflictions, and so on', and may well 'behave in ways that regulators have not contemplated beforehand'.[116]

Another major addition to the Commercial Space Launch Act as per the amendments of 2004 was the inclusion of 'experimental permits' as

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[115] *Cf.* Sec. 50904, 51 U.S.C.; e.g. Perlman, *supra* n. 15, 930, 935–7; also Commercial Space Transportation – Industry Trends, Government Challenges, and International Competitiveness Issues, GAO-12-836T, 19. Strictly speaking, Sec. 50904, 51 U.S.C., only refers to 'launch' and 're-entry', without specifying whether this encompasses (parts of) the flight in outer space, which of course also means that in the licensing process the FAA will keep an eye out also for what might happen in the outer space portions of any space object's flight, if only for international third-party liability reasons, and insert as possible relevant conditions, for example in a safety approval, if at issue. Furthermore, firstly Sec. 50902(4), 51 U.S.C., defines launch with reference to placing or trying to place spacecraft, manned or unmanned, into outer space, *suggesting* that the in-space part of the operations should no longer be defined as part of the launch – but since normal payload separation *does* take place in outer space, one need not simply assume that there is *no* FAA jurisdiction in outer space whatsoever. Secondly, it may be noted that 14 C.F.R., § 440.11, requires insurance obligations under a launch licence to cover the period up to 30 days from payload separation or alternatively from the launch properly speaking, apparently extending FAA authority over the licensed operations to that extent into outer space also. The underlying rationale for these limitations largely seems to refer back to a hesitation on the part of the United States to exert extra-territorial jurisdiction in the global commons of outer space; *cf.* Perlman, *supra* n. 15, 942 ff. See also further *infra*, § 12.4.4.1.

[116] Perlman, *supra* n. 15, 940, 941.

alternatives to the licences properly speaking: the former would allow for launches or re-entries 'solely for – (1) research and development to test new design concepts, new equipment, or new operating techniques; (2) showing compliance with requirements as part of the process for obtaining a license under this chapter; or (3) crew training prior to obtaining a license'.[117]

Still, the existing US regime had now become applicable to private sub-orbital manned spaceflight, with a few more specifics added to take account both of the additional issues flowing from the presence of humans on board spacecraft launched and the need for the FAA to stimulate, not stifle, this infant industry.[118] Also the existing third-party and inter-party liability regimes summarized above were now applied to sub-orbital manned launches to be licensed.[119]

Of course, as the pre-existing versions of the Commercial Space Launch Act addressed satellite launches, there had been no need to regulate any passenger liability – but the 2004 Amendments did not really fill that gap either. Notably, they maintained the arrangement that on inter-party liability vis-à-vis contractual parties other than the US government, a reciprocal cross-waiver of liability was imposed, which did *not* extend to spaceflight participants, although an argument could well be made that they should, as such, qualify as 'contractors' or 'customers'.[120] Actually, an earlier version of the proposed amendments did include spaceflight participants in this waiver,[121] but this provision did not make it into the final legislation.

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[117] Sec. 50906(d), 51 U.S.C.; see also Hughes & Rosenberg, *supra* n. 6, 33–4, 60–1, 65–7; on the absence of third-party liability indemnification for flights under experimental permits, 57–8.

[118] *Cf.* also Sec. 50901(7), 51 U.S.C.

[119] Thus, for the 2004 Scaled Composites launches a cap of US$ 3.1 million was quoted for third-party liability in the licence, whereas the cap for inter-party liability vis-à-vis the US government was zero as the launches did not take place from US government facilities; see FAA-OCST, Financial Responsibility Requirements as Determined by the Maximum Probable Loss (MPL) Process as of January 9, 2012, slide 7, at www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/mpl_values/media/MPL_Values_2012.pdf, last accessed 18 April 2014.

[120] See Sec. 50914(b), 51 U.S.C.; also discussion in Hobe, *supra* n. 96, 451; R. Sadowski, Insuring Commercial Space Travel, 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 85–6.

[121] See H.R. 3752, Sec. 2 (2004); *cf.* further Hughes & Rosenberg, *supra* n. 6, 57, 59, 61–4.

Instead of addressing passenger liability in a straightforward fashion, by way of the most targeted adaptation of the existing regime to manned sub-orbital flight the 2004 Amendments required an operator to obtain 'informed consent' of the passenger before he would be licensed to fly him or her:

> The holder of a license or a permit under this chapter may launch or reenter a space flight participant only if … [he] has informed the space flight participant in writing about the risks of the launch and reentry, including the safety record of the launch or reentry vehicle type … [and] the holder of the license or permit has informed any space flight participant in writing, prior to receiving any compensation from that space flight participant … that the United States Government has not certified the launch vehicle as safe for carrying crew or space flight participants.[122]

'Informed consent' in that sense replaces the possibility of certification of craft and/or crew as a piece of safety regulation common to aviation. As a matter of fact, the Commercial Space Launch Act now specifically prohibited the proposal of regulations 'restricting or prohibiting design features or operating practices', unless a serious accident or incident has occurred, until December 2012,[123] a prohibition more recently extended to – so far – October 2015.[124]

This requirement of 'informed consent', a concept borrowed from the high-adventure sports and tourism sector, and notably what the safety records should at a minimum provide for in order to ensure that the 'consent' would indeed be 'informed', was further elaborated by the Code of Federal Regulations.[125] In addition, an 'informal consent-light' was required for the licensed operator to launch or re-enter crew in its craft; the information requirement here was limited to the lack of US government safety certification of the vehicle.[126]

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[122] Sec. 50905(b)(5), 51 U.S.C.

[123] *Cf.* Sec. 50905(c)(2)(C) & (3), 51 U.S.C.

[124] See Sec. 827, FAA Modernization and Reform Act of 2012, Public Law 112-95, 112th Congress, 14 February 2012, amending Sec. 50905(c)(3), 51 U.S.C.

[125] See § 460.45, 14 C.F.R. Chapter III. See for a thorough analysis and critique of the concept of 'informed consent' in this context T. Knutson, What is 'Informed Consent' for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?, 33 *Journal of Space Law* (2007), 105 ff. See also Hughes & Rosenberg, *supra* n. 6, 35–7, 51–6; R.A. Yates, State Law Limitations on the Liability of Spaceflight Operators, 9-1 *The SciTech Lawyer* (summer 2012), 15; Lyall & Larsen, *supra* n. 96, 493–4; Hobe, *supra* n. 96, 445–6.

[126] *Cf.* Sec. 50905(b)(4), 51 U.S.C.

Whilst these clauses do not make any reference to a waiver of liability towards the passenger in case the lack of safety certification translated into an actual accident, they were perceived by many as allowing operators at least a strong defensive argument against any claims by passengers or their descendants for compensation of damage sustained on such flights.[127] Principally, however, it left courts or tribunals seized with a claim for damage the discretion to honour such defence or alternatively ignore it partially or comprehensively.[128] It certainly did not equate with the rather straightforward passenger liability which airlines had to accept under national laws, harmonized as relevant by international aviation treaties.[129]

12.3.4.4 The individual US state statutes

Following the lack of legal certainty resulting from the federal 'informed consent'-based regulation, the various companies gearing up to enter the business still felt uncomfortable about the possibilities for being sued successfully by passengers or their descendants. Several individual US states then took advantage of the resulting opportunity to make themselves more attractive as places of business by precisely filling that gap, in creating statutes linking explicit waivers of liability to detailed 'informed consent' provisions.[130]

This concerned, in chronological order: Virginia with its Space Flight Liability and Immunity Act in 2007,[131] Florida with its Space Activities

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[127] *Cf.* e.g. Chatzipanagiotis, *supra* n. 8, 106 ff., esp. 109–12; Hughes & Rosenberg, *supra* n. 6, 63–4.

[128] *Cf.* also Yates, *supra* n. 125, 15; Hobe, *supra* n. 96, 451.

[129] The Montreal Convention, *supra* n. 54, for example, provided for strict liability up to 100,000 SDR per passenger per accident, with a second tier of in principle unlimited liability applicable unless the carrier could fully exculpate himself. See Art. 21, Montreal Convention; further e.g. von der Dunk, *supra* n. 3, 430–1, 434–5.

[130] *Cf.* also in detail F.G. von der Dunk, Federal *versus* State: Private Commercial Spaceflight Operator Immunity Regulation in the United States, in *Proceedings of the International Institute of Space Law 2013* (2014), 517–28; further Kleiman, Lamie & Carminati, *supra* n. 107, 107–8; Chatzipanagiotis, *supra* n. 8, 114–5; A. Greene Apking, A Step in the Right Direction: Colorado's First Space Legislation, 91 *Denver University Law Review Online* (2013), 201–6; Mineiro, *supra* n. 8, 797–8; Sadowski, *supra* n. 120, 87–8.

[131] Space Flight Liability and Immunity Act; Art. 24, Code of Virginia; Va. Code Ann. §§ 8.01-227.8 to 8.01-227.10 (2007), http://leg1.state.va.us/cgi-bin/legp504.exe?071+ful+CHAP0893+pdf, last accessed 18 April 2014.

Statute in 2009,[132] New Mexico with its Space Flight Informed Consent Act in 2010,[133] Texas with its Space Activities Statute in 2011,[134] Colorado with its Act Concerning Limited Liability for Spaceflight Activities signed into law in April 2012,[135] and most recently so far California with its Spaceflight Liability and Immunity Act of September 2012, part of the California Civil Code.[136]

All six statutes essentially translated the federal 'informed consent' requirement into (slightly differently phrased) warning statements dictated by the statutes themselves, to be signed by the spaceflight participant, which then automatically resulted in immunity from liability of the operator vis-à-vis the spaceflight participant.[137]

Exceptions to this immunity from liability are provided by each of the statutes, but here a first major measure of divergence may be noted. Whilst in Virginia and Texas only (1) gross negligence, wilful or wanton disregard, or alternatively (2) intentional injury disallow the operator to claim immunity,[138] in the other four states an additional, third carve-out

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[132] Space Activities Statute; Chapter 331, Sec. 501, Florida Statutes; Fla. Stat. Ann. Sec. 331-501 (2009), www.flsenate.gov/Laws/Statutes/2011/331.501, last accessed 18 April 2014.

[133] Space Flight Informed Consent Act; S.B. 9, 49th Leg. Reg. Sess. (N.M. 2010), https://rescommunis.wordpress.com/2010/03/04/new-mexico-space-flight-informed-consent-act/, last accessed 18 April 2014.

[134] Space Activities Statute; S.B. 115, 82d Leg. (Tex. 2011), Tex. Civ. Prac. & Rem. Code, Title 4, Chapter 100A, www.statutes.legis.state.tx.us/Docs/CP/htm/CP.100A.htm, last accessed 18 April 2014.

[135] Act Concerning Limited Liability for Spaceflight Activities; Colo. Rev. Stat. Ann. Sec. 41-6-101, www.state.co.us/gov_dir/leg_dir/olls/sl2012a/sl_126.htm, last accessed 18 April 2014.

[136] Spaceflight Liability and Immunity Act; AB 2243, Cal. Civ. Code, Div. 3, Pt. 4, Title 7, Chapter 5, Art. 5, www.leginfo.ca.gov/cgi-bin/displaycode?section=civ&group=02001-03000&file=2210-2212, last accessed 18 April 2014; see also www.commercialspaceflight.org/2012/09/california-governor-signs-the-spaceflight-liability-and-immunity-act/, last accessed 18 April 2014.

[137] See respectively § 8.01-227.10(B), Space Flight Liability and Immunity Act (Va.), *supra* n. 131; Secs. 331.501(3)(b), 331.501(2)(a), Space Activities Statute (Fl.), *supra* n. 132; Secs. 4(A), 3(A), Space Flight Informed Consent Act (N.M.), *supra* n. 133; Secs. 100A.003(a), 100A.002(a), Space Activities Statute (Tx.), *supra* n. 134; Secs. 41-6-101(3)(b), 41-6-101(2)(a), Act Concerning Limited Liability for Spaceflight Activities (Co.), *supra* n. 135; Secs. 2211(a), 2212(a), Spaceflight and Liability Immunity Act (Ca.), *supra* n. 136.

[138] *Cf.* § 8.01-227.9(B), *cf.* also (A), Space Flight Liability and Immunity Act (Va.), *supra* n. 131; Sec. 100A.002(b), Space Activities Statute (Tx.), *supra* n. 134.

is provided for, phrased in the Florida example as cases where the operator '[h]as actual knowledge or reasonably should have known of a dangerous condition on the land or in the facilities or equipment used in the spaceflight activities and the danger proximately causes injury, damage, or death to the participant'.[139] Such a carve-out, however, might prove rather tricky in real-life court disputes:

> The intended scope of this additional exception can only be made clear when viewed in the overall context of the statutory schemes and the pre-existing statutory and judicial precedent. *Of course, all spaceflight operators are aware of dangers in the use of their facilities and equipment*: it is the reason warnings must be given to the spaceflight participant and an informed consent secured. If that knowledge alone could nullify the limitations on liability, then the entire statutory scheme would be rendered meaningless.[140]

A further key element of the statutes concerns the scope *ratione personae* of the immunity from liability thus offered. For example in the case of Virginia, whilst the space flight entity is defined in the first instance as the operator licensed by the FAA as per the Commercial Space Launch Act,[141] it is then added that it 'shall also include any manufacturer or supplier of components, services, or vehicles that have been reviewed by the United States Federal Aviation Administration as part of issuing such a license, permit, or authorization'[142] – read: essentially the contractors and subcontractors of the flight operator itself.

Florida and Colorado follow the same approach as Virginia,[143] but Texas extends the scope of the immunity to even include any 'employee, officer, director, owner, stockholder, member, manager, or partner of the entity',[144] whilst California by contrast does *not* extend the scope of the

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[139] Sec. 331.501(2)(b)(2), Space Activities Statute (Fl.), *supra* n. 132; *cf.* also Sec. 3(B), Space Flight Informed Consent Act (N.M.), *supra* n. 133; Sec. 41-6-101(2)(b), Act Concerning Limited Liability for Spaceflight Activities (Co.), *supra* n. 135; Sec. 2212(c), Spaceflight and Liability Immunity Act (Ca.), *supra* n. 136.

[140] Yates, *supra* n. 125, 15 (emphasis added); the author proceeds to briefly analyse such pre-existing statutory and judicial precedent.

[141] Notably by Secs. 50905, 50906, 51 U.S.C.

[142] § 8.01-227.8, Space Flight Liability and Immunity Act, *supra* n. 131.

[143] See respectively Sec. 331.501(1)(c), Space Activities Statute (Fl.), *supra* n. 133; Sec. 41-6-101(1)(b), Act Concerning Limited Liability for Spaceflight Activities (Co.), *supra* n. 135.

[144] Sec. 100A.001(4)(B), Space Activities Statute, *supra* n. 134.

immunity to contractors and subcontractors, except if responsible for the payload.[145]

Originally, New Mexico had adopted the narrowest approach here, *not* including any contractors and subcontractors in the scope of the waiver.[146] Following the realization that this would actually place the state at a relative disadvantage vis-à-vis other states competing for the business of commercial spaceflight, however, a new Bill was introduced in the New Mexico Senate.[147] This Bill proposes to add to the definition of 'space flight entity', as the legal person entitled to the waiver, the by now familiar phrase 'a manufacturer or supplier of components, services or vehicles used by the entity that has been reviewed by the United States federal aviation administration as part of issuing such a license, permit or authorization'.[148]

Further to the above-mentioned differences in formulations, the importance of which will perhaps be difficult to gauge until actual disputes arise and will have to be solved by courts seized of such disputes, differences in other areas could also present cause for concern from the perspective of a harmonized US-wide legal framework.[149] In view, moreover, of the leading role of the United States globally in addressing issues of private commercial spaceflight in legal and regulatory detail, at the international level similar issues may arise – the potential for 'flags of convenience' and a resulting global 'competition' for such industry to arise in this context has already begun to be discussed at the UN level.[150]

Firstly, with six states now having accepted at least a general warning-plus-waiver regime with limited exceptions *ratione materiae* and broad application *ratione personae*, what about the 44 other US states? Suppose a case were brought before the courts of one of those states – for example, because an heir of a victim does not feel bound by the waivers? After all, the warning statements giving rise to those waivers, quoted

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[145] See Sec. 2210(d), Spaceflight and Liability Immunity Act, *supra* n. 136.

[146] *Cf.* Sec. 2(C), Space Flight Informed Consent Act, *supra* n. 133.

[147] S.B. 240, 51st Leg.; Bill introduced by M.K. Papen, www.nmlegis.gov/Sessions/13%20Regular/bills/senate/SB0240.pdf, last accessed 18 April 2014. As of this writing, the Bill has not (yet) passed.

[148] Sec. 2(J) (renumbered from 2(C)) as proposed, S.B. 240, *supra* n. 147.

[149] *Cf.* again Yates, *supra* n. 125, 15–6.

[150] *Cf.* e.g. F.G. von der Dunk, Towards 'Flags of Convenience' in Space?, in *Proceedings of the International Institute of Space Law 2012* (2013), 811–30; M. Gerhard, Article VI, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 25.

above, are qualified by the phrases 'under Virginia law', 'under Florida law', 'under New Mexico law', 'under Colorado law' and 'under California law' respectively – only the Texas Statute does not make such a reference. What does it mean that, nevertheless, those statutes make reference to a 'participant's representatives', sometimes expressly including 'heirs', as being precluded from bringing liability claims?[151]

Secondly, and related to the foregoing, the variations in US state law – and the absence of any state law so far in the majority of US states – in an area already regulated, albeit lightly, at the federal level with regard to a sector being perceived generally as being of nationwide, if not indeed international character, raise the issue of 'federal pre-emption': to what extent do individual US states have the constitutional right to draft their own laws in this field?[152] While this issue has so far not been legally tested – partly because the first commercial flights are still in the future, partly because the FAA may not yet be clear itself on how to regulate further than it currently has – it will most likely sooner or later have to be addressed.

In view of the overwhelming focus so far of the impending spaceflight industry on the United States, such issues and problems might spill over also into the international arena, to the extent private commercial spaceflights are being considered in that context for the near future. This *inter alia* refers back to the issue of 'flags of convenience', where non-US jurisdictions may not be willing – or even constitutionally allowed – to accept 'informed consent'-based immunity from liability for private operators.[153]

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[151] See § 8.01-227.9(A), Space Flight Liability and Immunity Act (Va.), *supra* n. 131; Sec. 331.501(2)(a), Space Activities Statute (Fl.), *supra* n. 132; Sec. 3(A), Space Flight Informed Consent Act (N.M.), *supra* n. 133; Sec. 41-6-101(2)(a), Act Concerning Limited Liability for Space Activities (Co.), *supra* n. 135; and Sec. 2212(b), Spaceflight and Liability Immunity Act (Ca.), *supra* n. 136. The Texas Statute simply posits a lack of liability 'to any person'; Sec. 100.A.002(a), Space Activities Statute, *supra* n. 134.

[152] See on this e.g. also Yates, *supra* n. 125, 16; Perlman, *supra* n. 15, 955 ff.

[153] Such issues may be all the more relevant in view of the fundamental uncertainty as to how 'informed' 'consent' can really be in a novel yet highly technological sector; see again Knutson, *supra* n. 125, 105 ff.

12.4 LEGAL ISSUES OF PRIVATE ORBITAL MANNED SPACEFLIGHT

12.4.1 'Public' Versus 'Private'

Whilst the overarching legal question as regards sub-orbital manned spaceflight concerns the potential applicability of space law, air law, or both, at least there can be no doubt that it concerns *private* flight, as the envisaged operations comply with both sub-criteria of the definition of private spaceflight given.

For orbital manned spaceflight this works the other way around: there can be little doubt that both in terms of technologies used and activities aimed for, and in terms of areas involved, this concerns *space*flight. By contrast, here the overarching question is more profoundly to what extent one is dealing with *private* spaceflight, or more precisely where the public elements of the complex projects at issue would give way to private elements. For proper legal analysis of these issues one should currently distinguish three types of orbital manned spaceflight:[154] orbital tourism, orbital service flights and orbital hotel operations.

12.4.2 Orbital Tourism

12.4.2.1 The legal character of orbital tourism

As to the first subcategory of orbital manned spaceflight, the type of orbital private manned spaceflight inaugurated by Tito's flight clearly complies with a lower level of privatization of manned spaceflight, being compliant only with sub-criterion (a) of the working definition of private manned spaceflight provided before.[155] Whilst the motivation and money for the flight was private, his transportation on board a Soyuz to and from outer space was a governmental affair and his destination in outer space an intergovernmental space station. Consequently, the novel aspects of this type of 'private' flight were not so much legal in themselves, but rather para-legal in that certain aspects of the existing legal environment were given a different flavour and perspective. For example, the Liability and Registration Conventions clearly applied, as there could be no

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[154] This means, for example, that private manned flights to the moon or other celestial bodies, not likely to occur in the near or medium term, need not be addressed at this point. See also von der Dunk, *supra* n. 3, 409–10, Lele, *supra* n. 1, 221–2; for a first rudimentary discussion of such legal issues e.g. Freeland, *supra* n. 3, 13–4.

[155] See *supra*, § 12.2.1.

question the vehicles used for such orbital tourism qualified as 'space objects', read objects launched into outer space.[156]

Only at the next level would some questions arise. Most notably, this regards the extent to which the presence of an inexperienced, essentially non-trained,[157] non-career space flyer raises additional liability issues, following a considerably heightened chance of damage being caused (or at least the perception thereof), creating unease concerning the applicability of the existing regime to such damage.[158]

12.4.2.2 Liability in the context of orbital tourism

Following the state liability imposed by the Liability Convention, the baseline legal analysis at the international level is simple: the 'launching State(s)' remain(s) liable, and it is up to such states to ensure, as appropriate, that the private space tourist will be subject to reimbursement obligations, insurance obligations or other conditions if they wish to be legally able to derogate (parts of) relevant claims to the tourists or their operators.[159]

The main difference between the individual orbital tourist and other private entities, read companies, is that those states qualifying as 'launching States have (usually) established a requirement for such private operators to obtain a licence by way of national space legislation. Such a licence would notably include obligations to insure against third-party liability of those states under the Liability Convention in so far as claims would result from damage caused by such licensees.[160] The orbital

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[156] *Cf.* Art. I(c), Liability Convention, *supra* n. 38, and Art. I(a), Registration Convention, *supra* n. 38; also *supra*, § 12.3.3.2. Consequently, e.g. such launches were also properly registered with OOSA; see e.g. for the Soyuz TM-32 flight of 28 April 2011 with Tito on board: # 3099, ST/SG/SER.E/397, of 14 September 2001, 2, §1, at www.unoosa.org/pdf/reports/regdocs/ser397E.pdf, last accessed 18 April 2014.

[157] Whilst the various orbital space tourists did undergo a training programme of sorts, this did not really compare with the extensive selection and multi-year training process of 'true' astronauts and cosmonauts.

[158] *Cf.* e.g. von der Dunk, *supra* n. 3, 413–7; Freeland, *supra* n. 3, 2–3. The other major legal issue concerns the status of non-career astronauts vis-à-vis career astronauts; see on this further *infra*, § 12.5.1, also *supra*, § 11.4.3.2.

[159] *Cf.* the fourfold definition of the 'launching State(s)' as per Art. I(c), Liability Convention, *supra* n. 38; also *supra*, § 2.2.3.

[160] *Cf.* e.g. Kerrest de Rozavel & von der Dunk, *supra* n. 94, 127–34; C. Gaubert, Insurance in the Context of National Authorisation, in *National Space*

tourists themselves, however, would not normally be covered by such licensing regimes – nor have they so far even been seriously considered in that context.

In the abstract, the solution might perhaps indeed be to require a similar licence from an orbital tourist – yet obviously the practicality of such an approach is highly doubtful. In addition, it may be remarked that a major rationale for allowing, even stimulating up to a point, orbital tourism was the additional funding it would generate for the public agencies taking such tourists on board flights likely planned anyway – which brings analysis to the only context in which such flights have so far taken place: that of the ISS.[161]

12.4.2.3 Liability as dealt with in the context of the ISS

All seven orbital tourists that have flown so far went to the ISS; all flew on Russian Soyuz vehicles operated by the Russian Space Agency launched from the Russian launch facilities at Baikonur.[162] Whereas Tito was originally headed for the Russian Mir station, with the de-orbit of the latter shortly before his flight was due, he was re-directed to the ISS – more precisely, to the Russian module of the ISS.[163]

Legislation in Europe (Ed. F.G. von der Dunk) (2011), 165–9; also *supra*, § 3.2.3, *infra* § 17.2.

[161] Especially for the Russian Space Agency, flying all orbital tourists so far, fees ranging from US$ 20 million to US$ 40 million constituted a welcome contribution to mission costs and more broadly the Russian space programme, to some extent struggling after the end of the Soviet Union; see http://en.wikipedia.org/wiki/Space_tourism, last accessed 3 January 2014.

[162] See http://en.wikipedia.org/wiki/Space_tourism, last accessed 3 January 2014; further *supra*, § 11.4.3. Though Baikonur was on Kazakh territory and launches from there consequently (also) gave rise to liability of Kazakhstan under the Liability Convention, *supra* n. 38, under bilateral arrangements between Russia and Kazakhstan the former took it upon itself to reimburse the latter for any such claims which necessitated compensation to be paid. See Agreement between the Russian Federation and the Republic of Kazakhstan on Basic Principles and Terms of the Utilization of the Baikonur Cosmodrome, Moscow, done 28 March 1994, entered into force 10 December 1994; 30 *Journal of Space Law* (2004) at 26.; further e.g. M. Hosková, The 1994 Baikonur Agreements in Operation, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 263–72.

[163] See e.g. Billings, *supra* n. 15, 163; R. Sattler, US Commercial Activities aboard the International Space Station, 28 *Air & Space Law* (2003), 79–81; Lele, *supra* n. 1, 219; F.G. von der Dunk, Regulation of Space Activities in the Netherlands, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 231–3.

There was no arrangement in the context of the ISS for something which might be called ‘personal’ liability, for understandable reasons – hitherto all persons having entered into outer space were highly trained employees normally of governmental space agencies, whose presence in outer space was primarily or exclusively for professional reasons. This also meant that any issues of such persons causing damage and hence invoking questions of liability were dealt with in the context of their professional employment, any ‘personal’ liability likely being waived except in cases involving gross negligence or disregard of orders.

Upon offering Tito a new destination in outer space by way of the Russian module of the ISS, Russia met with considerable resistance from the ISS Partners. The specific liability regime applicable to ISS operations as ‘Protected Space Operations’ amounted to a comprehensive mandatory cross-waiver of such liabilities.[164] As a result, NASA in particular[165] was worried it might face a situation where Tito could cause damage to the US module or US experiments (not to mention the whole ISS) without being able to hold Russia or the Russian Space Agency liable for such damage, or alternatively might cause the ISS to cause damage to third-parties entailing US liability as one of the ‘launching States’ of the ISS without a proper recourse mechanism.

This possibility was foreseen by the Intergovernmental Agreement only to the extent that if Partner States were to bring in a further state or a private entity under the jurisdiction of such a state, they would require consultation and *a priori* consensus with other Partner States for doing

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[164] See Art. 16, Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4; also further *supra*, § 11.2.

[165] Of course, the same would apply to any other ISS Partner State, but at that point in time, apart from Russia itself, only the United States already had a module in place on the ISS. Moreover, US authorities were most worried about amateur astronauts, read tourists, as they had been faced recently with a tragic accident on a US submarine with visitors on board, happening to surface precisely under a Japanese fishing vessel, killing more than a dozen fishermen. *Cf.* further L.J. Smith & K.U. Hörl, Legal Parameters of Space Tourism, in *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (2004), 45, n. 7; P. Collins, Meeting the Needs of the New Millennium: Passenger Space Travel and World Economic Growth, 18 *Space Policy* (2002), 191; Freeland, *supra* n. 3, 2–4.

so.[166] Also, such states should seek 'to avoid causing serious adverse effects on the use of the Space Station by the other Partners'.[167] At the same time, however, the Intergovernmental Agreement provided that respective Partner States would maintain jurisdiction and control over their respective modules; in other words, it was essentially within the sovereign discretion of Russia to allow Tito on board its module.[168] More specifically, Partner States have 'the right to barter or sell any portion of their respective allocations'.[169]

The deadlock resulting from these clauses was solved by a special *ad hoc* agreement between the relevant states, which provided for a prohibition on Tito leaving the Russian module and Russia taking out liability insurance (purportedly at the cost of US$ 100,000), whilst NASA (and the other space agencies) would drop further resistance to his presence on board the ISS.[170] Had it been aware in advance, Russia could well have required either the company sending Tito or Tito himself to accept an obligation of reimbursement through a licence.[171] In other (future) cases, this certainly remains a possibility – and obviously not only for Russia.

Once NASA realized that bringing tourists to the space station, as long as properly covered by appropriate legal arrangements, could actually be a beneficial operation (partly because of the trend towards allowing partial commercialization of space station activities in order to help alleviate governmental budget problems), its attitude fundamentally changed, giving rise to a comprehensive and formalized solution.[172]

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166 See Art. 9(3.a), Intergovernmental Agreement, *supra* n. 164.

167 Art. 9(4), Intergovernmental Agreement, *supra* n. 164.

168 See Art. 5(2), Intergovernmental Agreement, *supra* n. 164.

169 Art. 9(2), Intergovernmental Agreement, *supra* n. 164.

170 See e.g. Freeland, *supra* n. 3, 2–3; von der Dunk, *supra* n. 3, 414.

171 It may be noted in this regard that the cross-waiver of Art. 16, Intergovernmental Agreement, *supra* n. 164, whilst comprehensive in many other respects, does not extend to 'claims between a Partner State and its related entity or between its own related entities'; *cf.* Art. 16(3)(d)(1).

172 As per the Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers, November 2001, www.spaceref.com/news/viewsr.html?pid=4578, last accessed 4 January 2014; now offering the possibility in principle of bringing non-professionals to the ISS; see *infra*, § 12.5.1. Further e.g. Freeland, *supra* n. 3, 3; *cf.* also R.P. Veldhuyzen & T.L. Masson-Zwaan, ESA Policy and Impending Legal Framework for Commercial Utilisation of the European Columbus Laboratory Module of the ISS, in *The International Space Station* (Eds. F.G. von der Dunk & M.M.T.A. Brus) (2006), 54–5.

It should be noted, however, that this development did not in any sense change the liability situation as dealt with by Article 16 of the Intergovernmental Agreement – or for that matter the Liability Convention as far as international third-party liability is concerned.[173] The cross-waiver continues to stand, making the state under whose jurisdiction a tourist is going up (so far, this concerns Russia only) immune from claims under the Intergovernmental Agreement for damage caused by such a tourist; whereas at the same time that state continues to be liable for international third-party damage, something to be possibly – but not automatically or necessarily – deflected through the particular contract with the 'tourist company' involved obliging it to disburse any relevant international claim.

12.4.3 Legal Issues of Orbital Service Flights

12.4.3.1 The legal character of orbital service flights

In a sense, orbital service flights represent a mirror-side scenario from orbital tourism: in this case the operator of the flight is a private operator, thus complying with criterion (b) of the working definition of private spaceflight, but the passengers are essentially employees of public space agencies, 'true astronauts', thereby not fitting within criterion (a). In that sense, the main novel legal issues remain confined to the flight to and from the destination in outer space.

In the United States, so far the only state where privately operated manned flights to orbital locations, read exclusively again so far the ISS,[174] are about to be actually undertaken, this development goes back to the specific US political decision to decommission the Space Shuttles.[175] The resulting looming exclusive dependence on Russian human transportation to and from the ISS was not considered acceptable – both

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[173] See also Art. 17(1), Intergovernmental Agreement, *supra* n. 164, which expressly confirms that 'except as otherwise provided in Article 16, the Partner States, as well as ESA, shall remain liable in accordance with the Liability Convention'. Further *supra*, §§ 11.3.1.2, 11.3.2.6.

[174] Obviously, the private entities concerned would be willing to serve other destinations in outer space if possible with their current vehicles, but so far the only possible two candidates would be the Chinese space station being developed – where for political and security-related reasons the involvement at least of US private operators is quite unlikely whereas outside the United States so far no immediate private manned orbiting servicing capacity would be available – and the Bigelow space hotels being developed; see for the latter *infra*, § 12.4.4.

[175] See e.g. Lele, *supra* n. 1, 219; Brannen, *supra* n. 4, 662; Chaddha, *supra* n. 4, 50.

in general, for redundancy purposes, and in specific political terms of the Russo–American relationship – and it caused NASA to be directed to forcefully stimulate the development of private alternatives through extended (including notably financial) support for research and development, and develop strategies and programmes to engage selected private companies in this.[176]

Once the decision to phase out the Space Shuttle in the course of 2010 had been taken in 2006, NASA started out by investing through the Commercial Orbital Transportation Services (COTS) programme in unmanned access capabilities to the ISS, then by way of the Commercial Crew Development (CCDev) programme in preliminary work for manned space transportation.[177] Following their success, both are now complemented by a Commercial Crew & Cargo Program (C3PO) to have privately developed and operated spacecraft soon transporting astronauts to and from the ISS.[178]

As all such flights are still privately operated, they continue to require licences from the FAA, which *inter alia* takes care of the liability issues just as with other FAA-licensed launches.[179] NASA from this perspective is going to be little more than a customer once the manned spaceflight capabilities of the various vehicles are proven, likely buying individual flights to the ISS – albeit a rather special customer in many ways.[180]

12.4.3.2 Legal issues of flying government-employed astronauts on private vehicles

As a consequence of NASA's key role in stimulating orbital service flights, it may in particular (be tempted to) foist high-level requirements upon these private partners – who will likely remain quite dependant on such an anchor tenant for the foreseeable future – in order to allow its astronauts (or guest astronauts from other space agencies destined for the

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176 *Cf.* e.g. Brannen, *supra* n. 4, 660–8; Chaddha, *supra* n. 4, 50–2.

177 See on the COTS and CCDev programmes e.g. *2011 U.S. Commercial Space Transportation Developments and Concepts: Vehicles, Technologies, and Spaceports*, *supra* n. 64, 38–45; *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 60–1; Chaddha, *supra* n. 4, 29–30; Brannen, *supra* n. 4, 667.

178 See on the C3PO programme e.g. *The Annual Compendium of Commercial Space Transportation: 2012*, *supra* n. 7, 60 (as consisting of 'CCDev2' and 'CCiCap'); also Chaddha, *supra* n. 4, 30–1; Lele, *supra* n. 1, 219–20.

179 See *supra*, §§ 3.3.3.1, 12.3.4.2, 12.3.4.3; also www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/licensed_launches/historical_launch/, last accessed 3 January 2014.

180 See also further *infra*, § 12.4.3.2, on the issue of 'informed consent'.

ISS) to board those vehicles, but these will essentially remain a matter of *contractual* legal arrangements, NASA in this context not having any regulatory authority as such.[181]

The most topical legal issues would thus be the consequence of having NASA employees or guests, formally qualifying as government personnel, flying on board vehicles operated by private operators licensed by the FAA – and consequently required under the current regime to only have their passengers declare their 'informed consent'. In short, the FAA and NASA have discussed such complexities for several years now and have reached an agreement where in essence such flights will have joint oversight of the FAA and NASA, in which the FAA will license with public safety in mind and NASA will provide passenger and crew safety and mission assurance.[182]

Since the signature of the MOU, NASA and the FAA have been closely cooperating to implement its goals and strategies. The two agencies established a programme-level working group and a 'harmonization team' tasked respectively with identifying potential issues related to NASA astronauts flying on FAA-licensed vehicles and addressing additional specific legal questions and issues. This has already given rise to some tangible results.

For example, in November 2013 the FAA, following a specific request by NASA,[183] made public its interpretation on the ability of NASA astronauts to perform operational functions during an FAA-licensed launch and re-entry.[184] The FAA found that the operative version of the Commercial Space Launch Act and the FAA's regulations impose no

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[181] *Cf.* e.g. Sec. 102(b), (c), National Aeronautics and Space Act, Public Law 85-568, H.R. 12575, 29 July 1958; as amended through 1983; 72 Stat. 426; *Space Law – Basic Legal Documents*, E.III.1, directing NASA to 'exercis[e] control over aeronautical and space activities sponsored by the United States' and to '*seek and encourage*, to the maximum extent possible, the fullest commercial use of space' (emphasis added) – that is: *not* to *regulate* it.

[182] See Memorandum of Understanding between the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) for Achievement of Mutual Goals in Human Space Transportation, signed June 4, 2012; see www.nasa.gov/pdf/660556main_NASA-FAA%20 MOU%20-%20signed.pdf, last accessed 15 January 2014; also www.spacenews.com/article/nasa-faa-sign-agreement-human-spaceflight-regulation, last accessed 15 January 2014.

[183] See e.g. http://spaceref.com/news/viewsr.html?pid=45022, last accessed 18 April 2014.

[184] See Federal Aviation Administration Interpretation Concerning Involvement of NASA Astronauts During a Licensed Launch or Reentry, Fed. Reg. Vol.

operational constraints on NASA astronauts for the performance of such functions. Furthermore, in December 2013 NASA, in collaboration with the FAA, submitted to Congress a proposed amendment to the Commercial Space Launch Act to more fully address issues related to FAA-licensed missions providing space station transportation services for NASA astronauts by adding a 'Government Astronaut' classification to the CSLA.[185] It remains an open question of course how this construction would be regulated in different contexts, or even different states, in the future.

12.4.4 Legal Issues of Orbital Hotel Operations

12.4.4.1 The legal character of orbital hotel operations

In a sense, orbital operations such as currently being developed by Bigelow Aerospace would most likely combine the legal aspects of both orbital tourism and orbital servicing flights, and hence could comply with the working definition of private spaceflight under both aspects. Whilst, certainly upon proof of viability and operational safety of the concept, astronauts may also come to be sent to such space facilities and may moreover be brought there (and back) by spacecraft operated by public space agencies, for the first phase it is more likely that only private tourists will seek out that facility (giving rise to compliance with criterion (a)) and will go there and back on board privately operated spacecraft (giving rise to compliance with criterion (b)).[186]

At a basic level, an orbiting space hotel is a 'space object' without any question, so it simply triggers all the legal consequences as per, for example, the Liability Convention and the Registration Convention.[187] All its manoeuvres as well as all activities on board moreover clearly

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78, No. 231, of 2 December 2013; Rules and Regulations; 72011-72013; FR Doc No: 2013-28405.

[185] See NASA Return on Investment Report, Issue 14, February 2014, www.nasa.gov/sites/default/files/files/NASA_ROI_Report_Feb_2014.pdf, last accessed 18 April 2014.

[186] In order to try to ensure that indeed such private transportation capabilities would be developed, Bigelow also offered 'America's Space Prize' of US$ 50 million for the first completely privately developed spacecraft with orbital capabilities; see Brannen, *supra* n. 4, 644–5; Bromberg, *supra* n. 17, 658.

[187] See *supra*, on the Liability Convention (*supra* n. 38) § 2.3.3, and on the Registration Convention (*supra* n. 38) § 2.3.4.

constitute 'activities in outer space' so as to trigger the international responsibility of the state whose national activities they constitute.[188]

Focusing once more on the United States as the state where relevant developments have proceeded furthest, the legal analysis is more complicated. Following the perceived lack of the FAA's on-orbit jurisdiction, future orbiting space hotels would or could not, except for the launch (and if appropriate re-entry), be licensed by the FAA under the Commercial Space Launch Act.[189] The FCC is only entitled to regulate the telecom aspects of in-orbit operations.[190] NOAA only has regulatory authority for orbiting remote sensing satellites as far as the specific remote sensing aspects are concerned.[191] NASA has no legislative or regulatory authority vis-à-vis other private actors in space.[192]

How, thus, should the orbital phases of hotel operations – by far the longest phases – come to be regulated? And if this is yet an open question in the US context, in other states so far no particular attention has been paid to such legal issues – for obvious reasons, in view of the practical realities; yet these issues will sooner or later also require international attention.

12.4.4.2 Specific legal issues of orbital hotel operations

As a consequence of the above, it is especially the quasi-permanent character of hotels in orbit – they would likely be intended to be operational at least for a number of years, if not decades, as opposed to space vehicles operated for short-duration flights – and their presumed lesser manoeuvrability as compared to 'normal' spacecraft which cause special legal issues to arise in practice.

Firstly, this means that the states possibly going to be held liable for damage caused by any activities on a hotel in orbit would be, much more than with regard to a 'simple' short-duration flight, induced to exercise jurisdiction on board these space hotels both by the licensing process and, perhaps, by actual monitoring at regular intervals of what is going

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188 Art. VI, Outer Space Treaty, *supra* n. 37; see also von der Dunk, *supra* n. 3, 435; further *supra*, § 2.3.1.1.

189 *Cf.* e.g. Perlman, *supra* n. 15, 934–7; also *supra*, § 12.3.4.3, esp. (text at) n. 115.

190 *Cf.* Secs. 151, 152, 301, 303, 307, Communications Act, 19 June 1934; 47 U.S.C. 151 (1988); 48 Stat. 1064.

191 As per Secs. 5621–5625, Land Remote Sensing Policy Act, Public Law 102-555, 102nd Congress, H.R. 6133, 28 October 1992; 15 U.S.C. 5601; 106 Stat. 4163.

192 See *supra*, n. 181.

on there. In other words: the issue of which state is entitled to exercise jurisdiction, following Article VIII of the Outer Space Treaty and the Registration Convention,[193] is of much greater importance than in short-duration flights, as is the way in which it then will apply national law to such a hotel.[194] This would now not only concern normal responsibilities and liabilities for operators of a transport activity, but also, for example, criminal law and intellectual property rights law.[195]

As it were mirror-wise to the private character of the hotel operator, the private character of the guests equally should be taken into consideration. Not only would states be rather keen on exercising jurisdiction on board hotels in orbit in terms of criminal law largely because guests on the hotel would principally not be trained professionals but paying amateurs,[196] but now also third-party liability issues need be dealt with more profoundly and broadly.

Most pertinently, the question arises regarding the applicability of the Liability Convention in case the guest – not necessarily coming from the/a 'launching State' of the hotel in orbit itself – him- or herself could be directly held to have caused relevant damage. Here, of course, the comparisons with the ISS hosting the first few orbital tourists so far might be helpful.[197] However, in that case it had to be concluded that the solution most appropriate in the abstract – individual licensing of ISS tourism with inclusion of certain reimbursement and insurance obligations – did not seem to be feasible in reality.

This particular legal issue therefore certainly requires further analysis and development, once the trips of the first orbital hotel guests are around the corner. As the above approach of licensing individual guests would be even less feasible in the case of orbital hotels, should the hotel operator, as a (primary) target for licensing, be burdened with taking care of such liabilities and responsibilities 'on behalf of', in lieu of his passengers/guests? And along similar lines: should inter-party, contractual liability as between the hotel operator and the hotel guests be left to contractual freedom, should cross-waivers be imposed by law or regulation – as is

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193 *Cf. supra*, § 2.3.4.1.

194 *Cf.* also e.g. Hobe, *supra* n. 96, 446–7.

195 *Cf.* e.g. Perlman, *supra* n. 15, 940–1.

196 *Cf. ibid.*, 941–2; M. van Pelt, *Space Tourism – Adventures in Earth Orbit and Beyond* (2005), 145–51; L.D. Solomon, *The Privatization of Space Exploration: Business, Technology, Law and Policy* (2011), 81–115.

197 See *supra*, § 12.4.2.3.

quite common elsewhere in the space sector[198] – or should yet different solutions be devised at the legislative level, nationally or internationally? Would or should the 'informal consent' approach currently being applied by US law to sub-orbital flights and their passengers[199] be transposed to orbital hotel operators and their guests?

A final particular issue in the liability realm concerns scenarios where spacecraft, whether private or not, dock with the space hotel, and effectively a situation arises where two different types of space objects conduct a docking operation: one a transport vehicle and the other a more permanent part of infrastructure. Such dockings would obviously constitute activities possibly leading to damage. Both being space objects, the relevant provisions of the Liability Convention provide for fault liability in case of damage.[200]

However, with two space objects consciously and intentionally docking but being of such different character, fault may turn out to be rather difficult to establish. Yet, the operator of the hotel should not automatically proceed on the assumption that it would be the operator of the docking spaceship, the more active and manoeuvrable of the two, which in case of damage should be held liable. In any case, proper protocols and standard procedures would have to be developed which include clear indications regarding potential liability situations as well as other legally relevant scenarios.

12.5 LEGAL ISSUES OF BOTH SUB-ORBITAL AND ORBITAL PRIVATE MANNED SPACEFLIGHT

12.5.1 The 'Astronaut' Issue

12.5.1.1 The Outer Space Treaty and the Rescue Agreement on 'astronauts'

The main legal issue which spans both sub-orbital and orbital private manned spaceflight concerns the legal status of the new categories of space flyers involved – notably crew employed by private operators and passengers privately paying for such flights.

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[198] See e.g. the ISS regime, *supra*, § 11.3.2, and the US national regime under the Commercial Space Launch Act (*supra* n. 87), *supra*, §§ 12.3.4.2, 12.3.4.3.

[199] See *supra*, § 12.3.4.3.

[200] See esp. Art. III, Liability Convention, *supra* n. 38.

Under the Outer Space Treaty, astronauts (or, in the Russian version of the Treaty, cosmonauts) were to be considered 'envoys of mankind',[201] who as per the Rescue Agreement[202] were then to be allotted special rights – in particular as regards the extended obligations of states concerned to come to their rescue in case of distress or emergency.[203] Technically speaking, the Rescue Agreement referred to 'personnel of a spacecraft' throughout the operative provisions, but the full title of the Rescue Agreement and its Preamble refer to 'astronauts', which essentially renders the question on whether these terms are identical largely semantic.[204] The change in terminology may perhaps have had to do with a desire to express more clearly what categories of man would be concerned, but does so essentially by equating the newer term to the older one.[205]

These provisions essentially remained theory, in so far as they were never invoked in practice to provide support or rescue services vis-à-vis astronauts or cosmonauts. Astronaut fatalities during spaceflight have so far remained confined to the Challenger crew halfway through the launch and the Columbia crew upon re-entry; cosmonaut fatalities to the parachute failure during re-entry of Soyuz-1 and the decompression of Soyuz-11 in outer space itself.[206] In all cases these disasters occurred so

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201 See Art. V, Outer Space Treaty, *supra* n. 37.

202 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968).

203 *Cf.* Arts. 1–4, Rescue Agreement, *supra* n. 202; see further *supra*, §§ 2.3.2, 11.4.3.2; also in general F.G. von der Dunk, A Sleeping Beauty Awakens: The 1968 Rescue Agreement after Forty Years, 34 *Journal of Space Law* (2008), 422–4; Cheng, *supra* n. 67, 258–61; *The Astronauts and Rescue Agreement* (Eds. G. Lafferanderie & S. Marchisio) (2011).

204 See e.g. 1st para., Preamble, Rescue Agreement, *supra* n. 202. Further e.g. R. Hara, Legal Status of Astronauts and Other Personnel on the Moon, *Proceedings of the Twenty-Sixth Colloquium on the Law of Outer Space* (1984), 165–7; S. Gorove, Major Definitional Issues in the Space Agreements, *Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space* (1993), 77–8, also n. 15; V. Kopal, Some Remarks on Issues Relating to Legal Definitions of 'Space Object', 'Space Debris' and 'Astronaut', *Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space* (1995), 105–6.

205 See e.g. M. Lachs, *The Law of Outer Space* (1972), 79, 88–9 at n. 4; *cf.* also Kopal, *supra* n. 204, 105.

206 See http://en.wikipedia.org/wiki/List_of_spaceflight-related_accidents_and_incidents, last accessed 4 January 2014.

rapidly and disastrously that no issue of international rescue efforts whatsoever arose.

12.5.1.2 'Crew' and 'spaceflight participants' in the context of the Rescue Agreement

The appearance of the first 'space tourists' on the scene and the likelihood that they will soon be followed by many more, at least into the edge of outer space, has *inter alia* given rise to new attention being paid to the Rescue Agreement. Do the privately employed crews undertaking the flight operations, and even more so the privately paying passengers they are flying, represent in any meaningful sense of the word the 'envoys of mankind' that Article V of the Outer Space Treaty was contemplating or the 'astronauts' enjoying special legal attention, even treatment, under the Rescue Agreement?

For the present subject, it was the first 'space tourist', Tito, fuelling such discussions. The aforementioned discussion about his presence on the Russian module, largely against the wishes of the other ISS participants who were afraid an untrained human being might cause serious havoc, if not disaster, quickly led to the formal establishment of a category of space travellers different from that of a professional astronaut: that of the 'spaceflight participant'.[207]

By agreement amongst the ISS Partner States on Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers in January 2002, this category was thus defined as comprising 'individuals … sponsored by one or more partner(s)', explicitly including tourists.[208] It was also under this regime that the second and further space tourists would visit the ISS.

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[207] *Cf.* also *supra*, § 12.4.2.3.

[208] See Sec. III – Definitions, Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers, *supra* n. 172. See also Veldhuyzen & Masson-Zwaan, *supra* n. 172, 55: a spaceflight participant is 'an individual (e.g. … crewmembers of non-partner space agencies, engineers, scientists, teachers, journalists, filmmakers or tourists), sponsored by one or more partner(s); normally this is a temporary assignment that is covered under a short-term contract; they are eligible for assignment as visiting scientist, commercial user or tourist, but their task assignment cannot include ISS assembly, operations and maintenance activities'. Also Smith & Hörl, *supra* n. 165, 39, and n. 24, *i.a.* making reference to Art. III, Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers. See further e.g. 111 *ESA Bulletin* (Aug. 2002), 82.

The rather explicit distinction thus made between professional astronauts and spaceflight participants, even if formally only applicable to the ISS context, may well turn out to be trendsetting. The ISS is currently, by a stretch, the most complicated manned space project in operation in international, operational, technical as well as legal terms, and the only current outer space destination for space tourists. In addition, it combines most of the first-rank space powers; from that perspective currently only China and India might qualify as such amongst the states *not* on board. This means that the legal arrangements for the ISS indeed stand a good chance of being a point of departure for developing relevant international law ultimately applicable to the whole world.

Furthermore, US legislation, as discussed above, has also used the term 'spaceflight participant' to clearly distinguish such private space flyers from 'classical' NASA and guest astronauts, and attached major legal consequences to such status as per the 2004 Commercial Space Launch Amendments Act.[209] Effectively, it also notionally separates 'crew' of private licensees from such classical astronauts, even though the former would also be professionals, as they would be subject to a light version of 'informed consent' as well, and at a later stage crew requirements may come to be imposed by the FAA.[210]

In view of these distinctions, it may well be argued that the Rescue Agreement should not apply to spaceflight participants. The often-heard argument that humanitarian considerations should be imperative and should therefore result in application of the Agreement to every human being in outer space, planning to go there or being on the way back,[211] may well backfire: why then any need to establish a special Agreement to provide for the – rather extended! – obligations of relevant states to come to the rescue, to 'immediately take all possible steps … and render … all necessary assistance' without regard for costs or own safety?[212]

Existing general humanitarian obligations to assist humans in distress already would cover what is necessary and justified for spaceflight participants, without the added 'entitlements' under the Rescue Agreement or even Article V of the Outer Space Treaty's qualification as

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209 See *supra*, § 12.3.4.3.

210 See *supra*, § 12.3.4.3; further also Knutson, *supra* n. 125, 105 ff.

211 *Cf.* e.g. M.J. Sundahl, The Duty to Rescue Space Tourists and Return Private Spacecraft, 35 *Journal of Space Law* (2009), 167 ff., esp. 178–89.

212 Art. 2, Rescue Agreement, *supra* n. 202.

'envoys of mankind'.[213] After all, this is also presently the case with tourists in the high mountains or similar realms, where the inherent dangers accepted willingly and only for the pleasure derived therefrom should not translate into a blanket licence to have others risk their lives or their funds if the risks unfortunately translate into reality.

12.5.2 Towards the Future – Space Traffic Management Issues

12.5.2.1 Blurring the lines between 'sub-orbital' and 'orbital'

As discussed above in particular in the context of the definitional issues pertaining to sub-orbital and orbital flight respectively,[214] for practical reasons presently it does make sense to distinguish between private sub-orbital manned spaceflight and private orbital manned spaceflight. The former concerns flights of short duration which for the near future would not reach above altitudes of some 120 km (that is marginally in outer space) and immediately return from such altitudes to the place of departure, whereas the latter aim for altitudes of several hundreds of kilometres (the ISS for example operating at altitudes of 350 to 400 km above sea level) and usually complete a number of orbits before any return trip is undertaken.

At the same time, it is obvious that this clear-cut situation may only be temporary, merely an initial stage in private manned spaceflight. Once sub-orbital flights start covering major parts of the globe and seek out higher altitudes, perhaps even use parts of orbital trajectories for the purpose, or launch small low-earth-orbiting satellites which may themselves seek out orbits at such slightly higher altitudes, the borderline between the two types of flight will increasingly become blurred.

Such blurring would firstly cause the above-noted discussions as to the applicable legal regimes for these activities to take on a different character altogether. For instance, if a spacecraft pilot can use essentially the same technology to go to 120 km and to go to 400 km, any licensing of crew along airline precedents would make less and less sense, and so would certification along similar lines.

Secondly, and more importantly, wherever one envisages airspace to give way to outer space, whether one acknowledges the existence of a

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[213] *Cf.* already G. Gál, *Space Law* (1969), 224; Lachs, *supra* n. 205, 79, 81; C.Q. Christol, *The Modern International Law of Outer Space* (1982), 153, 155–6, 159.

[214] See *supra*, § 12.2.2.

'right of innocent passage'[215] and whether one adheres more to a functionalist or to a spatialist approach when it comes to applying space law and air law respectively,[216] such flights in the end inevitably make use of the same geographical realm, and hence their activities would somehow need to be coordinated to avoid dangerous or even catastrophic situations.

12.5.2.2 Towards a space traffic management system?

The above brings analysis back to the issue of a space traffic management system: at whatever altitude, the air traffic system currently ensuring the safety of all movement in airspaces, both at the international and at the domestic levels, for operational, technical or other non-legal reasons cannot satisfactorily take care of the safety of operations. Thus the need for a space traffic management system of some sort or other arises.

The present situation from such a perspective clearly needs adaptation. Of course, initially the Registration Convention was developed to take care of the baseline for any safety-related coordination of space activities: the identification of space objects and their locations read orbits or orbital slots and an international open-access register allowing other users of outer space at least a general awareness of the presence, locations and orbits of such space objects.[217]

Even in the 'classical' context of space activities being predominantly governmental in character and usually moreover not involving humans in space (hence not requiring the same level of safety precautions), however, the Registration Convention has not been able to function to full satisfaction, the tendency being for registration to become increasingly

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[215] See on this *supra*, § 2.3.1.4; also R.L. Bridge, International Law and Military Activities in Outer Space, 13 *Akron Law Review* (1980), 661; J. Prevost, The Law of Outer Space – Summarized, 19 *Cleveland State Law Review* (1970), 602. Significantly, the right of innocent passage has been held by the United States since the beginning of the space age. For example, this right was championed by President D. Eisenhower, see NSC 5918, U.S. Policy on Outer Space, 17 December 1959, which states that the United States '[c]ontinue to support the principle that, in so far as peaceful exploration and use of outer space are concerned, outer space is freely available for exploration and use by all, and in this connection: (a) consider as a possible U.S. position *the right of transit through outer space* of orbital space vehicles or objects not equipped to inflict injury or damage'; sec. 42 (emphasis added).

[216] *Cf.* also further *supra*, § 2.3.1.3.

[217] *Cf.* Arts. II–VI, Registration Convention, *supra* n. 38.

neglected or sloppily executed.[218] That so far few actual collisions between space objects have occurred seems to be more a matter of the relatively small number of space objects operating in a huge area than of proper coordination.

It should be added, of course, that the Registration Convention, while perhaps a convenient starting point in theory, in itself does not provide for any 'management' or even 'coordination' system; it remains with the individual launching states to unilaterally undertake – if possible, of course – any 'traffic manoeuvres' necessitated by any awareness of the potential for a collision. The ISS, for example, with increasing regularity has to undertake in-orbit manoeuvres to avoid space debris – usually without the Registration Convention being of much help in identifying such collision dangers.[219]

The problem of maintaining an operational environment with optimum safety is further complicated by the fact that other systems of registration *also* may provide information (potentially) relevant for avoiding collisions: the voluntary system for registration based on UN Resolution 1721(XVI),[220] the registration of frequencies (intended to be) used by satellites in the context of the International Telecommunication Union (ITU),[221] and the registration of security interests as per the UNIDROIT Space Assets Protocol.[222]

Finally, the Registration Convention clearly has not been geared to either private space activities as such, with registration remaining

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[218] See e.g. the analysis in Y. Lee, Registration of Space Objects: ESA Member States' Practice, 22 *Space Policy* (2006), 42–51; also e.g. B. Schmidt-Tedd & M. Gerhard, Registration of Space Objects: Which are the Advantages for States Resulting from Registration, in *Space Law: Current Problems and Perspectives for Future Regulation* (Eds. M. Benkö & K.U. Schrogl) (2005), 122, 134–5; B. Schmidt-Tedd, The Registration Convention, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 310–14, 322.

[219] See e.g. ISS forced to perform debris avoidance maneuver, www.spacesafetymagazine.com/2012/01/13/iss-forced-perform-debris-avoidance-maneuver/, last accessed 15 January 2014; also generally *Protecting the Space Station from Meteoroids and Orbital Debris* (1997).

[220] UNGA Res. 1721(XVI)B, of 20 December 1961; General Assembly – Sixteenth Session, Resolutions adopted on reports of the First Committee, at 6. See further *supra*, § 2.2.1.1.

[221] See further *supra*, § 8.2.4.

[222] Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (hereafter Space Assets Protocol); UNIDROIT Doc., DCME-SP–Doc. 43, of 9 March 2012. See further *infra*, § 16.4.

squarely an obligation of relevant states entailing a major risk of time delays and other flaws arising, or in particular to private *manned* space activities, where indeed mere registration of positions or even complete flight patterns may no longer suffice – and at some point in the future a space traffic management regime along the lines of the air traffic regime devised under ICAO auspices, especially as applicable to international airspaces (noting that these, like outer space, should be characterized as 'global commons'),[223] may indeed be called for.[224]

12.6 CONCLUDING REMARKS

A mere 15 years ago it was unthinkable to address a complete chapter to private manned spaceflight in a book on space law, let alone one going into considerable detail as does the present one. Yet, the developments sketched here have not only been manifold and diverse, but they have also given rise to one of the more profound reconsiderations of many elements of international space law as it had developed up to that point – next to the more general involvement of private entities in such space sectors as satellite communications, launching and satellite remote sensing, or the ISS as an international manned outpost in space possibly foreshadowing longer-duration human presence on celestial bodies.

Of necessity, the present chapter therefore contains a snapshot of the present legal situation pertaining to private manned spaceflight, in view of the rapidly unfolding developments. Thus, it has also confined itself to just four subcategories of private manned spaceflight, and discussed only a few international as well as domestic US law aspects. Nevertheless, apart from any intrinsic interest in the (legal) subject matter of private manned spaceflight, the discussions on how to apply law to such new ventures are particularly illustrative of how space law evolves, and hence seem to warrant the attention being paid to them here.

This concerns in particular such definitional issues as outer space versus airspace, space objects versus aircraft, and sub-orbital versus orbital, but also responsibility versus liability, private versus public and even of launching, flight and transportation themselves. Many of those concepts had never been precisely circumscribed or defined – largely

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[223] *Cf.* Arts. 77, 78, Chicago Convention, *supra* n. 43; also N. Grief, *Public International Law in the Airspace of the High Seas* (1994); L. Weber & E. Giemulla, *Handbook of Aviation Law* (2011), 144.

[224] *Cf.* for further analysis e.g. *Cosmic Study on Space Traffic Management*, IAA, 2006.

because the necessity to do so had not been there – and had simply been taken for granted. If anything, therefore, the advent of private manned spaceflight is now forcing these issues, and hence will have a greater impact on the evolving legal and regulatory framework for space activities and their major applications than being merely relevant for the private spaceflight activities themselves.

13. Environmental aspects of space activities

Lotta Viikari

13.1 INTRODUCTION

Humanity has benefited from space activities in numerous ways. Among other uses, space technology can provide an effective tool for protection of the environment. For instance, satellites monitor the earth environment and changes in it. They can serve the needs of environmental impact assessments and early warning systems for natural disaster reduction. The range of environmental applications of satellites is nearly unlimited.[1]

Unfortunately, the use of outer space also involves increasing environmental problems. The detrimental effects of space activities may concern the space environment per se, the atmosphere, the earth, and/or human activities in these environments. The most severe environmental hazards in the space sector are those that take place after the launch phase. These include, above all, space debris.[2] Another environmental problem closely connected with that of space debris is the threat of nuclear contamination.[3]

Typical for the threats posed by environmental hazards in outer space is that these threats often do not affect the particular operation which causes them but endanger other space (and even terrestrial) activities indiscriminately. This is a manifestation of the 'tragedy of the commons' problem: benefits of individual space missions accrue primarily to the entities conducting these activities but the detrimental impact of space exploitation can usually hamper all those involved in the sector (and even others).[4] This renders many strategies adopted nationally or by a limited

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[1] See e.g. *Satellite-based Applications on Climate Change* (Eds. J. Qu, A. Powell & M.V.K. Sivakumar) (2013).

[2] See further *infra*, § 13.2.1.

[3] See further *infra*, § 13.2.2.

[4] For a more detailed treatment of the tragedy of the commons problem in general, see J. Vogler**,** *The Global Commons: Environmental and Technological Governance* (2nd edn., 2000), 10–5. On its role in the space sector in particular, see B.C. Weeden & T. Chow, Taking a Common-pool Resources Approach to Space Sustainability: A Framework and Potential Policies, 28 *Space Policy*

set of states for combating adverse environmental consequences of space activities ineffective. Actors adhering to debris mitigation measures, for instance, may find themselves at a competitive disadvantage if others do not comply with similar requirements.

Thus far the international community has not managed to treat many space-related environmental problems with the efficacy these problems appear to require. Nevertheless, positive indications are provided by the efforts of some states and international organizations to alleviate environmental degradation of outer space. Above all, both the governmental sector and the industry have tried to mitigate the problem of space debris by developing procedures, recommendations and standards to promote environmentally more benign practices in the design and operation of space missions. For instance, many states worldwide have issued national debris mitigation guidelines.[5] On a regional level, European organizations in particular have been active in alleviating this hazard. Space debris is also one of the central issues discussed within the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS).[6] Despite the various efforts to confront the debris problem, no binding international regulation exists for mitigating this threat, let alone other environmental problems related to space activities.

A detailed assessment of all environmentally inclined efforts to regulate space activities at regional and national levels is unnecessary because such attempts tend to be broadly consistent. Instead, this chapter discusses the relevance of the instruments of the international law of outer space for regulating environmentally harmful space activities – above all, the five UN space treaties. Additionally, the more recent work of the UN COPUOS and relevant developments within other international organizations are examined. The chapter also puts forward some recommendations for the future.

(2012), 167 ff.; also P.A. Meek, The CRP Approach to Space Sustainability: Commentaries on Weeden and Chow, 28 *Space Policy* (2012), 174–6.

[5] For more information on national regulation pertaining to space debris, see Active Debris Removal – An Essential Mechanism for Ensuring the Safety and Sustainability of Outer Space; Report of the International Interdisciplinary Congress on Space Debris Remediation and On-Orbit Satellite Servicing, 27 January 2012; U.N. Doc. A/AC.105/C.1/2012/CRP.16, 33 ff.

[6] See on the role of UN COPUOS in the law-making process at the international level *supra*, §§ 1.1–1.3, also § 2.1.

13.2 ENVIRONMENTAL HAZARDS

13.2.1 Space Debris

The most prominent environmental problem connected with space activities is space debris. 'Space debris' is a general term referring to all tangible man-made materials in space which do not serve a useful purpose.[7] Various definitions have been given for space debris.[8] The international documents pertaining to the issue typically focus on the functionality of objects as the relevant criteria: space objects[9] become space debris once they cease to be functional.[10] Debris thus includes spent satellites and rocket bodies, their fragments and parts, material released during space operations, as well as leaking fuel, paint flakes, microparticulate matter and such like, orbiting the earth uncontrolled. Everything launched into outer space has the potential to become space debris.

However, even seemingly non-functional space objects may constitute valuable assets. An inactive space object can be in reserve for future activities or carry valuable classified information, for instance. Therefore the criterion of technical functionality may not be the most feasible one for distinguishing space debris from other space objects.[11] Furthermore, it must be emphasized that only 'technical' definitions of space debris

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[7] On the definition of space debris in more detail, see L. Viikari, *The Environmental Element in Space Law* (2008), 31–6.

[8] See e.g. IAA Position Paper on Orbital Debris (2001), 3; Technical Report on Space Debris, UN COPUOS STSC, (1999), para. 6; IADC Space Debris Mitigation Guidelines (2007), Sec. 3.1.

[9] 'Space object' is the term of art used in several space treaties, such as notably the Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971); *cf.* esp. Arts. I(d), II–V; and the Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975); *cf.* esp. Arts. I(b), II, IV. See also further on these Conventions *infra*, and § 2.3.3 and § 2.3.4 respectively.

[10] See Active Debris Removal 2012, *supra* n. 5, 30.

[11] See L. Perek, Management Issues Concerning Space Debris, in *Proceedings of the Fourth European Conference on Space Debris* (2005), ESA/ESOC, ESA SP-587, 588; F.G. von der Dunk, Too-close Encounters of the Third-party Kind: Will the Liability Convention Stand the Test of the Cosmos 2251–Iridium

exist: as indicated above, there is no commonly accepted legal definition of what constitutes space debris. It may well be that not all man-made items in outer space that can be considered debris from a purely technical point of view should be classified as space debris in a legal sense.

Currently about 21,000 man-made objects are being actively tracked in earth orbit; around 16,000 of them are of known origin and catalogued in the US Space Command's Space Surveillance Network (SSN).[12] Fewer than 3,500 of the catalogued space objects are payloads, about 9,000 fragmentation debris, and about 1,800 mission-related debris; the number of rocket bodies is nearly as high as that of mission-related debris.[13] Additionally, it is estimated that there may be as many as 600,000 smaller (1–10 cm) uncatalogued objects in earth orbit, and hundreds of millions of pieces within the range of one millimetre to one centimetre.[14]

The main sources of space debris are break-ups (accidental and intentional) and (intentionally released) operational debris. These are expected to be overtaken by collisions as the primary source of debris in the not too distant future.[15] Debris originating from human space activities concentrates in the orbits where most human activities take place. Accordingly, a little over half of the debris measuring more than 1 cm in size is located in low earth orbit (LEO),[16] where also the highest probability of collisions lies.[17] At the same time, there have been more

33 Collision?, in *Proceedings of the Fifty-Second Colloquium on the Law of Outer Space* (2010), 203.

[12] For information about different space object catalogues worldwide, see B. Weeden, Overview of the Legal and Policy Challenges of Orbital Debris Removal, 27 *Space Policy* (2011), 41.

[13] See 16-1 *Orbital Debris Quarterly News* (Jan. 2012), 7–8.

[14] See Active Debris Removal 2012, *supra* n. 5, 10.

[15] See Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, UN OOSA (2010), ST/SPACE/49, www.oosa.unvienna.org/pdf/publications/st_space_49E.pdf, last accessed 11 February 2014. Initially the Guidelines were approved in 2007; see Report of the Forty-fourth session of the STSC, 2007, A/AC.105/890, Annex IV; Report of the Fiftieth session of COPUOS, 2007, A/62/20, Annex. Space Debris Mitigation Guidelines of the UN COPUOS, 1, 3.

[16] See Active Debris Removal 2012, *supra* n. 5, 15.

[17] See *ibid.*, 17. The low polar orbits used by earth observation satellites are particularly congested; see M. Williams, Space Debris as a 'Single Item for Discussion', in *Proceedings of the International Institute of Space Law 2011* (2012), 333; C. Wiedemann, Space Debris Mitigation, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 320, 323.

launches to higher orbits where objects (including space debris) stay longer.[18]

Until the mid-1990s, the growth of space debris was linear. Debris mitigation efforts and a decrease in the number of launches contributed to a notable decrease in the amount of catalogued space debris in the late 1990s and early 2000s.[19] However, two major debris-generating break-up events changed the situation. In January 2007 China conducted an anti-satellite (ASAT) weapons test by destroying its polar-orbiting weather satellite Fengyun-1C. In February 2009 the first collision between two satellites, the (non-functional) Russian satellite Cosmos-2251 and the active US satellite Iridium-33 took place.[20] By July 2012 a total of over 5,500 debris particles had been officially catalogued in the SSN following these break-ups, 90 per cent of which were still in orbit. These pieces of debris account for 36 per cent of all LEO objects.[21] Even a single break-up incident (let alone several) can thus make a big difference.

A mere 6–7 per cent of tracked space objects are active, operational satellites.[22] As said above, space debris constitutes a hazard to all spacecraft indiscriminately. The harm it may cause can range from radio interference to collisions. The latter may result in anything between minor damage to total loss of spacecraft. Effective shielding is possible only against debris below 1 cm in diameter.[23]

The potential damage by even the tiniest debris particle circulating in outer space derives from the fact that impact velocities in orbits are enormous (0.1–0.8 km/s in geostationary orbit; 6–14 km/s in LEO).[24] A particle no more than 1 cm in size can easily incapacitate an entire

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18 See Active Debris Removal 2012, *supra* n. 5, 7.

19 See Space Security 2011, 29, www.spacesecurity.org/space.security.2011.revised.pdf, last accessed 11 February 2014.

20 The incident has been described as having 'no doubt unchained a new chapter in the field of space debris': Williams, *supra* n. 17, 2. Such collisions are now increasingly viewed as a real risk; *ibid.*, 4. See also Report of the Fifty-second session of COPUOS, 2009, para. 110; Report of the Forty-sixth session of the STSC, 2009, A/AC.105/933, para. 73. For a detailed legal analysis of the incident from the point of view of liability, see von der Dunk, *supra* n. 11, 199–209.

21 See 16-3 *Orbital Debris Quarterly News* (July 2012), 2.

22 See Active Debris Removal 2012, *supra* n. 5, 10.

23 See *ibid.*, 14.

24 See R.S. Jahku, Space Debris in the Geostationary Orbit – A Matter of Concern for the ITU, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 206.

functional satellite, and an even smaller piece of debris entering the body of an active satellite can trigger a fatal reaction.[25] Space debris presents an obvious threat also to humans in space. Astronauts performing extra-vehicular activities are in the greatest danger, as a spacesuit cannot offer even as much protection against space debris as the shielding of a spacecraft can.

Even collisions with less dramatic consequences result in more debris, as larger pieces fragment into smaller ones, increasing the risk of further collisions. Although for most space operations the chance of colliding with a sizeable debris fragment might remain relatively low still for some time, it has been estimated that growth in the debris population can turn valuable regions in earth orbits inhospitable within only a few decades.[26] Once the density of objects in orbit is high enough, pieces of debris may even start to collide with each other in a cascading manner, leading to ever more space debris.[27]

Collisions can also release radioactive contamination and other harmful substances. Obviously, space debris is a particular hazard to manned space activities. The International Space Station (ISS)[28] had to conduct four collision avoidance manoeuvres between April 2011 and April 2012 (and would have conducted two more, had the warnings come sooner)[29] – quite an increase compared to its previous average collision avoidance

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[25] See *ibid.*, 209.

[26] *Cf.* e.g. Space Security 2011, *supra* n. 19, 29.

[27] Such a chain reaction is also known as the 'Kessler effect' or 'Kessler syndrome', referring to Donald Kessler, who predicted the possibility as early as 1978; see D.J. Kessler & B.G. Cour-Palais, Collision Frequency of Artificial Satellites: The Creation of a Debris Belt, 83-A6 *Journal of Geophysical Research* (June 1978), 2637–46; webpages.charter.net/dkessler/files/Collision%20Frequency.pdf, last accessed 11 February 2014. For a more detailed account of the threat, see The Kessler Syndrome, as discussed by Donald J. Kessler, 8 March 2009, http://webpages.charter.net/dkessler/files/KesSym.html, last accessed 11 February 2014.

[28] See for the ISS more in detail *supra*, §§ 11.2–11.6.

[29] Collision threats are not always detected in time for conducting avoidance manoeuvres. The last time astronauts on the ISS had to seek refuge in emergency escape capsules because of debris passing the station too close was in March 2012; *cf.* ISS Crew Take to Escape Capsules in Space Junk Alert 2012, BBC News, 24 March 2012, www.bbc.co.uk/news/science-environment-17497766, last accessed 11 February 2014. A similar incident took place in June 2011; see K. Chang, Debris Gives Space Station Crew Members a 29,000-M.P.H. Close Call, *New York Times*, 28 June 2011, www.nytimes.com/2011/06/29/science/space/29junk.html?_r=1, last accessed 11 February 2014.

manoeuvre rate of one per year since 2000.[30] Also satellites need to perform avoidance manoeuvres on a regular basis.[31] Space debris is dangerous even because it can crash to earth. This poses a risk to human life, as well as a risk of creating environmental pollution, particularly where satellites with nuclear power sources are concerned. On balance, 'space debris presents a global risk to humanity in general and to space activities of all space-faring nations in particular'.[32]

13.2.2 Nuclear Contamination

The problem of space debris is closely linked to that of the use of nuclear power for space activities. Nuclear power sources (NPS) as such constitute an environmental threat in outer space but the risks are multiplied by the presence of space debris which can cause collisions and, eventually, more radioactive space debris. A major source of nuclear contamination in outer space would be collisions and explosions of satellites with NPS on board.[33] Also nuclear space debris and radiation may pose particularly serious hazards for participants in manned space flights.

However, the most severe of the risks posed by the use of NPS in space from a human point of view seems to be the possibility of radioactively contaminated objects returning to earth. This constitutes a real risk for the population living beneath the orbit of a space object with an NPS on board, as was demonstrated by the unprogrammed re-entry in 1978 of the Soviet satellite Cosmos-954 which was equipped with a uranium-fuelled NPS. The orbit of Cosmos-954 decayed, and it

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[30] See Increase in ISS Debris Avoidance Maneuvers, 16-2 *Orbital Debris Quarterly News* (April 2012), 1, orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv16i2.pdf, last accessed 11 February 2014.

[31] In 2010, NASA's satellites conducted seven collision avoidance manoeuvres, ESA satellites nine, and satellites of the French space agency CNES a total of 13; see Space Security 2011, *supra* n. 19, 36. On average, satellite operators performed three collision avoidance manoeuvres per week in 2010; see Towards Long-term Sustainability of Space Activities: Overcoming the Challenges of Space Debris, Report of the International Interdisciplinary Congress on Space Debris, January 2011, A/AC.105/C.1/2011/CRP.14, 21.

[32] Towards Long-term Sustainability of Space Activities, *supra* n. 31, 6.

[33] Previously, intentional nuclear explosions, i.e. nuclear tests, were also conducted in outer space by the United States and the Soviet Union. Such operations were prohibited in 1963 by the Partial Test Ban Treaty (Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water, done 5 August 1963, in force 10 October 1963, 480 UNTS 43).

re-entered the atmosphere and disintegrated in Canada, scattering hazardous radioactive debris across a large tract of land. Fortunately, it landed in the uninhabited Canadian north, resulting in no more than clean-up operations. Had the debris come down in populated areas, massive damage to health and property could have occurred.[34] Despite the risks involved, NPS will be used in space activities; they provide the only viable energy option for many longer-duration space missions.[35]

13.2.3 Other Environmental Hazards

Space debris and nuclear contamination are by no means the only environmental problems related to space exploration. The production of space technology and the transport of its products on earth are far from being environmentally friendly activities. The launching stage produces noise pollution, dust and emissions. On the way to outer space, discharges from the rocket motors cause the atmosphere to deteriorate.[36] Other potential environmental hazards in the space sector include organic contamination of outer space ('forward contamination') and its converse, 'back-contamination' of the earth by unfamiliar contaminants transported by returning spacecraft.

At least at the moment, such threats appear less relevant than those posed by space debris and nuclear contamination. Therefore the focus in

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[34] For a more detailed account of the Cosmos-954 incident, see e.g. S. Gorove, *Developments in Space Law: Issues and Policies* (1991), 239–41; also further *supra*, § 2.3.3.9.

[35] See e.g. L. Summerer & U.M. Bohlmann, The STSC/IAEA Safety Framework for Space Nuclear Power Source Applications – Influence of Non-binding Recommendations, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 233–8.

[36] See e.g. M. Rothblatt, Environmental Liability Issues of Rocket Exhaust under International Space Law, in *Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space* (1993), 308; C.Q. Christol, Protection of the Space Environment – Debris and Power Sources. The Use of Airspace and Outer Space for All Mankind in the 21st Century, in *Proceedings of the International Conference on Air Transport and Space Application in a New World* (Ed. C.J. Cheng) (1995), 254, 258. It has been argued, however, that degradation of the atmosphere caused by space activities is negligible; *cf.* L. Perek, Maintaining the Space Environment, in *Luft- und Weltraumrecht im 21. Jahrhundert/Air and Space Law in the 21st Century* (Eds. M. Benkö & W. Kröll) (2001), 422.

the following is on regulation of the space debris issue and the use of NPS, primarily in earth orbits.[37]

13.3 SPACE LAW FROM AN ENVIRONMENTAL PERSPECTIVE

13.3.1 UN Space Law

The body of international space law consists of five UN treaties: the 1967 Outer Space Treaty;[38] the 1968 Rescue Agreement;[39] the 1972 Liability Convention;[40] the 1975 Registration Convention;[41] and the 1979 Moon

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37 One should also not ignore the fact that other celestial bodies and their orbital environments will face similar threats sooner or later; see M. Williamson, Scope and Methodology, in *IAA Cosmic Study 'Protecting the Environment of Celestial Bodies'* (Eds. M. Hofmann, P. Rettberg & M. Williamson) (2010), 12; iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%205/sg56/sg56finaldraftreport.pdf, last accessed 11 February 2014. The current international law of outer space is largely silent as to environmental considerations pertaining to celestial bodies other than the earth (and our moon). For instance, the UN NPS Principles (see further *infra*, § 13.3.1.4) give no guidance for the disposal of nuclear devices elsewhere than in earth orbiting satellites; see F. Lyall, Planetary Protection from a Legal Perspective – General Issues, in *IAA Cosmic Study 'Protecting the Environment of Celestial Bodies'* (Eds. M. Hofmann, P. Rettberg & M. Williamson) (2010), 60; iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%205/sg56/sg56finaldraftreport.pdf, last accessed 11 February 2014.

38 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967). See further in general *supra*, § 2.3.1.

39 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968). See further in general *supra*, § 2.3.2.

40 *Supra*, n. 9.

41 *Supra*, n. 9.

Agreement.[42] The Moon Agreement is the most advanced of these in an environmental sense. However, to this date, it has gained no more than 15 states parties, which renders the instrument practically meaningless.[43] Another UN space treaty which remains less relevant for the current examination is the Rescue Agreement.[44]

Unfortunately, even the remaining UN space treaties have relatively little to say about environmental issues. At the time of their conclusion in the 1960s and 1970s, such considerations were not among the highest-ranking items on the agendas of states. Later on, it has proven very challenging for the actors in the arena to agree on new legally binding international rules. Instead, the UN General Assembly has adopted five sets of (non-binding) principles applicable to the use of outer space.[45] The most relevant of these from an environmental point of view are the 1992 NPS Principles (Principles Relevant to the Use of Nuclear Power Sources in Outer Space).[46]

Another regulator of space activities worth mentioning here is the UN-sponsored International Telecommunication Union (ITU).[47] Its interest in guaranteeing undisturbed telecommunication activities (including those that are space-based) in general and the effective use of the geostationary orbit (GEO) for satellite communications in particular have resulted in certain regulations relevant to environmental aspects of space activities.

Above all, the ITU has long been concerned over physical overcrowding of GEO by functional as well as non-functional space objects. As early as the beginning of the 1970s, the Union declared GEO to be a limited international natural resource to which all countries are entitled to

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[42] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979). See further in general *supra*, § 2.3.5.

[43] See www.unoosa.org/oosa/SpaceLaw/treatystatus/index.html, last accessed 11 February 2014. For a thorough examination of the Moon Agreement from an environmental perspective, see Viikari, *supra* n. 7, 62–5.

[44] For an examination of the possible relevance of the Rescue Agreement in cases involving environmental damage in the space sector, see Viikari, *supra* n. 7, 81–3.

[45] *Cf.* in general also *supra*, § 2.2.1.3.

[46] Principles Relevant to the Use of Nuclear Power Sources in Outer Space (hereafter NPS Principles), UNGA Res. 47/68, of 14 December 1992; UN Doc. A/AC.105/572/Rev.1, at 47.

[47] See on the role of the ITU in general *supra*, § 8.2.

equitable access.[48] Today, the ITU Constitution provides that 'Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically'.[49]

The ITU also adopted as early as 1993 a recommendation on 'Environmental Protection of the Geostationary Satellite Orbit', which called upon states to ensure that geostationary satellites are transferred at the end of their lifetime to a 'supersynchronous graveyard orbit' which does not intersect GEO.[50]

13.3.1.1 The Outer Space Treaty

The leading principle in UN space law is that of the freedom of use and exploration of outer space.[51] The Outer Space Treaty requires 'free access to all areas of celestial bodies',[52] which might be compromised by pollution of outer space, particularly by the growing amount of space debris.[53] Another central principle is that the 'launching State', by registering it, retains jurisdiction and control over a space object and any personnel thereof.[54] The ownership of objects launched into outer space is not affected by their presence there or by their return to earth.[55] At the time the Outer Space Treaty was drafted, it was obviously presumed that

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48 *Cf.* Art. 33(2), International Telecommunication Convention, Malaga-Torremolinos, done 25 October 1973, entered into force 1 January 1975; 28 UST 2495.

49 Art. 44(2), Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1; newest version: Collection of the Basic Texts of the International Telecommunication Union adopted by the Plenipotentiary Conference, 2011 edition, 3–56.

50 *Cf.* ITU-R S.1003, Point 3. In 2004, the ITU revised this recommendation to endorse use of the formula of the IADC Space Debris Mitigation Guidelines, *supra* n. 15, (see further *infra*, § 13.3.2.2) for calculating minimum disposal altitudes for GEO spacecraft (Sec. 5.3.1, Space Debris Mitigation Guidelines). The formula generally results in disposal altitudes of 235–450 km above GEO. The aim is to guarantee that the spacecraft disposed of will never return to within 200 km of GEO; *Cosmic Study on Space Traffic Management*, IAA (Eds. C. Contant-Jorgenson, P. Lála & K.U. Schrogl) (2006), 34.

51 See Art. I, Outer Space Treaty, *supra* n. 38.

52 Art. I(2), Outer Space Treaty, *supra* n. 38.

53 See also M. Williamson, *Space: The Fragile Frontier* (2006), 154.

54 See Art. VIII, Outer Space Treaty, *supra* n. 38.

55 See *Ibid.*

each state wanted to maintain the ownership of a spacecraft at all times. However, this is not necessarily the case with space debris because of the responsibility and liability provisions (as will be examined in more detail below).

Retaining jurisdiction and control also means retaining responsibility and liability: a state cannot avoid its duties as a 'launching State' by abandoning a space object.[56] An extremely difficult question is whether the removal of another state's space object could be possible under some circumstances without the approval of that state. The UN space treaties never envisioned such a scenario either. They recognize no termination of the jurisdiction and control over a space object – either permanently or temporarily.[57] Because of the extra-territorial jurisdiction of states over their space objects, an attempt to unilaterally remove a foreign space object can even be considered a breach of sovereignty.[58]

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[56] *Cf.* Art. VII· Outer Space Treaty, *supra* n. 38.

[57] See Active Debris Removal 2012, *supra* n. 5, 33. It has been suggested that the Rescue Agreement, *supra* n. 39, could allow a state threatened by space debris launched by another state to unilaterally remove such an object; see N.M. Matte, Environmental Implications and Responsibilities in the Use of Outer Space, 14 *Annals of Air & Space Law* (1989), 433; C.Q. Christol, Jurisdiction and Control: Permissible Unilateral Responses to Dangerous Space Debris, in *Luft- und Weltraumrecht im 21. Jahrhundert/Air and Space Law in the 21st Century* (Eds. M. Benkö & W. Kröll) (2001), 303–12. On unilateral measures as a response to space debris, see also e.g. H.A. Baker, Liability for Damage Caused in Outer Space by Space Refuse, 13 *Annals of Air & Space Law* (1988), 191–2; C.Q. Christol, Suggestions for Legal Measures and Instruments for Dealing with Debris, in *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection* (1990), 268–80; H. DeSaussure, An International Right to Reorbit Earth Threatening Satellites, 3 *Annals of Air & Space Law* (1978), 389–94; G.T. Hacket, *Space Debris and the Corpus Iuris Spatialis* (1994), 189–99; Matte, *supra*, 434; K.F. Schwetje, Liability and Space Debris, in *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection* (1990), 36–40. However, the Outer Space Treaty, *supra* n. 39, assigns the jurisdiction, control and ownership of a space object to the state of registration for an indeterminate period of time, which seems to militate against such interpretations.

[58] State jurisdiction is the manifestation of state sovereignty. The extra-territorial jurisdiction a state possesses over its space objects (and persons and things on board) can also be termed 'quasi-territorial jurisdiction'. The same applies to ships and aircraft beyond the national territory. See B. Cheng, *Nationality for Spacecraft? Air and Space Law: De Lege Ferenda* (Eds. T.L. Masson-Zwaan & P.M.J. Mendes de Leon) (1992), 206; also Weeden, *supra* n. 12, 41. On the other hand, as the debris population increases, hazards may become so severe that there might not always be time to negotiate about the need

Article IV of the Treaty forbids the stationing of 'any objects carrying nuclear weapons or any other kinds of weapons of mass destruction' in outer space. It also reserves celestial bodies for 'exclusively peaceful purposes', banning all military activity on them. Furthermore, Article IX requires states parties to conduct their activities in outer space, including the moon and other celestial bodies, 'so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, [to] adopt appropriate measures for this purpose'.

It should be noted that although the Outer Space Treaty prescribes that states are to avoid any harmful contamination of outer space, the terrestrial environment is only protected from 'changes … resulting from the introduction of extraterrestrial matter' ('back-contamination'). Another observation is that the determination of which measures should be regarded as 'appropriate' (and when it is 'necessary' to adopt such measures) is completely at the discretion of the state conducting potentially harmful space activities. Moreover, the Outer Space Treaty fails to give guidance in determining the meaning of both 'harmful contamination' and 'adverse changes in the environment'.[59] On balance, the duty to avoid harmful contamination is 'general and aspirational', leaving 'indefinite the circumstances when active measures are to be taken'.[60]

Furthermore, Article IX of the Treaty includes an obligation to conduct space activities 'with due regard to the corresponding interests of all other States Parties', thus pointing towards an obligation to avoid creating hazards that could adversely affect the safe conduct of space

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to remove a certain space object with the state that has jurisdiction and control over it. Eventually, it may become necessary to exempt space debris from such 'protection' by space law; *cf.* Perek, *supra* n. 11, 589. See M. Mejía-Kaiser, Removal of Non-functional Space Objects without Prior Consent, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 293–301, for a suggestion to use the Nairobi International Convention on the Removal of Wrecks (Nairobi Convention), Nairobi, done 18 May 2007, not yet entered into force; Cm. 8243, Misc. No. 5 (2011); 46 ILM 694 (2007), www.official-documents.gov.uk/document/cm82/8243/8243.pdf, as a model for the removal of space debris.

59 For a discussion concerning the terms 'contamination', 'harmful', and 'adverse changes', as well as the 'necessity' and 'appropriateness' referred to in Art. IX, Outer Space Treaty, *supra* n. 39, see, e.g. *ILA Report of the Sixty-Fourth Conference*, Queensland, 1990, 156–61.

60 Lyall, *supra* n. 37, 58.

activities by other states.[61] As for more concrete obligations, the Article establishes a requirement for a state party to undertake 'appropriate international consultations' before proceeding with a planned space activity or experiment that might cause 'potentially harmful interference' with the space activities of others. Another state party may request such consultations – but only if it 'has reason to believe' that the planned activity 'would cause potentially harmful interference with activities in the peaceful exploration and use of outer space'.[62]

By talking about harmful interference with others' space activities, the consultation clause of the Outer Space Treaty clearly aims not to protect the environment per se but to safeguard human space activities.[63] Yet, a spill-over effect may be better environmental protection. However, the obligation to enter into consultations does not entitle the potentially affected state to bar the planned activity, nor does it specify any procedure or time limits for the consultations or requirements for providing the other state(s) involved with information of any kind. Furthermore, the consultations need not lead to any result, and even if they do, there is no obligation to take into account the result in any way when eventually conducting the space activities concerned. Even the basic notion of 'appropriate international consultations' remains quite ambiguous. Accordingly, although consultations could provide a positive force for environmental protection the consultation requirement of the Outer Space Treaty remains rather trivial in practice.[64] Not surprisingly, states are not particularly eager to consult with each other about their planned space activities. A state reluctant to consult could in many cases also easily claim that it was not aware of any potential threat from its plans to the space activities of others.[65]

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[61] The duty to pay due regard to the corresponding interests of other states in the Outer Space Treaty, *supra* n. 38 (and in the law of the sea) is examined in more detail in Hacket, *supra* n. 57, 86–103.

[62] Art. IX, Outer Space Treaty, *supra* n. 38.

[63] It has been argued that the protection offered to outer space by Art. IX, Outer Space Treaty, *supra* n. 38, was never intended to extend to the space environment as such but was only meant to further scientific utility. See H.A. Baker, Protection of the Outer Space Environment: History and Analysis of Article IX of the Outer Space Treaty, 12 *Annals of Air & Space Law* (1987), 163, 166–7. For a more detailed treatment of the negotiation history of Art. IX and the conflict between environmental and utility approaches, see *ibid.*; also Hacket, *supra* n. 57, 104–20.

[64] See Hacket, *supra* n. 57, 120–31, for a discussion of the consultation clause of the Outer Space Treaty, *supra* n. 38, in general.

[65] See Hacket, *supra* n. 57, 124.

This also raises the question regarding whether the only obligation China violated when shooting down their Fengyun-1C weather satellite was not informing and consulting in advance, not so much the shooting itself. This might have been an extreme case; following prior information and consultation the protests that would have arisen in this particular case would have made it hard for China to claim ignorance of potentially harmful consequences. But even then one might need to resort to general environmental and other international law principles of a more general nature (such as *sic utere tuo*[66]) for finding illegality of China's actions, as space law alone would seem to provide tools too modest for such a result.

13.3.1.2 The Liability Convention

A central concern when talking about environmental harm caused by space activities is responsibility and liability. The general rule, according to Article VI of the Outer Space Treaty, is that states bear international responsibility for activities in space. Article VII, moreover, establishes international liability of 'launching States'. The 'launching State' is liable 'for damage to another State Party or to its natural or juridical persons caused by [its space] object or its component parts on the Earth, in air or in outer space, including the Moon and other celestial bodies'.[67]

The Liability Convention complements these provisions by setting out more detailed rules for cases of 'space damage' involving different states. It establishes two separate regimes of liability: one of absolute liability to be applied in the case of damage caused by a space object 'on the surface of the Earth or to aircraft flight',[68] and another based on fault liability

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[66] For more information on the principle *sic utere tuo, ut alienum non laedas* ('use your own property in such a manner as not to injure that of another') in general and its role in the space sector in particular, see Viikari, *supra* n. 7, 150–7; further also E.E. Smead, Sic Utere Tuo Ut Alienum Non Laedas: A Basis of the State Police Power, 21 *Cornell Law Quarterly* (1935–1936), 276–92; G. Lynham, The Sic Utere Principle as Customary International Law: A Case of Wishful Thinking, 2 *James Cook University Law Review* (1995), 172–89.

[67] Art. VII, Outer Space Treaty, *supra* n. 38.

[68] Art. II, Liability Convention, *supra* n. 9. Pursuant to Art. VI, exoneration from absolute liability is to be granted 'to the extent that a launching State establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents', except in cases where the 'launching State' has caused the damage by violating international law.

which applies when the damage occurs in outer space.[69] All space activities are ultra-hazardous and it has been deemed appropriate that those engaged in such activities (and gaining profit from them) should also bear the risk of any ensuing damage, whereas possible victims on earth deserve full compensation.[70] In particular, if NPS are used, such damage can be considerable. Article V of the Convention improves the possibilities for victims of damage to obtain compensation by establishing joint and several liability of all 'launching States' for joint launches and the right of the victim state to seek the entire compensation from any or all of the launching states.

However, although this system may by and large afford victims of space operations considerable protection, it can appear less just from the point of view of those involved in a space mission. Firstly, the Liability Convention restricts its scope by excluding damage caused to citizens of the same state which launched the space object in question, as well as to foreign nationals participating in that space operation.[71] Secondly, under Article III, persons (as well as property) must be on board a space object in order to recover damages, a condition which in principle would, for instance, exclude incidents in which astronauts engaged in extra-vehicular activities are killed.

Furthermore, a major problem is the overly extensive definition of a launching state. Pursuant to the Liability Convention, the term 'launching State' means '(i) A State which launches or procures the launch of a

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[69] See Art. III, Liability Convention, *supra* n. 9.

[70] This can be seen as a manifestation of the doctrine of 'dangerous things', under which 'a person who creates a situation where there is a possibility of acute and catastrophic danger is liable without proof of fault to pay compensation if that danger eventuates'; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 108. Pursuant to the Preamble to the Liability Convention, *supra* n. 9, a focal motive for the Convention was 'to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of [damage caused by space objects]'. As is stated in Advantages of adherence to the Convention on International Liability for Damage Caused by Space Objects, produced by a Working Group on the Status and Application of the Five United Nations Treaties on Outer Space under the Legal Subcommittee of the UNCOPUOS: '[b]y concentrating internationally the concept of absolute or objective and unlimited liability for any damage caused by space objects on the surface of the Earth or to aircraft in flight, the [Liability] Convention has become a unique case and a real novelty in contemporary public international law concerning the protection of victims'. Report of the Forty-fifth session of the LSC, 2006, A/AC.105/871, Annex I, Appendix, para. 3.

[71] See Art. VII, Liability Convention, *supra* n. 9; also *supra*, § 2.3.3.5.

space object; (ii) A State from whose territory or facility a space object is launched'.[72] Hence, most launches will involve several 'launching States', of which only few typically have a real say in the operation of the space mission. Application of the Liability Convention may thus result in liability of states that are in fact little more than 'innocent bystanders'. It may even be complicated to determine which states constitute the 'launching States' under the Liability Convention. Above all, the 'procurement' of the launching of a space object is anything but an unequivocal expression, particularly where space objects launched by private entities are concerned.[73]

The Liability Convention also regulates situations where damage is caused

> elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State, and of damage thereby being caused to a third State or to its natural or juridical persons.[74]

In such a case 'the first two States shall be jointly and severally liable to the third State'.[75] This means that, for instance, if a piece of space debris hits a spacecraft of another state and this causes further damage to a third state, both the 'launching State' of the debris (where its identity can be established) and that of the ('innocent') spacecraft damaged by it are jointly and severally liable for possible damage to any other states. In the case of damage which occurs in outer space, fault liability applies,[76]

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[72] Art. I(c), Liability Convention, *supra* n. 9. Art. V(3) further specifies that a state 'from whose territory or facility a space object is launched shall be regarded as a participant in a joint launching'. See also Application of the concept of the 'launching State', UNGA Res. 59/115, of 10 December 2004; UN Doc. A/RES/59/115, adopted on the basis of a resolution of UN COPUOS in 2004 (Report of the Forty-seventh session of COPUOS, 2004, A/59/20, para. 149 and Annex II).

[73] 'Procurement' may be interpreted to include financial backing for a launch, a request by one state to another to launch a satellite of the requester or a private individual or enterprise providing payload for a launch, for instance. On the other hand, such activities as supplying minor components to the payload or the sale of a satellite should not be enough to qualify as 'procurement' causing a country to be considered as a 'launching state'. *Cf.* Christol, *supra* n. 36, 271–2; also *supra*, § 2.3.3.1.

[74] Art. IV(1), Liability Convention, *supra* n. 9.

[75] *Ibid.*

[76] See Art. IV(1.b), Liability Convention, *supra* n. 9.

whereas for damage on earth (or to aircraft in flight) liability is absolute.[77]

If a spacecraft with an NPS is involved and parts of it fall back to earth, the damage may be very grave and the ensuing absolute liability accordingly significant. Moreover, the victims are allowed to ask for full compensation from any one of the liable states, who are then to apportion it between themselves according to fault.[78] Consequently, if there is no fault on the part of the launching state of the NPS-equipped spacecraft but only on the part of the 'launching State' of the piece of debris (no matter how small that piece is), the latter is to pay all of the compensation.[79] Even in such a case, the victims of damage on earth can, on the other hand, legitimately demand the entire compensation from the 'innocent' state (which may eventually encounter difficulties in collecting it from the state at fault).

The situation is the same where active debris removal (ADR) is concerned: if a removal operation causes damage to a third state, both the 'launching State' of the target (space debris) and that of the removal mechanism would be liable (jointly and severally). Even where the 'launching State' itself is performing the removal operation, the legal complexities involved can be significant. All ADR operations will inevitably require some interaction with the target object and may hence pose a hazard to space activities.[80] Crossing orbits obviously increases the risk of collisions.[81] On balance, debris removal operations can entail

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[77] See Art. IV(1.a), Liability Convention, *supra* n. 9.

[78] See Art. IV(2), Liability Convention, *supra* n. 9. Also von der Dunk, *supra* n. 11, 204. Art. IV(2) further provides: 'If the extent of the fault of each of these States cannot be established, the burden of compensation shall be apportioned equally between them.'

[79] This illustrative example has been presented by A. Kerrest de Rozavel, Space Debris, Remarks on Current Legal Issues, in *Proceedings of the Third European Conference on Space Debris*, Vol. 2 (2001), ESA SP-473, 870–1, who suggests that liability rules should be amended so as to avoid outcomes where damage resulting from nuclear pollution is not compensated by the user of the NPS; see *ibid.*, 873.

[80] Even the possible use of 'remote control' techniques based on lasers fired into space in order to alter the orbit of a piece of debris can be problematic. For instance, accidental illumination of spacecraft by low-power lasers could damage optical sensors; see Weeden, *supra* n. 12, 39, 41–2.

[81] See Active Debris Removal 2012, *supra* n. 5, 32.

considerable legal challenges in terms of liability – which may create an incentive to leave space debris where it is.[82]

Fault liability is problematic also because proving fault may be an insurmountable problem where damage caused by space debris is concerned. Very often, the source of a particular piece of debris cannot be identified, in which case it is also impossible to identify an entity to whom fault could be attributed. It may even be impossible to point out the debris particle which caused the damage.

However, even where a known debris object is concerned, proving fault can be very difficult. There exist no systematic 'space traffic rules' or other such standards (including standards for handling the environmental hazards of space activities) a breach of which could indisputably be considered as establishing fault under the Liability Convention. For instance, leaving a non-functional satellite in orbit (even in a congested one) is not against the law of outer space, although removing such objects would of course be desirable.[83] In a similar manner, as long as no standard of care for ADR operations exists, it is very difficult to assess whether negligence has been involved in a possible damaging incident occurring in the context of such operations.[84]

Furthermore, even if liability can be established, the liable entity is the 'launching State' – also where the owner and operator of the space object is a completely different entity. This is true even for satellites the ownership of which has changed while in orbit.[85] Damage is, moreover, only compensable if it results in 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations'.[86] States cannot be held liable for the mere

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[82] It has been proposed that if damage occurs while someone attempts to 'do the right thing', i.e. to remove space debris, fault could be somehow mitigated. See Active Debris Removal 2012, *supra* n. 5, 32. Fault-based liability could even be replaced by a standard building upon strict, objective liability with a limited liability amount. Alternatively, states involved in debris mitigation/remediation programmes could resort to mutual waivers of liability; see Active Debris Removal 2012, *supra* n. 5, 42.

[83] The situation is typically less complicated where damage is caused by space debris falling down to earth: there is no need to establish fault because the absolute liability regime applies. Moreover, objects that survive passage through the earth's atmosphere tend to be large and thus more likely to be identifiable. See Kerrest de Rozavel, *supra* n. 79, 870.

[84] See Weeden, *supra* n. 12, 42.

[85] See Active Debris Removal 2012, *supra* n. 5, 32.

[86] Art. I(a), Liability Convention, *supra* n. 9.

presence in outer space of any form of pollution or even for damage the pollution may have caused to the environment outside the sovereign territory of states. The Liability Convention does not even mention such environmental problems as pollution; it is merely concerned with direct damages suffered by states or legal or juridical persons due to the space activities of others.[87] Moreover, an activity merely involving a *risk* of damage, no matter how hazardous, without such damage actually occurring can never result in liability under the Convention.

The ambiguous terminology of the Liability Convention can even be interpreted to exclude all damage caused by space debris: it applies to damage 'caused by a space object' and the only definition the Convention provides of a 'space object' is that it includes 'component parts of a space object as well as its launch vehicle and parts thereof'.[88] It has indeed been questioned whether this provision refers to anything other than entire units. The situation becomes most complicated in the case of small pieces of debris, as one can argue that such a particle is neither a space object nor a component part of one. However, if space debris does not qualify as a space object for the purposes of the Liability Convention, the instrument becomes largely meaningless in establishing liability for space activities: an interpretation which would exclude the most common and hazardous form of potential damage related to space activities from the scope of the Convention can hardly be considered feasible.[89]

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87 Only Art. XXI, Liability Convention, *supra* n. 9, can be interpreted as referring to the environmental consequences of space activities: it mentions damage caused by space objects presenting 'a large-scale danger to human life' or seriously interfering 'with the living conditions of the population or the functioning of vital centres'. This Article does not, however, regulate issues of responsibility or liability but merely aspires to guarantee 'appropriate and rapid assistance to the State which has suffered the damage', if that state so requests.

88 Art. I(d), Liability Convention, *supra* n. 9; see also *supra*, § 2.3.3.3.

89 It has been argued to be 'commonly accepted' that the definition of 'space object' as including 'its launch vehicle and parts thereof' 'may include debris caused by the breakup of a launch vehicle' and even other types of space debris; Lyall & Larsen, *supra* n. 70, 107, see also 86. Interestingly, the European Space Agency took the position as early as 1988 that space debris can be regarded as a 'component part' of a space object; see Report of the ESA Space Debris Working Group, 1988, 67. Some authors go as far as to argue that anything launched into outer space can qualify as a 'space object'; see Kerrest de Rozavel, *supra* n. 79, 869 and n. 1. In the same vein, the 2004 European Code of Conduct for Space Debris Mitigation defines space debris as any non-functional man-made space object 'including fragments and elements thereof'; European Code of Conduct for Space Debris Mitigation, Issue 1.0, 28 June 2004, 13, www.cnsa.gov.cn/n615708/n676979/n676983/n893604/appendix/2008529151013.pdf, last accessed

13.3.1.3 The Registration Convention

The Registration Convention also has relevance, if only indirect, for environmental problems related to space activities. It operates in conjunction with the Liability Convention in particular. Availability of information such as that registered with the United Nations pursuant to the Registration Convention can be essential in the case of a collision between space objects as it can facilitate identification of the (liable) 'launching State(s)' involved.

The Registration Convention obligates launching states to register all objects 'launched into Earth orbit or beyond' in a national register[90] as well as to furnish the UN Secretary-General 'as soon as practicable'[91] with various types of information concerning space objects registered in the national registry. This information is then entered into a UN register maintained by the Office for Outer Space Affairs (OOSA).

The information to be registered with the UN OOSA includes (1) the name of launching state(s); (2) an appropriate designator of the space object (or its registration number); (3) the date and territory or location of launch; and (4) basic orbital parameters.[92] The 'general function of the space object' should also be notified.[93] Furthermore, the Registration Convention requires notification of space objects which are no longer in earth orbit.[94]

Unfortunately, the Registration Convention entails problems similar to those of the other UN space treaties. Above all, the ambiguous terminology leaves ample scope for interpretation (again considering the terms 'launching State' and 'space object', for instance). The Registration Convention, too, appears to envision only the registration of unitary space objects and therefore provides little help in cases where the cause of damage is, for instance, a tiny piece of fragmentation debris.

If new environmental standards for space activities are established, more exacting registration requirements could provide an important

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11 February 2014. See also Viikari, *supra* n. 7, 70–1. It should be noted that responsibility for internationally wrongful acts under Art. VI, Outer Space Treaty, *supra* n. 38, is borne for 'national activities in outer space'; it is not tied to 'space objects' in the way international liability under Art. VII is. Hence the definitional problems concerning space debris as 'space object' are relevant only where the question of liability for harm is at stake. See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 24.

90 Art. II(1), Registration Convention, *supra* n. 9.

91 Art. IV(1), Registration Convention, *supra* n. 9.

92 See *ibid*.

93 Art. IV(1)(e), Registration Convention, *supra* n. 9.

94 See Art. IV(3), Registration Convention, *supra* n. 9.

mechanism for assuring compliance. The least that could be done is to demand that states inform the UN Secretary-General about fragmentation of their space objects. Furthermore, bearing in mind collision hazards, it would be most useful to have information about a space object's power source registered – above all where this is nuclear power. Another very simple improvement would be to require registration of information on the most distinctive orbital parameter for GEO satellites, namely the location of the object relative to the surface of the earth.[95]

Furthermore, although the Registration Convention requires notification of space objects which are no longer in earth orbit, there are no requirements concerning explosions and break-ups of registered space objects or changes of orbital positions.[96] The Convention also says nothing about furnishing information regarding defunct satellites still in orbit or other types of space debris, nor does it provide for registration of different parts of a space object. Moreover, there is no requirement to register possible transfer of ownership of space objects in outer space.[97] Obviously, more detailed registration practices could greatly facilitate the

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[95] This is usually expressed as the corresponding longitude on the earth's equator; Practice of States and International Organizations in Registering Space Objects, Background paper, Secretariat, Forty-fourth session of the LSC (2005), A/AC.105/C.2/L.255, para. 73. Despite the lack of an obligation to do so, many (if not most) states with space objects on GEO have already registered their GEO positions; *ibid.*, para. 74.

[96] See again Art. IV(3), Registration Convention, *supra* n. 9. Besides, even the record of notifications by states parties to the Registration Convention concerning re-entering space objects has not been laudable: only about 50% of re-entries have been notified to the United Nations; *cf.* Practice of States and International Organizations in Registering Space Objects, *supra* n. 95, para. 81.

[97] Any additional information *can* be furnished to the United Nations even now on the basis of Art. IV(2), Registration Convention, *supra* n. 9: 'Each State of registry may, from time to time, provide the Secretary-General of the United Nations with additional information concerning a space object carried on its registry'. In practice, hardly any pieces of space debris (catalogued or uncatalogued) are registered with the United Nations. See Weeden, *supra* n. 12, 41. Registrations of transfer of ownership of space objects in orbit are also rare. The registration of other kinds of 'additional information' has been more common. For instance, information has been provided when a satellite has ceased to function. Art. IV has also been also used for notifying the international community in potential emergency situations involving an impending re-entry of space objects and decay of nuclear-powered space objects; Practice of States and International Organizations on Registering Space Objects, *supra* n. 95, Chapter IV.C.7. However, registration practices vary significantly, internationally and nationally.

identification of hazardous space objects and the states responsible for them – possibly providing an incentive to prevent the generation of debris.[98]

Another interesting proposal for improving the situation is that states could register the functional status of their space objects and thus themselves define whether, for instance, intact satellites that are no longer active should be regarded as debris.[99] Technically, the simplest register along these lines would be one that contains information on those objects which are considered 'functional' (or which a state wants to protect);[100] another approach would obviously be the registration of objects considered debris.[101] Although it could be unfeasible to register very small objects, registration of at least the bulkier parts of spacecraft that have become debris, such as used launch-related rocket bodies and stages, would seem not only possible, but potentially very beneficial.[102] Such registrations could also greatly facilitate ADR operations.

13.3.1.4 The Nuclear Power Source Principles

The NPS Principles adopted unanimously by the UN General Assembly in 1992 constitute a positive step towards more advanced environmental protection by legal means in the space sector. However, the Principles only apply to nuclear power sources for electricity generation – not to the possible use of nuclear energy for propulsion purposes.[103] Also, the safety requirements adopted in the Principles are rather general, allowing those utilizing NPS considerable freedom of choice.[104] Besides, their focus is on nuclear safety rather than serving environmental considerations. Furthermore, principles adopted by a General Assembly

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[98] See Kerrest de Rozavel, *supra* n. 79, 873.

[99] See Practice of States and International Organizations on Registering Space Objects, *supra* n. 95, para. 109. It has been proposed that an inter-agency body similar to the IADC (see further *infra*, § 13.3.2.2) could develop international guidelines for the practice of registering the functionality of space objects; see Perek, *supra* n. 11, 588.

[100] See the proposal of Perek to that end in *ILA Report of the Sixty-Fifth Conference*, Cairo, 1992, 144–5.

[101] See e.g. Mejía-Kaiser, *supra* n. 58, 297.

[102] See Perek, *supra* n. 11, 588. Where a collision in space between space objects of different states results in debris, determination of the nationality of the new pieces of debris could be very difficult though.

[103] See 6th para., Preamble, NPS Principles, *supra* n. 46.

[104] See also Christol, *supra* n. 36, 266.

Resolution can of course never have the legally binding force of a convention.[105]

In the main, the NPS Principles reflect already well-accepted rules of space law dealing with such matters as safe use, safety assessment, notification of re-entry, emergency assistance, responsibility, liability and compensation. However, they also contain some innovations, contributing to increased safety of space operations – not least from an environmental perspective. Principle 3 attempts to restrict the use of nuclear power in space by limiting it to 'those space missions which cannot be operated by non-nuclear energy sources in a reasonable way'. The general goal is to 'protect individuals, populations and the biosphere against radiological hazards'.[106] The Principle even requires that the 'design and use [of NPS] shall also ensure with high reliability that radioactive material does not cause a significant contamination of outer space'.[107] Furthermore, the Principle calls for the fuelling of on-board nuclear reactors by 'highly enriched uranium 235' only.[108] It also prescribes that 'nuclear reactors shall not be made critical before they reach their operating orbit or interplanetary trajectory'.[109]

Another innovative principle is Principle 2, which offers a definition of a 'launching State' as 'the State which exercises jurisdiction and control over a space object with nuclear power sources on board at a given point in time relevant to the principle concerned'.[110] However, the NPS Principles still leave largely unresolved the question of the nature and status of the 'launching State' where accountability for damage in the case of an NPS incident is concerned. According to Principle 2(2), '[f]or

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[105] On the legal status of UN General Assembly resolutions in general and those pertaining to space activities in particular, see A.T. Terekhov, UN General Assembly Resolutions and Outer Space Law, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 97–8; Lyall & Larsen, *supra* n. 70, 43–50. For discussion in UN COPUOS concerning the need for revision of the NPS Principles, see e.g. Report of the Fifty-first session of the LSC, 2012, A/AC.105/1003, paras 88–104, and Report of the Fifty-fourth session of COPUOS, 2011, paras 189–194.

[106] Princ. 3(1)(a), NPS Principles, *supra* n. 46.

[107] *Ibid.*

[108] Princ. 3(2)(c), NPS Principles, *supra* n. 46.

[109] Princ. 3(2)(d), NPS Principles, *supra* n. 46. To this end, there is a further requirement that a nuclear reactor's design and construction be such that it 'cannot become critical before reaching the operating orbit during all possible events, including rocket explosion, re-entry, impact on ground or water, submersion in water or water intruding into the core'; § (2)(e).

[110] Princ. 2(1), NPS Principles, *supra* n. 46.

the purpose of principle 9 [on liability and compensation], the definition of the term "launching State" as contained in that principle is applicable'; but Principle 9 only refers to the Outer Space Treaty and the Liability Convention for a definition of launching state.[111]

Finally, Principle 4 requires that a state launching a space object must ensure that 'a comprehensive safety assessment' is conducted prior to the launch.[112] The assessment is to cover 'all relevant phases of the mission and shall deal with all systems involved, including the means of launching, the space platform, the nuclear power source and its equipment and the means of control and communication between ground and space'.[113] The results of the assessment 'shall be made publicly available prior to each launch, and the [UN] Secretary-General … shall be informed on how States may obtain such results of the safety assessment as soon as possible prior to each launch'.[114]

13.3.2 Other Regulatory Developments

On balance, the UN space law treaties do not have very much to offer in terms of addressing environmental effects of space activities. Fortunately, more recent – and more plausible – efforts to alleviate environmental problems related to space activities by common norms have also taken place. The Inter-Agency Space Debris Coordination Committee (IADC) and the International Law Association (ILA) have been trying to mitigate the hazard of space debris. Also UN COPUOS has adopted Space Debris Mitigation Guidelines which are based on the IADC Guidelines. Moreover, the International Organization for Standardization (ISO)[115] is developing international standards on the basis of the work of the IADC. The Guidelines reflect 'the fundamental mitigation elements of a series of existing practices, standards, codes and handbooks developed by a number of national and international organizations',[116] hence the in-depth

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[111] See also Christol, *supra* n. 36, 271–2.

[112] Princ. 4(1), NPS Principles, *supra* n. 46.

[113] *Ibid*.

[114] Princ. 4(3), NPS Principles, *supra* n. 46. For a detailed treatment of the NPS Principles and the negotiating history of the instrument, see D.A. Porras, The United Nations Principles Relevant to the Use of Nuclear Power Sources in Outer Space: The Significance of a Soft Law Instrument after Nearly 20 Years in Force, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 205–32.

[115] See in general www.iso.org/iso/home/about/about_governance.htm, last accessed 11 February 2014.

[116] Space Debris Mitigation Guidelines, *supra* n. 15, 1.

treatment of such other attempts is unnecessary in the context of the current examination.

In addition to space debris, the other environmental problems of the space sector are also discussed internationally. The other environmental hazard UN COPUOS is currently discussing is the use of NPS in space.[117] The Committee on Space Research (COSPAR) has long been working on issues related to planetary protection.[118]

13.3.2.1 The UN Committee on the Peaceful Uses of Outer Space (UN COPUOS)

13.3.2.1.1 Space debris After several years of discussions about whether space debris should be put on the agenda of the Scientific and Technical Sub-Committee (STSC) of the UN COPUOS, space debris has been included as a separate annual agenda item since 1994.[119] The STSC established a Working Group on Space Debris in 2004 to develop a set of technical debris mitigation guidelines on the basis of the IADC Guidelines.[120] The STSC adopted its space debris mitigation guidelines in 2007.[121] The Committee proper endorsed the guidelines the same year,[122] and so did the UN General Assembly, also inviting member states to implement the guidelines nationally.[123]

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[117] See Report of the Fifty-first session of the LSC, *supra* n. 105, paras 88–104, and Report of the Fifty-fourth session of COPUOS, 2011, paras 189–194.

[118] COSPAR has also discussed other environmental aspects of space activities to some extent. It prepared a study for UN COPUOS entitled 'Environmental Effects of Space Activities' as early as 1983. A follow-up study under the same title with a particular emphasis on space debris was released in 1988; see L. Perek, Space Debris at the United Nations, 2 *Space Debris* (2002), 126.

[119] See Report of the Thirty-first session of the STSC, 1994, A/AC.105/571, paras 63–74. For a summary of the discussion concerning space debris within the UN prior to its adoption as an STSC agenda item, see Hacket, *supra* n. 57, 201–4.

[120] Initially, UN COPUOS asked the IADC to develop a set of such voluntary guidelines in 2001. See Report of the Thirty-eighth session of the STSC, 2001, A/AC.105/761, para. 130. They were submitted to the UN COPUOS in late 2002.

[121] See Report of the Forty-fourth session of the STSC, *supra* n. 15, para. 99 and Annex IV.

[122] See Report of the Fiftieth session of COPUOS, *supra* n. 15, paras 118–19 and Annex.

[123] International cooperation in the peaceful uses of outer space, UNGA Res. 62/217, of 22 December 2007; UN Doc. A/RES/62/217. National implementation

The Space Debris Mitigation Guidelines of UN COPUOS are 'the leading international arrangement to mitigate space debris'.[124] They provide guidance on how to conduct space activities in a manner which minimizes their harmful by-products.[125] The Guidelines are to be considered for mission planning, design, manufacture and operational phases of spacecraft and launch vehicle orbital stages. Hence they apply both to planning and operation of new missions, as well as to operation of existing ones ('if possible'). Exceptions to the implementation of the guidelines can be justified by provisions of the UN space treaties and principles, for instance.[126] Obviously, the guidelines are not legally binding under international law.[127] Nevertheless, the fact that all major spacefaring states take part in the work of the STSC which, moreover, operates by consensus, should facilitate the approval and implementation of the Guidelines on the national level.[128]

The UN COPUOS Space Debris Mitigation Guidelines are:

1. Limit debris released during normal operations.
2. Minimize the potential for break-ups during operational phases.
3. Limit the probability of accidental collision in orbit.
4. Avoid intentional destruction and other harmful activities.
5. Minimize potential for post-mission break-ups resulting from stored energy.

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of the UN COPUOS Guidelines varies significantly; the US national regime is currently the most elaborate one. In 2010 China finalized its national space debris mitigation regulations similar to the IADC/UN COPUOS Guidelines; see Towards Long-term Sustainability of Space Activities, *supra* n. 31, 21–2. For more information on national implementation measures, see *ibid.*, 30–4.

[124] Towards Long-term Sustainability of Space Activities, *supra* n. 31, 5.

[125] *Cf. ibid.*, 28.

[126] See Space Debris Mitigation Guidelines, *supra* n. 15, 2.

[127] This is also explicitly stated in Sec. 3, 2nd para., Space Debris Mitigation Guidelines, *supra* n. 15.

[128] In the United Kingdom, for instance, the IADC/UN COPUOS mitigation measures are used by national licensing authorities as evaluation criteria for assessing operators' ability to comply with debris mitigation safety requirements; see R. Crowther, R. Tremayne-Smith & C. Martin, Implementing Space Debris Mitigation Within the United Kingdom's Outer Space Act, in *Proceedings of the 4th European Conference on Space Debris* (Ed. D. Danesy) (2005), ESA/ESOC, ESA SP-587, 579–80; R. Tremayne-Smith, Environmental Protection and Space Debris Issues in the Context of Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 184–7.

6. Limit the long-term presence of spacecraft and launch vehicle orbital stages in the LEO region after the end of their mission.
7. Limit the long-term interference of spacecraft and launch vehicle orbital stages with the GEO region after the end of their mission.

All space systems should be designed in the first place so that no debris is released during normal operations (as opposed to emergency situations, less severe accidents and other non-foreseeable potentially debris-generating incidents). If this is not feasible, at least the effect of debris on the space environment should be minimized. Operators are to prepare themselves for the possibility of operational phase break-ups by planning (and executing where needed) disposal and passivation measures.[129] Also many accidental on-orbit collisions could be avoided by proper design and mission profiles, allowing for, *inter alia*, adjustments of launch time and collision avoidance manoeuvres. Obviously, intentional destruction of space systems should be avoided. If intentional break-ups are necessary, they should be conducted at (low) altitudes where the orbital lifetime of the fragments remains short. Any on-board energy sources no longer needed should be depleted or passivated. Finally, non-operational spacecraft and launch vehicle orbital stages should be removed from the densely populated orbits (LEO and GEO) in a controlled manner or (if removal is not feasible) stored in sufficiently safe post-mission disposal ('graveyard') orbits.[130]

Although the UN COPUOS Space Debris Mitigation Guidelines constitute an important step towards reducing risks related to space debris, they are not sufficient in the long term. They remain quite general in nature and do not provide a comprehensive approach to the problem. Environmental protection is not even mentioned. The Guidelines give no guidance as to questions of liability. Provisions about data exchange concerning the space environment are also missing. Even intentional destruction of space objects (such as ASAT tests) is not banned.[131] Given the increase in launches to higher altitudes and the fact that the only feasible debris removal mechanism still is natural decay due to atmospheric drag, which is even somewhat effective only in LEO,[132] it is of

[129] See Space Debris Mitigation Guidelines, *supra* n. 15, 2.

[130] See *ibid.*, 3.

[131] Quite the contrary: pursuant to the Space Debris Mitigation Guidelines, *supra* n. 15, intentional break-ups may even be 'necessary' (in which case they should be conducted at low-enough altitudes).

[132] In higher orbits the atmospheric drag is virtually nil. See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 15 (Fig. 1). For more

utmost importance to stop deliberate destruction of spacecraft, particularly in the higher orbits. Furthermore, the Guidelines do not address the debris issue in the context of non-peaceful space activities. For the issues they do address, the Guidelines express at most political, not legal commitment to mitigating the space debris problem.[133] The instrument was even developed without contribution from the Legal Sub-Committee.

Currently, UN COPUOS is discussing the debris issue through both of its subcommittees. The STSC has had space debris as an agenda item for nearly two decades already. It has recently agreed that 'States, in particular spacefaring nations, should pay greater attention to the problem of collisions of space objects, including those with nuclear power sources on board, with space debris and to other aspects of space debris, including its re-entry into the atmosphere'.[134] Additionally, the STSC has on its agenda a new item, 'Long-term sustainability of outer space activities' (since 2010). The space debris issue has been discussed also in the context of this item.[135] In the Legal Sub-Committee, 'General exchange of information on national mechanisms relating to space debris mitigation measures' has been an agenda item since 2009.[136] During the discussions on the topic, information about national efforts in the field of space debris policies and mitigation standards is brought to the attention of the Sub-Committee.

However, the mandate of the Legal Sub-Committee does not extend to the consideration of any substantive legal aspects of space debris or to detailed analysis of the UN COPUOS Guidelines.[137] It has been repeatedly proposed that the Legal Sub-Committee 'should include on its

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information on the effect of the atmospheric drag on space objects, see Weeden, *supra* n. 12, 39.

133 See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 28, 36–37.

134 E.g. Report of the Forty-ninth session of the STSC, 2012, A/AC.105/1001, para. 91.

135 See e.g. Report of the Forty-ninth session of the STSC, *supra* n. 134, paras 199–204. The Sub-Committee has noted, for instance, that 'States could contribute to the long-term sustainability of outer space activities by implementing the Space Debris Mitigation Guidelines of the Committee and the Safety Framework for Nuclear Power Source Applications in Outer Space'; Report of the Forty-seventh session of the STSC, 2010, A/AC.105/958, para. 185.

136 See Report of the Forty-eighth session of the LSC, 2009, A/AC.105/935, paras 148–62.

137 See Review of the Legal Aspects of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, with a View to Transforming the Guidelines into a Set of Principles to be Adopted by the

agenda an item to review the legal aspects of the [UN COPUOS] Space Debris Mitigation Guidelines'.[138] It has been proposed also that the UN COPUOS Guidelines be transformed into a new set of UN space principles (like the NPS Principles).[139] This should obviously be discussed in the Legal Sub-Committee.[140]

Although UN Principles are legally non-binding, they could establish additional political support for the UN COPUOS Guidelines.[141] They could also 'create a basis for legally binding rules to be negotiated at some time in the future'.[142] Provided that the principles managed to generate unified state practice and *opinio juris* on the need to honour such principles, they could even contribute to the establishment of (binding) customary international law.[143]

13.3.2.1.2 Nuclear power The use of NPS in outer space is a separate agenda item of the STSC.[144] The Sub-Committee's Working Group on Nuclear Power Sources in Space has prepared in cooperation with the International Atomic Energy Agency (IAEA)[145] a voluntary Safety

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General Assembly, Working Paper Submitted by the Czech Republic, 50th session of the LSC, 2011, UN Doc. A/AC.105/C.2/L.283, para. 10. Accordingly, this agenda item has been described as a 'cautious attempt to approach the legal aspects of the [space debris issue] in UNCOPUOS'; I. Marboe, The Importance of Guidelines and Codes of Conduct for Liability of States and Private Actors, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 140.

[138] E.g. Report of the Fifty-fourth session of COPUOS, 2011, para. 209; Report of the Fifty-first session of the LSC, *supra* n. 105, paras 148, 150.

[139] See e.g. Report of the Fifty-fourth session of COPUOS, 2011, paras 103, 209; Review of the Legal Aspects of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, *supra* n. 137, 2011, para. 11; Report of the Fifty-first session of the LSC, *supra* n. 105, paras 149–150. See also *ILA Report of the Seventy-Fifth Conference*, Sofia, 2012, 303.

[140] See also Report of the Fifty-first session of the LSC, *supra* n. 105, para. 155.

[141] See Towards Long-term Sustainability for Space Activities, *supra* n. 31, 39.

[142] Review of the Legal Aspects of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, *supra* n. 137, para. 18.

[143] See *ibid*.

[144] See e.g. Report of the Forty-ninth session of the STSC, *supra* n. 134, paras 136–51.

[145] The IAEA was established by way of the Statute of the IAEA (Statute of the International Atomic Energy Agency, New York, done 23 October 1956, entered into force 29 July 1957; 276 UNTS 3, www.iaea.org/About/statute.html, last accessed 18 April 2014).

Framework for Nuclear Power Source Applications in Outer Space, approved in 2009.[146] The Safety Framework is to 'provide high-level guidance in the form of a model safety framework' for national and international use.[147] It consists of recommendations for governments and management of space NPS applications as well as of general technical guidance.[148]

The Safety Framework for Nuclear Power Source Applications in Outer Space applies to launch, operation and end-of-service phases of space missions using nuclear power.[149] It urges, for instance, governments to 'verify that the rationale for using the space [NPS] application has been appropriately justified'.[150] The benefits of the use of NPS in a space mission and the risks associated must be thoroughly assessed: 'a balance needs to be found between the requirement for protection … and the expected benefits of the space NPS application'.[151]

Furthermore, the Safety Framework calls for proper emergency preparedness by governments and relevant intergovernmental organizations (such as regional space agencies).[152] At the same time, the instrument stresses that the organization conducting a space NPS mission has the prime responsibility for safety, 'ensuring the availability of adequate resources for safety and promoting and sustaining a robust safety culture

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146 The instrument is intended to supplement the IAEA Safety Standard Series without being a publication in the series (see Preface of the Safety Framework for Nuclear Power Source Applications in Outer Space, *infra* n. 147). For more information about the development of the Safety Framework, see Summerer & Bohlmann, *supra* n. 35, 241–8.

147 Safety Framework for Nuclear Power Source Applications in Outer Space, 2009, A/AC.105/934, www.iaea.org/Publications/Booklets/Safety/safety framework1009.pdf, last accessed 11 February 2014, 1 (para. 1.2).

148 For a detailed assessment of the Safety Framework for Nuclear Power Source Applications in Outer Space, see Summerer & Bohlmann, *supra* n. 35.

149 Other aspects of space NPS applications (e.g. those concerning development, testing, production and transportation of space NPS on earth) are addressed by other international and national nuclear safety standards; Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, 2 (para. 1.3); see also Summerer & Bohlmann, *supra* n. 35, 238.

150 Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, 3 (para. 3.2).

151 Summerer & Bohlmann, *supra* n. 35, 248–9. This also necessitates an analysis of alternatives to the use of NPS, for instance.

152 See Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, 4 (para. 3.4).

at all organizational levels'.[153] Most importantly, however, this responsibility is not to be confused with the international responsibility of the UN space law treaties (under Article VI of the Outer Space Treaty and NPS Principle 8).[154]

Furthermore, the Safety Framework, *inter alia*, reiterates that 'having technical competence in nuclear safety is vital for satisfying the safety objective'.[155] Of utmost importance are design and development processes. They should 'provide the highest level of safety that can reasonably be achieved' by integrating 'safety considerations in the context of the entire space NPS application', throughout all mission phases.[156] Also risk assessments should be an essential part of mission authorization processes.[157]

The scope of the Safety Framework for Nuclear Power Source Applications in Outer Space is narrower than that of the NPS Principles in the sense that it is aimed at protecting 'people and the environment in Earth's biosphere' only, not the space environment nor humans in outer space.[158] On the other hand, the Safety Framework constitutes a significant advance by being applicable to the use of NPS not only for

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153 *Ibid.*, chapter 4. ESA, for instance, has started implementing the Safety Framework. However, it has declared that 'the implementation of some of the guidance requires a deeper analysis of the options available within the organizational setup of ESA' – including, for instance, questions related to the primary responsibility of the organization conducting the space NPS mission. See Report of the Forty-ninth session of the STSC, *supra* n. 134, App., 42.

154 The 'prime responsibility for safety' of the Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, should be understood in the context of internal distribution of responsibilities among partners in a space mission only. In more detail, see Summerer & Bohlmann, *supra* n. 35, 256–8. More in general on Art. VI, Outer Space Treaty (*supra* n. 39), *supra* § 2.3.1.1.

155 Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, 6 (para. 5.1).

156 *Ibid.*, 6–7 (para. 5.2).

157 See *ibid.*, 7 (para. 5.3).

158 *Ibid.*, 2 (para. 2). These limitations are due to the fact that sufficient knowledge for providing 'a technically sound basis for developing a space NPS application framework for protecting humans in the unique conditions in space and beyond Earth's biosphere' does not yet exist. The same applies to protection of environments of other celestial bodies (see para. 1.3). It has been pointed out that the argument of lacking scientific knowledge as a reason for such limitations can also be seen as 'leaving the door open' to future revision of the Safety Framework in this respect: if sufficient data becomes available, the protection of

electricity generation, but for propulsion and heating purposes too; it applies to all space NPS applications 'without prejudice'.[159] Neither the NPS Principles nor the Safety Framework constitutes a legally binding instrument under international law, however.[160]

International regulation of the use of space NPS is difficult because such applications have unique nuclear safety considerations which cannot be addressed in safety guidance for terrestrial nuclear applications. The requirements of space NPS applications vary significantly also from mission to mission.[161]

13.3.2.2 The Inter-Agency Space Debris Coordination Committee (IADC)

The IADC is an organization of ESA and national space agencies from (currently) 11 countries founded in 1993.[162] Its purpose is to exchange information on space debris research activities and facilitate cooperation in the area, to review ongoing cooperative activities, and to identify options for debris mitigation.[163] In fulfilling this purpose, it has, *inter alia*, issued the IADC Space Debris Mitigation Guidelines.[164] These Guidelines are not examined here in detail as their provisions are largely repeated in the Guidelines of the UN COPUOS.

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extraterrestrial environments and humans in outer space might be included in the scope of the framework. See Summerer & Bohlmann, *supra* n. 35, 240–1.

[159] Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147, 2 (para. 1.2).

[160] It has been proposed that the UN COPUOS Legal Sub-Committee should 'undertake a review of the Safety Framework and … promote binding standards': Report of the Fifty-first session of the LSC, *supra* n. 105, para. 92.

[161] See Preface, Safety Framework for Nuclear Power Source Applications in Outer Space, *supra* n. 147.

[162] See in general on the IADC www.iadc-online.org, last accessed 11 February 2014; also e.g. Viikari, *supra* n. 7, 93–6; Lyall & Larsen, *supra* n. 70, 23, 38, 308, 493, 529, 563; N.N. Smirnov, *Space Debris: Hazard Evaluation and Debris* (2001), 22; J. Wheeler, Space Debris: Legal Framework, Issues Arising and New ISO Guidelines in 2010/2011, in *Yearbook on Space Policy 2010/2011: The Forward Look* (Eds. P. Hulsroj, S. Pagkratis & B. Baranes) (2013), 260 ff.

[163] For more detail, see Terms of Reference for the Inter-Agency Space Debris Coordination Committee, 4 October 2006, www.iadc-online.org/index.cgi?item=torp, last accessed 10 August 2012.

[164] IADC Space Debris Mitigation Guidelines (hereafter IADC Guidelines); A/AC.105/C.1/L.260. The latest version of the Guidelines is from 5 July 2007; see www.iadc-online.org/index.cgi?item=docs_pub, last accessed 10 August 2012.

It is important to note that the two sets of guidelines are not the same, however. Above all, the IADC Guidelines are in some respects more detailed. For instance, they not only call for post-mission disposal of spent spacecraft, but also establish specific instructions as to how this should be conducted, including a formula for calculating the minimum altitude to which objects from the GEO should be re-orbited.[165]

Disposal of LEO objects should be conducted by de-orbiting. For the LEO region, the instrument further suggests a 25-year post-mission orbital lifetime limit.[166] Moreover, the IADC Guidelines recommend that '[i]n order to manage the implementation of space debris mitigation measures … a feasible Space Debris Mitigation Plan be established and documented for each program and project' (irrespective of the orbital region).[167] This Mitigation Plan should include (1) a 'management plan addressing space debris mitigation activities'; (2) a 'plan for the assessment and mitigation of risks related to space debris, including applicable standards'; (3) 'measures minimising the hazard related to malfunctions that have a potential for generating space debris'; (4) a 'plan for disposal of the space system at end of mission'; (5) a '[j]ustification of choice and selection when several possibilities exist'; and (6) a '[c]ompliance matrix addressing the recommendations of these Guidelines'.[168]

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[165] See Sec. 5.3.1, IADC Guidelines, *supra* n. 164.

[166] See Sec. 5.3.2, IADC Guidelines, *supra* n. 164. Re-orbiting of LEO spacecraft into orbits where the residual lifetime of debris is 25 years at most is an efficient measure for stopping the accumulation of space debris. This option is not economically feasible for higher-altitude orbits, however. For GEO spacecraft, the best end-of-life disposal mechanism currently is re-orbiting to a graveyard orbit at least 235 km above the nominal GEO altitude. At the moment, only half of all satellites are properly re-orbited. See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 42. Even a GEO graveyard cannot provide a long-term solution, as the re-orbited satellites remain uncontrolled; see Williamson, *supra* n. 37, 8.

[167] Part 4, IADC Guidelines, *supra* n. 164.

[168] *Ibid*. For a more detailed assessment of the IADC Guidelines, see Viikari, *supra* n. 7, 93–6. For comparison between the guidelines of the IADC and those of UN COPUOS in more detail, see Committee for the Assessment of NASA's Orbital Debris Programs; National Research Council, Limiting Future Collision Risk to Spacecraft: An Assessment of NASA's Meteoroid and Orbital Debris Programs (2011), 80.

The IADC Guidelines have been criticized for containing no advice as to their practical implementation by states.[169] Nevertheless, the Guidelines have been used in the development of new international standards, such as the debris document of UN COPUOS and mitigation standards of the ISO. The IADC Guidelines have also been widely used by national and regional space organizations when identifying their own standards for mission requirements and establishing norms of a more general nature.[170]

One example is the 2008 Requirements on Space Debris Mitigation for ESA Projects, which are fully compatible with the Guidelines of the IADC (and those of UN COPUOS).[171] Also in the United States, national debris mitigation requirements of government agencies such as the Federal Aviation Administration, the Federal Communications Commission and the National Oceanic and Atmospheric Administration are in conformity with the IADC Guidelines.[172] In the United Kingdom, mitigation measures provided by the IADC Guidelines are used directly by national licensing authorities as standards for assessing compliance of proposed space activities with the current best practices of the space sector. For instance, compliance of a licence applicant's end-of-life satellite disposal plans with the recommendations of the IADC (*inter*

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[169] See e.g. T. Hitchens, Space Debris: Next Steps, in *Safeguarding Space for All: Security and Peaceful Uses,* Conference report March 2004, UNIDIR/ 2005/20 (2005), 65.

[170] See e.g. Report of the Forty-second session of the STSC, 2005, A/AC.105/848, para. 91.

[171] In 2002, five European space agencies issued the European Space Debris Safety and Mitigation Standard, which became the European Code of Conduct for Space Debris Mitigation in 2004. The ESA Director General confirmed his endorsement of the European Code but also emphasized that 'the Code of Conduct may be difficult to implement directly, especially in binding business agreements'; many of its provisions need more detailed implementation standards; Space Debris Mitigation for Agency Projects, ESA, Paris, 1 April 2008, ESA/ADMIN/IPOL(2008)2, www.cnsa.gov.cn/n615708/n676979/n676983/n893604/appendix/200852915833.pdf, last accessed 11 February 2014, 1. ESA's own space debris mitigation instructions translate the IADC Guidelines and those of UN COPUOS applicable to all procurements of space systems and launch services for new ESA programmes. They define minimum requirements for the limitation of space debris and risk reduction measures in case of re-entries of space objects into the earth's atmosphere. The document addresses management, design and operational requirements.

[172] See Lyall & Larsen, *supra* n. 70, 493.

alia, the use of IADC's re-orbiting formula for GEO satellites) is examined.[173]

13.3.2.3 The International Organization for Standardization (ISO)

The International Organization for Standardization is the primary international standards organization relevant for the space sector. Virtually all ISO space standards (over 150 to date) are produced by subcommittees 13 (developing standards related to space data and information transfer systems) and 14 (developing standards related to space systems and operations) of the technical committee ISO/TC 20, 'Aircraft and space vehicles'.[174]

From an environmental point of view, the high level standard ISO 24113:2011, 'Space systems – Space debris mitigation requirements' is the most important achievement. It applies to all unmanned systems launched into near-earth space – including launch-vehicle orbital stages, operating spacecraft and any objects released as part of normal operations or disposal actions. The European Cooperation for Space Standardization (ECSS) has adopted this standard (with modification); also ESA and many national space agencies subscribe to the standard.[175] Another early ISO space standardization project now completed concerns satellite propellant measurement and management in orbit for the purpose of debris mitigation.[176] An example of space standards currently under development is ISO 16158, 'Space systems – Avoiding collisions with orbiting objects'.

Of course, compliance with standards of the ISO, as a non-governmental organization, is voluntary and the ISO has no powers of enforcement. Yet, the ISO is a network of national (governmental and private) standards institutes operating in no fewer than 164 countries. As ISO standards are developed only in response to market need, many of

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[173] See Crowther, Tremayne-Smith & Martin, *supra* n. 128, 579–80. On the national implementation of IADC/UN COPUOS Guidelines in Canada, China, France, Germany, India, Russia, and the United States, see Towards Long-term Sustainability of Space Activities, *supra* n. 31, 30–4.

[174] See E. Gasiorowski-Denis, Blast off … ISO Standards Make a Deep Impact in Space, 2–9 *ISO Focus*+ (Oct. 2011), 9.

[175] See D. Finkleman & H. Stokes, Keep It Clean – Taking Action on Space Debris, 2–9 *ISO Focus*+ (Oct. 2011), 22.

[176] ISO 23339:2010 'Space systems – Unmanned spacecraft – Estimating the mass of remaining usable propellant'. Other standards relevant for environmental management of space activities include ISO 27875:2010, 'Space systems – Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages'.

them have achieved widespread applicability and practical influence in the globalized markets.[177]

13.3.2.4 The International Law Association (ILA)

The International Law Association (ILA), through its Space Law Committee, produced a Draft Convention on Space Debris in 1994.[178] The instrument attempts to address the issue in a comprehensive way in its 16 articles, 'correct[ing] the lack of precision of the Space Treaties in force'.[179] It applies to 'space debris which causes or is likely to cause direct or indirect, instant or delayed damage to the environment, or to persons or objects'.[180] The scope of application of the instrument thus includes even indirect damage. Moreover, in addition to applying to existing damage, the ILA Draft Convention applies to situations where debris is likely to cause damage. The instrument also takes into account purely environmental damage; it even refers to such damage prior to mentioning damage to persons and objects. Hence, it clearly goes beyond the Liability Convention in many respects.

What is more, the ILA Draft Convention has no restrictions as regards the areas of outer space to which it applies.[181] The instrument also includes provisions on international responsibility and liability.[182] Article 6 further specifies the application of the instrument in this respect

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[177] See M. Campins-Eritja & J. Gupta, The Role of 'Sustainability Labelling' in the International Law of Sustainable Development, in *International Law and Sustainable Development: Principles and Practice* (Eds. N. Schrijver & F. Weiss) (2004), 264–70.

[178] ILA Draft Convention on Space Law Debris, 43 *Zeitschrift für Luft- und Weltraumrecht* (1994), at 395. See also *infra*, § 19.2.4.3.

[179] *ILA Report of the Sixty-Fifth Conference*, Cairo, 1992, 143. At the same time, the ILA Draft Convention on Space Debris, *supra* n. 178, expressly states that its provisions should not be considered incompatible with the existing space treaties; see Art. 5.

[180] Art. 2, ILA Draft Convention on Space Debris, *supra* n. 178. 'Damage' in this instrument means 'loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations, or any adverse modification of the environment of areas within or beyond national jurisdiction or control'; Art. 1(e). The wording is derived mostly from Art. 1(a), Liability Convention, *supra* n. 9.

[181] Initially, the scope of the instrument was to be narrower: the early drafts were restricted to GEO and LEO only. See *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994, 311.

[182] See Arts. 7 & 8 respectively, ILA Draft Convention on Space Debris, *supra* n. 178. Also on responsibility and liability in general *supra*, § 2.3.1.1.

by stating that its rules concerning responsibility and liability 'apply to damage caused by space debris in the space environment and, in the absence of other international agreements on the matter, to damage caused to the Earth environment'.[183]

Furthermore, in addition to a general obligation of cooperation,[184] the Draft Convention sets out a duty to cooperate in more detail: it contains specific obligations to 'prevent, inform, consult, and negotiate in good faith'.[185] These obligations concern prevention of environmental damage and dispute avoidance, development and exchange of technology for debris mitigation (in accordance with 'national laws and practices'), information exchange, and consultations in the case of potential damage deriving from space debris.[186] Moreover, there is an obligation to negotiate in good faith, which is specified to mean, *inter alia*, 'not only to hold consultations or talks but also to pursue them with a view of reaching a solution'.[187] However, the ILA Draft Convention on Space Debris has not (at least as yet) developed into a legally binding international instrument.

13.3.2.5 The Committee on Space Research (COSPAR)

The Committee on Space Research published recommendations concerning planetary quarantine requirements as early as 1964. The COSPAR Planetary Protection Policy was adopted in 2002.[188] It is revised on a

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[183] Questions of responsibility and liability were among the major issues of discussion at the time of drafting the ILA instrument. The predominant view was that any obligations to prevent and control space debris should be accompanied by provisions on responsibility and liability; *cf.* Williams, *supra* n. 17, 3–4. For a more detailed discussion, see *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994, 311–4.

[184] See Art. 3, ILA Draft Convention on Space Debris, *supra* n. 178.

[185] Art. 4, ILA Draft Convention on Space Debris, *supra* n. 178.

[186] See, Art. 4, (a), (b) & (c) respectively, ILA Draft Convention on Space Debris, *supra* n. 178. Pursuant to Art. 4(d), there is an obligation to hold consultations when there are 'reasons to believe that activities carried out … , or planned to be carried out, produce space debris that is likely to cause damage to the environment, or to persons or objects, or significant risk thereto'.

[187] Art. 4(e), ILA Draft Convention on Space Debris, *supra* n. 178. 'Refusal to hold consultations, or the breaking up of such without justification, shall be interpreted as bad faith'; Art. 4(d).

[188] COSPAR Planetary Protection Policy, 20 October 2002, amended the last time 24 March 2011; https://cosparhq.cnes.fr/sites/default/files/pppolicy.pdf, last accessed 18 April 2014.

regular basis. The COSPAR Policy is based on the following policy statement:

> The conduct of scientific investigations of possible extraterrestrial life forms, precursors, and remnants must not be jeopardized. In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from an interplanetary mission. Therefore, for certain space mission/target planet combinations, controls on contamination shall be imposed in accordance with issuances implementing this policy.[189]

The Policy establishes five planetary protection categories, defined depending on the nature of the mission and the target body, and suggests planetary protection requirements for each category. The decisive criterion is the degree of interest a mission's target body represents for understanding the origins and evolution of life. The most demanding planetary protection requirements are imposed for missions returning to earth (Category V).

'Planetary protection' is generally understood as concentrating on biological protection from contamination (forward and back-contamination).[190] The COSPAR Policy is 'regarded as the international consensus standard for biological contamination under the [Outer Space Treaty]',[191] interpreting Article IX in particular.[192] It has been described as 'the established policy of the concerned space-faring nations to take into account the COSPAR Planetary Protection Guidelines in the definition of requirements for their missions'.[193] Both NASA and ESA comply with the COSPAR requirements.[194]

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189 *Ibid.*, 1.

190 See Williamson, *supra* n. 37, 7, 9; C. Conley & P. Rettberg, COSPAR Planetary Protection Policy – Present Status, in *IAA Cosmic Study 'Protecting the Environment of Celestial Bodies'* (Eds. M. Hofmann, P. Rettberg & M. Williamson) (2010), 16; http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%205/sg56/sg56finaldraftreport.pdf, last accessed 12 February 2014.

191 Conley & Rettberg, *supra* n. 190, 19.

192 See e.g. M. Hofmann, The Role of COSPAR Guidelines in Interpreting Article IX OST, in *Proceedings of the International Institute of Space Law 2011* (2012), 311–7.

193 U.M. Bohlmann, Connecting the Principles of International Environmental Law to Space Activities, in *Proceedings of the International Institute of Space Law 2011* (2012), 305.

194 For a more detailed treatment, see Bohlmann, *supra* n. 193, 301 ff. In Europe, the COSPAR standards have been implemented also by the ECSS, by a set of recommendations approved in 2008 with the aim of preventing forward

Furthermore, it has been suggested that 'COSPAR should propose management guidelines to the UN COPUOS in collaboration and coordination with other international bodies … similar to the way that space debris guidelines were developed and adopted internationally'.[195] The issue of planetary protection has taken on renewed relevance with the various plans for new (manned and unmanned) moon and Mars missions. The COSPAR Planetary Policy framework may need to be expanded to address even forms of harmful contamination other than biological/organic.[196]

13.4 THE WAY FORWARD

The UN space law treaties have only a little to say about environmental aspects of space activities. For instance, none of them even mentions space debris. The more recent non-binding instruments fill the gaps to some extent. Although the Space Debris Mitigation Guidelines produced by the IADC are called mere 'guidelines', they were described as a *de facto* 'standard for the responsible space operator' even before the development and adoption of the UN COPUOS Guidelines building upon the recommendations of the IADC.[197]

The global standardization work of the ISO further strengthens the role of the common guidelines, better enabling their use in a legally relevant manner. However, it has been assessed that there are 'mixed signs' about how well the UN COPUOS Guidelines are in fact working. Apparently,

contamination of other celestial bodies: ECSS-Q-ST-70-55C 'Space product assurance – Microbial examination of flight hardware and cleanrooms'; ECSS-Q-ST-70-01 'Space product assurance – Cleanliness and contamination control'; ECSS-Q-ST-20 'Space product assurance – Quality assurance'; ECSS-Q-ST-10-09 'Space product assurance – Nonconformance control system'.

[195] See *COSPAR Workshop on Ethical Considerations for Planetary Protection in Space Exploration* (Eds. J.D. Rummel, M.S. Race & G. Horneck) (2012), 16, 21, 40–41; https://cosparhq.cnes.fr/sites/default/files/ppp_workshop_report_ethical_considerations_princeton_final_v1a_7nov2012.pdf, last accessed 20 February 2014.

[196] See Conley & Rettberg, *supra* n. 190, 17–8. For a current discussion on the COSPAR Planetary Protection Policy (particularly from an ethical point of view), see *ibid.*; also *COSPAR Workshop on Ethical Considerations for Planetary Protection in Space Exploration*, *supra* n. 195.

[197] S.A. Mirmina, Reducing the Proliferation of Orbital Debris: Alternatives to a Legally Binding Instrument, 99 *American Journal of International Law* (2005), 661.

standard practices on average have improved. Nevertheless, at worst, a single major break-up event can undo the progress made during years of mitigation efforts.[198] Besides, even the most scrupulous implementation of the existing debris mitigation instruments globally would not be enough. These instruments lay down recommendations the focus of which is on curtailing the creation of new pieces of space debris. This does not help to reduce the massive amount of debris already in orbit. International standardization in general is a tool not well suited to tackling problems already created. In particular, it is hardly ever capable of affecting the operation of spacecraft which have already been put into outer space.[199]

Alongside legal development, the development of technology for active removal of non-functional objects in outer space is indeed imperative. Also on-orbit satellite servicing (OOS) could alleviate the problem.[200] It has been evaluated that ADR and OOS 'are necessary to ensure the continued sustainability of activities in LEO, MEO [medium earth orbit] and GEO, and that they will become absolutely indispensable in a relatively short period of time'.[201] Given that space debris is difficult (if not impossible) to clean up and the amount of it is increasing steadily, the need for ADR and OOS activities is obvious 'in order to meet the long-term need to protect the space environment as well as a short-term need to protect operating space assets from damage or destruction by debris'.[202]

However, ADR and OOS unavoidably entail major legal problems, many of which need to be solved before conducting such operations. Under the current space law regime, no distinction between functional spacecraft and non-functional space debris exists: both are considered

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198 See Towards Long-term Sustainability in Space Activities, *supra* n. 31, 29.

199 The situation is different as regards pre-existing installations on earth: at least technically (even if not politically) it is usually possible to make their future operations subject to review and licensing requirements in accordance with new standards. In contrast, present technology does not allow the same in respect of objects in outer space.

200 See Active Debris Removal, *supra* n. 5, 7. For an assessment of the (emerging) technical means for ADR and OOS, see *ibid.*, 21 ff. For a summary of ADR technologies and techniques, see Weeden, *supra* n. 12, 39–40.

201 Active Debris Removal, *supra* n. 5, 8.

202 *Ibid*, 43. It has been estimated that with ADR and collision avoidance the accumulation of space debris in earth orbits could be stopped almost completely; see Towards Long-term Sustainability of Space Activities, *supra* n. 31, 20.

'space objects'.[203] Once an unequivocal legal definition of what constitutes space debris has been established, the next major question is how the legal status of 'space debris' changes compared to that of 'space object' (in terms of jurisdiction, control and salvage).

Above all, the international legal framework pertaining to space debris must be able to address obligations and rights to take preventive measures. This entails questions concerning the legality/illegality of generating space debris, debris mitigation obligations, collision avoidance, data exchange – and ADR.[204] For instance, which entity can decide that a particular object is space debris available to be removed? Which types of space debris should be prioritized for removal?[205] Who is allowed to remove debris? How about liability aspects of ADR operations?[206] The current law of outer space is unable to answer such questions. In fact, instead of encouraging ADR, it largely constitutes a prohibitive element.

The international community needs to resolve such legal questions, preferably by an international treaty. It has also been suggested that states establish an intergovernmental organization to foster the development of the technologies for ADR and OOS and – once feasible – to conduct such operations on a commercial basis. Along the same lines, the establishment of a 'Global Fund for Space Debris Removal' has been proposed, with the mandate to contribute to the development of technology and compensate for costs of ADR activities.[207]

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[203] See also Weeden, *supra* n. 12, 40.

[204] See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 22.

[205] For a more detailed treatment of this question, see Weeden, *supra* n. 12, 40–1. In general, if the preferred goal is to reduce short-term risks to operational spacecraft in the most popular orbits, the target of removal operations should be small (1–10 cm) objects. If the aim is primarily to reduce the growth of the space debris population and hence the long-term risk to spacecraft, removal of large objects (i.e. the sources of future space debris) should be prioritized; see *ibid.*, 40.

[206] See Active Debris Removal, *supra* n. 5, 29–30.

[207] See *ibid.*, 28–9, 45. See also e.g. McGill Declaration on Active Space Debris Removal and On-Orbit Satellite Servicing, of 12 November 2011, A/AC.105/C.1/2012/CRP.16, App. A: 'National governments and competent international bodies should examine legal and regulatory mechanisms and processes to advance and facilitate the removal of space debris from orbit and the servicing of satellites in orbit. These mechanisms and processes should seek to encourage or commend the following types of actions: … b. Establishment of national or international funds to support the removal of space debris from orbit

Furthermore, states are urged to procure the removal of space debris created by national space activities and to include in their national licensing rules for the space sector 'an assured removal requirement'. Indeed, although the environmental problems of the space sector are inherently international, national law is indispensable in tackling them because that is the level where all space operations are licensed.[208] Unfortunately, many licensing systems have traditionally not required public authorities to get approval for their projects, particularly for military ones;[209] many space missions are public projects, very often involving also at least some military application. Even government-sponsored civilian space activities typically are not subject to licensing regimes.[210]

New environmentally relevant regulatory attempts include the initiative by the European Union for an International Code of Conduct for Outer Space Activities. In June 2012, the European Union officially launched a multilateral diplomatic process to discuss its initiative.[211] Information dissemination and the exchange of views on the concept of this Code of Conduct have been delegated to the UN Institute for Disarmament Research (UNIDIR). Negotiations open to all UN Member States started

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and the servicing of satellites in orbit'; para. 7. Moreover: 'Consideration should be given to the creation of a Global Economic Fund for Space Debris Removal to pay for removal service in the long term (to cover the cost of removal of existing debris plus spacecraft that fail in orbit)'; para. 10.

[208] *Cf.* Active Debris Removal, *supra* n. 5, 39–40, 44–5.

[209] See A. Kiss & D. Shelton, *International Environmental Law* (2nd edn., 2000), 211–2.

[210] See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 30. Nevertheless, the more intensive the use of outer space becomes, the more interest all stakeholders should have in reliable regulations. For instance, despite its initial reluctance, the military now favours increasingly stricter codes of conduct for the management of the space debris problem. *Cosmic Study on Space Traffic Management*, *supra* n. 50, 54.

[211] By way of Council Decision 2012/281/CFSP of 29 May 2012 in the framework of the European Security Strategy in support of the Union proposal for an international Code of Conduct on outer-space activities, para. 4. The Code was originally drafted in 2008 (Council of the European Union, 17 December 2008, 17175/08), and revised in 2010 (Council of the European Union, Council Conclusions concerning the Revised Draft Code of Conduct for Outer Space Activities, 11 October 2010, 14455/10). The latest version of the draft code was released on 16 September 2013, http://eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_16_sept_2013_en.pdf, last accessed 18 April 2014.

in October 2012, with a view to adopting the Code in 2013,[212] and concluding the process in 2014.[213]

The proposed legally non-binding instrument would be a set of best practices applicable to all space activities and complementary to the existing space law framework.[214] It is meant, for example, to help to avoid accidents and harmful interference in space, curtail the generation of new space debris and reduce its detrimental effects, and facilitate cooperation, including information sharing, on space activities.[215] The goal is also to facilitate the implementation of the UN COPUOS Space Debris Mitigation Guidelines.[216] Despite the laudable objectives, many states have raised concerns about the European proposal;[217] the success of the Code remains to be seen.

It is not merely the law of outer space and developments within this normative system that are relevant for the space sector. As Article III of the Outer Space Treaty affirms, all public international law is applicable

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[212] See EU Launches Negotiations on an International Code of Conduct for Outer Space Activities, Press release, Brussels, 6 June 2012; A 252/12, www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/EN/foraff/130649.pdf, last accessed 12 February 2014.

[213] See Statement by the Spokesperson of EU High Representative Catherine Ashton on the consultations for an International Code of Conduct for Outer Space Activities, 20 November 2013; 131120/01, http://eeas.europa.eu/statements/docs/2013/131120_01_en.pdf, last accessed 18 April 2014.

[214] See para. 1, Revised Draft, *supra* n. 211.

[215] See, paras. 4, 5, 8 respectively, Revised Draft, *supra* n. 211.

[216] See para. 5, Revised Draft, *supra* n. 211. The European Union professes to be 'particularly sensitive to the issue of the risks posed by space debris, whatever its origin, which is detrimental to present and future activities'; Council Decision 2012/281/CFSP, *supra* n. 211, para. 4.

[217] Including countries such as Brazil, India and China; China has apparently already announced that it will not even participate in the upcoming negotiations. The attitudes of Russia and the United States remain quite unpredictable, even though the latter has recently declared its support for the European effort. See e.g. M. Listner, Code of Conduct: Corrections, Updates, and Thoughts Going Forward, *The Space Review*, 18 June 2012, www.thespacereview.com/article/2101/1, last accessed 12 February 2014. Support is not coherent even within the European Union itself; *cf.* J.F. Mayence, The European Union's Initiative for a Code of Conduct on Space Activities: A Model of Soft Law for Outer Space?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 348. Among the reasons for dissatisfaction is the exclusion of many states from the consultations on the initiative, in addition to objections and concerns of more substantive nature; see Listner, *supra*. For a more detailed assessment of the European initiative, see Mayence, *supra*; also *infra*, § 6.7.

to space activities.[218] This includes international environmental law. Thus far international environmental law has paid relatively little attention to the space sector (and vice versa), hence environmental treaties are mostly designed for activities taking place on earth. In contrast, general principles of environmental law are potentially applicable to all states in respect of all kinds of activities and all types of environmental problems[219] – those of the space sector included. Accordingly, international environmental principles can and should provide direction in attempts to modify the outdated law of outer space. They are an equally essential tool in filling the gaps in the space treaties as well as in addressing the various problems evident in interpretation of the existing provisions of space law.

No doubt the principle of sustainable development, for instance, is increasingly important for all space activities. Degradation of the space environment has become a severe problem, with the potential to threaten not only the exploration and exploitation of outer space by the present generation but also the opportunities of generations to come.[220] As has been pointed out in the context of space debris, '[t]he proliferation of space debris poses major risks to the sustainability of mankind's exploration and use of outer space'.[221]

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[218] Art. III, Outer Space Treaty, *supra* n. 38, provides: 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.'

[219] See P. Sands, *Principles of International Environmental Law* (2nd edn., 2003), 231.

[220] See, for instance, Space Debris Mitigation Guidelines, *supra* n. 15, 1: '[t]he prompt implementation of appropriate debris mitigation measures is … considered a prudent and necessary step towards preserving the outer space environment for future generations'. In a similar manner, the first statement of the McGill-Cologne Declaration on Space Debris 2010 (13 April 2010, A/AC.105/C.1/2011/CRP.14, App. 2) proclaims: 'States should make safe and sustainable use of outer space a policy priority and should preserve access to and use of this unique environment for future generations.'

[221] Active Debris Removal 2012, *supra* n. 5, 7; see also McGill Declaration on Active Space Debris Removal and On-Orbit Satellite Servicing, *supra* n. 207, 1: 'orbital debris poses a growing and serious hazard to the sustainability of space activities'.

Accordingly, 'Long-term Sustainability of Space Activities' has been an agenda item of UN COPUOS since 2010.[222] The STSC has set up a Working Group on Space Sustainability to address the issue; one of its four expert groups covers space debris as an aspect of space sustainability. The goal of the Working Group is to develop by 2014 a set of best practice guidelines for operating safely and sustainably in earth orbit.[223] Indeed, the general idea of sustainable development as a comprehensive view of integrating economic and environmental interests should be accepted as a starting point for all space activities.[224] Sustainable management of outer space and its resources should serve as the foundation for any new norms in space law, too.

Another environmental principle worth mentioning here is that of due diligence. Basically, it means the duty to protect the rights of other states and is concerned with unlawful failure to take precautions that would safeguard other states from damage resulting from the source state's activities. However, the principle of due diligence does not imply that any harm whatsoever constitutes a breach of international law. The state causing the harm fulfils its duties if it takes all due care – all measures expected from a 'good government' acting in consideration of its international responsibilities – not to cause damage.[225] The Outer Space Treaty also contains a due diligence provision of sorts: the obligation of Article IX to conduct space activities 'with due regard to the corresponding interests of all other States Parties'.[226]

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[222] See Report of the Fifty-third session of COPUOS, 2010, A/65/20, paras 150–68.

[223] See Report of the Fifty-fourth session of COPUOS, 2011, A/66/20, Annex II; Terms of reference and methods of work of the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Legal Subcommittee, AC.105/L.281/Add.4, 2011. For a more detailed account of this agenda item of UN COPUOS, see G. Brachet, The Origins of the 'Long-term Sustainability of Outer Space Activities' Initiative at UN COPUOS, 28 *Space Policy* (2012), 161–5.

[224] See Williamson, *supra* n. 37, 8. For a definition of 'space sustainability', see R.A. Williamson, Assuring the Sustainability of Space Activities, 28 *Space Policy* (2012), 155–6. It has been argued that 'space sustainability' has even 'become the buzz word in the space community'; Meek, *supra* n. 4, 1.

[225] See J. Brunnée, *Acid Rain and Ozone Layer Depletion: International Law and Regulation* (1988), 95.

[226] It has even been assessed (quite optimistically, though) that this provision 'can be interpreted as creating an obligation to respect the interests of other States Parties not to endanger the environment both of outer space, including the celestial bodies, and of the Earth by space activities'; M. Hofmann, Planetary

The particular measures required to observe due diligence depend on the circumstances of each case.[227] A breach of international standards, even standards of a legally non-binding character, could have legal consequences by constituting evidence of a breach of due diligence obligations.[228] For instance, a sufficiently detailed code of conduct which is consistent with other relevant instruments could help to determine the level of care that any ‘good launching state’ needs to observe in its space activities.[229] The Space Debris Mitigation Guidelines of UN COPUOS, the IADC Guidelines, the COSPAR Planetary Protection Policy and the STSC/IAEA Safety Framework may all provide points of reference for the exercise of due diligence.[230] The principle of due diligence has, however, not been tried in a concrete case concerning environmental aspects of space activities, hence its scope and potential in the space sector remain unclear.[231]

One should also recognize the specific characteristics of the space sector which make some environmental principles less applicable. For instance, the fact that any activity taking place in outer space may be

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Protection from a Legal Perspective: Due Diligence and National Legislation, in *IAA Cosmic Study ‘Protecting the Environment of Celestial Bodies’* (Eds. M. Hofmann, P. Rettberg & M. Williamson) (2010), 63; http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%205/sg56/sg56finaldraftreport.pdf, last accessed 12 February 2014. The author also argues that Art. I, Outer Space Treaty, *supra* n. 38, declaring the exploration and use of outer space as the province of all mankind, could be interpreted ‘so as to include a common interest of all countries not to cause any harm to the existing space environment’; Hofmann, *supra*, 63–4.

[227] For instance, considerations of the resources available to a state, the factual effectiveness of its control, and the nature of the activities in question may justify differing degrees of diligence; see P.W. Birnie & A.E. Boyle, *International Law and the Environment* (2nd edn., 2002), 112.

[228] *Cf.* Kiss & Shelton, *supra* n. 209, 52.

[229] *Cf.* Kerrest de Rozavel, *supra* n. 79, 872–3.

[230] See Bohlmann, *supra* n. 193, 3–4; Towards Long-term Sustainability of Space Activities, *supra* n. 31, 23; *COSPAR Workshop on Ethical Considerations for Planetary Protection in Space Exploration*, *supra* n. 195, 41; Marboe, *supra* n. 137, 141–4.

[231] For an interesting assessment of the required standard of care in space activities vis-à-vis the debris problem, see M. Mejía-Kaiser, Collision Course: 2009 Iridium-Cosmos Crash, in *Proceedings of the International Institute of Space Law 2009* (2010), 274–84. It has been assessed that ‘the concepts of due diligence and standard of care to avoid collisions come to the limelight’, thanks to the increasing relevance of debris mitigation; *ILA Report on the Seventy-Fifth Conference*, Sofia, 2012, 494–5.

regarded as ultra-hazardous renders the principle of due diligence, as well as that of precaution[232] somewhat less applicable. In a similar manner, the principle that the polluter (that is the immediate actor at fault) pays does not appear entirely suitable for the space sector. As discussed above, it can already be a challenge to determine the most appropriate (or even any) liable entity or entities. Complex causation questions can also not be avoided; considering, for instance, the problems in attributing damage to particular pieces of debris and, moreover, the potential cumulative effects of damaging events. Even if these issues were resolved, there would be additional challenges in designing the liability system, including questions such as the determination of the relevant damage and appropriate time limits for liability given that the occurrence of damage in outer space may involve (very) long time lags.

A straightforward application of the 'polluter pays' principle seems particularly unfeasible also because the damaging potential of space activities exceeds the capacity of any single spacefaring entity to make reparation.[233] Furthermore, satellite constellations can be seen as constituting a global 'social infrastructure' providing important services to all countries. The allocation of losses within a larger community of relevant entities than only those directly involved with the launching and operation of a particular space object thus often seems warranted.[234] Tiered systems and collective loss-sharing arrangements could channel the risks of ultra-hazardous activities and ensure means for adequate indemnification for damages.

Of course, those gaining the economic benefits of space activities ought to bear the primary responsibility. One potential tool for achieving a balance between the 'polluter pays' principle and collective responsibility would be an international 'space damage fund' that takes into account the extent of states' space activities as well as their economic situation.[235] The proposal to establish a Global Fund for Space Debris Removal, contributions to which would be made 'on an equitable basis' by 'all

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[232] For a detailed treatment of the precautionary principle and its role in the space sector, see Viikari, *supra* n. 7, 157–78.

[233] For a more detailed assessment of the applicability of the 'polluter pays' principle in the space sector, see Viikari, *supra* n. 7, 190–203.

[234] See e.g. Report of the Forty-ninth session of the STSC, *supra* n. 134, para. 91.

[235] See also M. Uchitomi, Sustainable Development in Outer Space: Applicability of the Concept of Sustainable Development to Space Debris Problems, in *Proceedings of the Forty-Third Colloquium on the Law of Outer Space* (2001), 77–8.

launch operators as well as space systems owners and operators', governmental and non-governmental, also reflects such thinking.[236] Such mechanisms can be seen as reflecting the principle of common but differentiated responsibility too.[237]

13.5 CONCLUSION

Effective management of environmental problems related to space activities is impossible using the current international law of outer space only. The UN space treaties were all drafted at a time when environmental considerations were not central to the political discourse. In fact, they may even be counterproductive to the environmentally inclined aspirations of the space sector today.

The fundamental problem with UN-sponsored space law is that it sets out a variety of principles and rules which are expressed in very general terms. Concepts such as environmental protection, due regard, cooperation, prior consultation, and interests of all present and future generations are considered important in space law but, at the same time, the particular provisions implementing them are vague and leave considerable room for interpretation. Support for (or at least acceptance of) nearly any kind of peaceful activity in outer space can be derived from the UN space treaties. They also expressly permit states to conduct a wide range of potentially environmentally detrimental activities in outer space. For instance, the generation of space debris is not per se illegal,

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236 Active Debris Removal, *supra* n. 5, 2012, 45. In analogous areas of human activities, liability has often been shared between the producer of damage and society according to different kinds of formulas; this is called 'socialization of risks'; G.F. Silva Soares & E. Vieira Vargas, The Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal, 12 *Yearbook of International Environmental Law* (Eds. G. Ulfstein & J. Werksman) (2003), 69–104. On the idea of using international fund mechanisms in the space sector, see also L. Viikari, A New Liability Regime for the Space Sector – An Economic Imperative, 3 *Indian Journal of International Economic Law* (2010), 113–40.

237 The focal role of this principle in the space sector, including in respect of the debris issue, has been emphasized, e.g., in the McGill-Cologne Declaration on Space Debris 2010: 'Recognizing that the principle of common but differentiated responsibility, as enabling all States to fulfil their obligations associated with current international efforts in preserving the terrestrial environment, is an important precedent to guide current and future space debris mitigation and remediation efforts.' More on the role of the principle in the space sector, see Viikari, *supra* n. 7, 2008, 178–84.

and debris may be the result of various fully legitimate space operations. On the whole, the provisions of the space treaties imply that changes (including contamination) in the environment of the earth, outer space, or celestial bodies below the threshold of 'harmfulness' are permissible. Moreover, evaluation of the impact of a particular activity is largely left to the very state responsible for conducting that activity. Where novel techniques such as ADR and OOS are concerned, the UN space law treaties can even hinder the adoption of environmentally more benign practices.[238]

Although subsequent space law instruments have not managed to rectify the shortcomings of the UN space treaties, some of the environmental problems connected with space activities have been diminished by UN space principles – the NPS Principles, above all – and the regulations of the ITU. More advanced norms for environmental purposes in the space sector have been proposed by other international organs, such as the IADC and the ILA. In the main, these have been recommendations concerning mitigation of space debris. The approval of the Space Debris Mitigation Guidelines by UN COPUOS and the UN General Assembly constitutes the most significant step forward. The work of the ISO in space standardization further supports this development. Yet many difficulties remain.

In principle, it obviously is in the self-interest of satellite operators and other actors in the space sector to preserve the environment where they are conducting their activities.[239] Even non-spacefaring nations have a vested interest in environmental protection of space activities: there is always the risk of re-entering space debris and – above all – many states which have no independent launch capabilities nevertheless own space assets (satellites) the preservation of which may be critical for the

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[238] It may well be that the most significant challenges concerning such operations are not technical but legal in nature; *cf.* Weeden, *supra* n. 12, 43.

[239] It has been pointed out that the commercial space sector may in fact have even more incentives to act in a responsible manner than non-commercial operators, as the financing of the activities of the latter 'may have little to do with the ability of the spacecraft to continue revenue-producing activity', Mitigation of Orbital Debris (in the Matter of), Notice of Proposed Rulemaking; Propose to amend our rules to address orbital debris mitigation, and seek comment on a number of issues. FCC 02-80, IB Docket No. 02-54. 13 March 2002 para. 32. K. Kensinger, S. Duall & S. Persaud, The United States Federal Communication Commission's Regulations Concerning Mitigation of Orbital Debris, in *Proceedings of the Fourth European Conference on Space Debris* (2005), ESA/ESOC, ESA SP-587, 571–2.

development of these countries.[240] In addition, the interests of even future generations should be safeguarded.

In practice, however, the earth orbits are not well preserved. For instance, compliance with the various debris mitigation instruments remains inconsistent. The problem is that debris mitigation policies typically increase the short-term costs of space missions, as the losses resulting from debris impacts avoided generally become a considerable factor only over time. Although the reduction of mission costs in the long term could be significant, this alone may not be capable of providing economic incentives to make environmentally more benign policies attractive enough.[241] Furthermore, objects launched into outer space before the importance of mitigation requirements was understood continue to contribute significantly to the generation of the debris population.

Nevertheless, there is hope. It has been estimated that 'we are at the threshold of a new epoch in which environmental preservation of outer space has taken on a new meaning and sense of urgency not only for purposes of protecting valuable space assets in the short-term, but also to ensure the continued sustainability of space activities in the long-term'.[242] Indeed, the efforts already taken by various stakeholders provide positive pointers to the existence of a common understanding on the need to adopt improved approaches to environmental management of space activities.

At the same time, it is obvious that these steps alone are not enough. For instance, the debris mitigation guidelines of UN COPUOS and IADC are only technical in origin and nature.[243] Besides, there is no guarantee that any voluntary actions will be continued in the future. Accordingly, it has been repeatedly proposed that the United Nations move from debris mitigation guidelines to a set of space debris principles adopted by the General Assembly.[244] Another proposal made is to adopt a Space Code of

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[240] See Towards Long-term Sustainability of Space Activities, *supra* n. 5, 36.

[241] See J.S. Greenberg, *Economic Principles Applied to Space Industry Decisions* (2003), 381.

[242] Active Debris Removal, *supra* n. 5, 8.

[243] Thus far the entire space debris problem has appeared primarily as a concern of technical nature. States have been far more hesitant to discuss the legal aspects of the issue. See Marboe, *supra* n. 137, 139–41.

[244] See, above all, Review of the Legal Aspects of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, *supra* n. 137, with a view to transforming the Guidelines into a set of principles to be adopted by the General Assembly. In a similar manner, see e.g. Williams, *supra* n. 17, 8; Towards Long-term Sustainability of Space Activities, *supra* n. 31, 39.

Conduct such as that currently put forward by the European Union. A code of conduct should be politically more acceptable than a legally binding treaty, yet more demanding than a set of principles.[245]

Obviously, the most demanding regulatory option would be an international convention concentrating on the environmental aspects of space activities. In practice, however, this would in all likelihood be a very challenging (if not practically unfeasible) approach at the moment. The lengthiness of the international treaty-making process is one among the many obstacles: attracting sufficiently broad acceptance for such an instrument would certainly take at least years. All the more so as there is a clear tendency in the space sector today to develop regulation not by adopting new legally binding instruments but in the form of less formal soft-law arrangements.[246]

Indeed, the adoption of new binding international space treaties (as well as the establishment of an international organization for space traffic management) has been estimated to be a long-term (20+ years) goal only.[247] However, the willingness of states to enter into legal commitments may change faster, too, particularly if other approaches prove insufficient. It seems quite obvious that the legal ambiguities related to UN space law will at some point necessitate the adoption of a new binding space treaty (or treaties), especially for the needs of space debris salvage and remediation operations.[248] Moreover, if there is renewed interest in using nuclear power sources for space missions and even for propulsion purposes, international rules for limiting hazards related to NPS will surely be in demand. The issue of planetary protection is also likely to need more rigorous common regulation sooner or later. The increasing diversity of the concerns and stakeholders involved and the need for long-term management call for persistent, extensive new environmental space policies which require binding, unambiguous, effective international rules. As long as such common rules are missing, an increasingly precautionary approach to all space activities is imperative.

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245 See Towards Long-term Sustainability of Space Activities, *supra* n. 31, 39.

246 It has been considered to be 'generally believed that the stage of treaty and principle adoption by the UN is over' – for the time being at least; Williams, *supra* n. 17, 8; see also *ILA Report on the Seventy-Fifth Conference*, Sofia, 2012, 303; as well as further *supra*, § 2.2.1.

247 Towards Long-term Sustainability of Space Activities, *supra* n. 31, 38.

248 See *ibid.*, 40; F.G. von der Dunk, *Contradictio in terminis* or Realpolitik?, in *Soft Law in Outer Space* (Ed. I. Marboe) (2012), 54–5.

14. Legal aspects of space resource utilization

Fabio Tronchetti

14.1 INTRODUCTION

Harvesting and using extraterrestrial natural resources has represented a dream of mankind for centuries as well as a favourite topic for science fiction novels. In recent years, these dreams have gotten closer to reality as both governments and private entities have announced ambitious plans involving the extraction and utilization of valuable materials contained in celestial bodies. Although technical and financial obstacles still stand in the way of the actual exploitation of extraterrestrial resources, these plans have caught the fascination of laymen and the media alike. This interest mostly stems from the economic rewards that the use of outer space materials is expected to generate.

Apart from the attention raised with the general public, the possibility to exploit the natural resources of the moon and other celestial bodies has generated extensive discussions within the legal community.[1] Such discussions have focused on the modes, forms and purposes of extra-terrestrial exploitative activities. At the bottom of the problem lies the fact that the existing international space law rules leave a great deal of uncertainty as to the legal status of celestial bodies' resources as well as

[1] See S. Hobe *et al.*, The Moon Agreement, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 325–426; F. Tronchetti, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime* (2009); W.N. White, Interpreting Article II of the Outer Space Treaty, in *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (2004), 175; V. Pop, Appropriation in Outer Space: The Relationship Between Land and Ownership and Sovereignty on the Celestial Bodies, 16 *Space Policy* (2000), 275; F.G. von der Dunk, The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources, 32 *Annals of Air & Space Law* (2007), 91; S. Hobe, Adequacy of the Current Legal and Regulatory Framework Relating to the Extraction and Appropriation of Natural Resources, 32 *Annals of Air & Space Law* (2007), 114–5; R.S. Jakhu, Twenty Years of the Moon Agreement: Space Law Challenges for Returning to the Moon, 56 *Zeitschrift für Luft- und Weltraumrecht* (2007), 54.

the possibility to mine and use them for commercial reasons. This uncertainty is to be seen as a negative and potentially destabilizing factor for two reasons. First, it may discourage private investors interested in devoting their financial capital to extraterrestrial mining. Second, it may eventually lead states (as well as private entities authorized by their national states) to act unilaterally and start exploiting the natural resources contained in the celestial bodies.

Taking these issues into account legal scholars have put forward proposals aimed at clarifying the legal status of extraterrestrial natural resources and regulating their extraction and commercial use.[2] However, so far none of these proposals has gained global consensus or has been taken over by any spacefaring state. Nevertheless, the formulation of internationally agreed rules to govern the exploitation of natural resources in outer space remains a primary goal of the international community. In pursuing this objective the existing rules dealing with the management and use of limited resources in international areas, such as in the context of Antarctica, the ocean floor and earth orbits, provide valid examples to be taken into account.

The purpose of the present chapter is to shed light on the legal status of celestial bodies as well as of the natural resources contained therein. The analysis will start setting out the nature of extraterrestrial resources and the current and future plans concerning their exploration and use. Then the chapter will address the legal framework applicable to and governing human activities on celestial bodies. Particular attention will be dedicated to the study of the rules applicable to space resource utilization, specifically from a commercial point of view. In this respect, the need to develop specific provisions regulating the latter option will be highlighted. The chapter will finally suggest elements to be inserted into a future legal regime to regulate extraterrestrial commercial mining.

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[2] See Tronchetti, *supra* n. 1, 233–86; L. Viikari, *From Manganese Nodules to Lunar Regolith* (2002), 141–62; R. Buxton, Property in Outer Space: The Common Heritage of Mankind Principle vs. the First in Time, First in Right Rule of Property Law, 69 *Journal of Air Law & Commerce* (2004), 689; R.J. Lee, Creating an International Regime for Property Rights under the Moon Agreement, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 409; C. Tucker, Lunar Rights: How Current International Law Addresses Rights to Use and Exploit Lunar Resources, the Practical Difficulties Attached, and Solutions for the Future, 34 *Annals of Air & Space Law* (2009), 591–620.

14.2 THE (NATURAL) RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES

The moon and other celestial bodies contain vast amounts of natural resources. The lunar crust offers a variety of primary elements, including uranium, thorium, potassium, oxygen, silicon, magnesium, iron, titanium, calcium, aluminium and hydrogen.[3] In addition, the lunar soil preserves platinum-group metals – such as platinum, palladium, osmium, and iridium; highly valuable commodities used in medical devices, renewable energy products, catalytic converters, and, potentially, automotive fuel cells.[4]

Significantly, scientific studies have indicated that the lunar surface is covered by a layer of loose particulate material, the so-called lunar regolith.[5] Lunar regolith are the result of a natural process where the lunar rocks are exposed to cosmic and solar radiation, as well as to solar wind.[6] Solar wind consists mainly of electrons and protons as well as alpha-particles (ionized Helium-3 and Helium-4). When these particles hit the surface of the moon, they are trapped in the crystals of the regolith minerals that naturally occur in the lunar soil.[7] Some evaluate the regolith in the *Mare Tranquilitatis* area on the moon to contain at least 10,000 metric tons of Helium-3.[8]

Helium-3 is thus often referred to as the first likely object of governmental and private interest, as it would have the potential to substitute fossil fuels as the main source of energy on earth. It is argued that 370 metric tons of Helium-3 would be able to supply mankind with energy for an entire year.[9] Chemically speaking, Helium-3 is a single neutron helium isotope that is not radioactive, and when bombarded with

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[3] See E. Robens *et al*., Investigation of Surface Properties of Lunar Regolith Part II, 94 *Journal of Thermal Analysis and Calorimetry* (2008), 627. *Cf.* also more in general H. Schmitt, *Return to the Moon* (2006).

[4] See www.space.com/2032-asteroid-mining-key-space-economy.html, last accessed 20 February 2014.

[5] See E.A. King, *Space Geology: An Introduction* (1976), 165.

[6] See I.A. Crawford, The Scientific Case for Renewed Human Activities on the Moon, 20 *Space Policy* (2004), 91; King, *supra* n. 5, 188.

[7] See G. Faure & T.M. Mensing, *Introduction to Planetary Science: The Geological Perspective* (2007), 164.

[8] See C.R. Neal, The Moon 35 years after Apollo: What's Left to Learn?, 69 *Chemie der Erde* (2009), 21. *Cf.* however I.A. Crawford, Lunar Resources: A Review, accepted for publication in *Progress in Physical Geography* (2014).

[9] See N. Reinke, No Helium-3 from Moon – Commentary on the Current Moon Debate, *DLR Countdown 03/07*, 24.

neutrons could interact with electromagnetic forces applied in the fusion process. This could create electricity directly, without producing radioactive neutrons as a by-product.[10] The downside of this process is that Helium-3 needs a temperature of about 10 million degrees Celsius for this collision to occur naturally. Such temperatures can be generated on earth for only very short periods of time (for example, in a thermonuclear hydrogen bomb).[11] Significant technological advancements are still required to enable large-scale usage of Helium-3 as a source of energy. Whether for Helium-3 or for other resources, however, the 'race' seems to be on its way.

Furthermore, the moon contains reserves of water. Scientific missions, such as NASA's Lunar Crater Observation and Sensing Satellite (LCROSS), have confirmed that moon water is present in some places in the form mostly of pure ice crystals.[12] Clearly, the presence of water in the lunar soil is of particular relevance for future exploration and use of the moon and its resources.

As to celestial bodies other than the moon, it is estimated that near-earth asteroids of a diameter larger than 1 kilometre contain vast amounts of platinum and minerals such as iron and nickel.

14.3 EXTRATERRESTRIAL MINING: WHERE DO WE STAND NOW?

Upon the conclusion of the Apollo programme in 1972, the moon and other celestial bodies almost completely disappeared from the space agenda of the spacefaring states. This situation lasted until the beginning of the twenty-first century when a renewed interest in exploring and possibly using extraterrestrial bodies and their resources emerged. Such an interest was expressed not only by governments, but also by ambitious private entities. The following section will provide a short overview of

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[10] See *ibid.*, 24.

[11] See Faure & Mensing, *supra* n. 7, 165.

[12] For an overview of the Lunar Crater Observation and Sensing Satellite mission see NASA, Lunar Crater Observation and Sensing Satellite, www.nasa.gov/mission_pages/LCROSS/main/index.html, last accessed 20 February 2014; and for a description of the results of this mission *Lunar Impact Uncovered More Than Just Moon Water* (Ed. T. Phillips), NASA Science News, 21 October 2010, http://science.nasa.gov/science-news/science-at-nasa/2010/21oct_lcross2/, last accessed 20 February 2014.

public and private plans for extraterrestrial mining and an analysis of the technical and economic issues related to them.

14.3.1 Current Governmental Extraterrestrial Explorative Operations and Future Plans

Starting from 2007 some of the technologically advanced states, including the United States,[13] China,[14] Japan,[15] and India[16] began launching unmanned lunar missions.[17] These missions were mostly motivated by the possibility to use the moon as a base for further exploration of the solar system and to extract and utilize the (natural) resources contained in the lunar soil and subsoil.[18] Thus, it seemed to many that a new, global, 'moon race' had started.

However, in 2010 the situation changed: on the one side, the newly elected US Administration decided to cancel its lunar programme;[19] on the other side, Japan and India began experiencing setbacks to their lunar ambitions.[20] By contrast, China was fully committed to pursuing its lunar projects and successfully completed the Chang'e-2 mission in 2010 and, most recently, on 14 December 2013, placed the rover Yutu on the lunar surface as part of the Chang'e-3 mission. Therefore, China can be currently viewed as the unchallenged leader in lunar projects, not only because of its past and present successes, but also looking at its ambitious future plans. The Chinese National Space Administration (CNSA) has announced its intention to launch a sample return mission to

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[13] The United States launched the Lunar Reconnaissance Orbiter mission on 18 June 2009.

[14] China launched the Chang'e-1 mission on 24 October 2007.

[15] Japan launched the Selene-1 mission on 14 September 2007.

[16] The Indian Chandrayaan-1 was launched on 22 October 2008.

[17] All these missions essentially consisted of a probe orbiting around the moon and analysing its geological composition.

[18] *Cf.* Tronchetti, *supra* n. 1, 1–7.

[19] See H. Lacey, Obama to Suggest End of NASA Moon Program, www.examiner.com/article/obama-to-suggest-end-of-nasa-moon-program, last accessed 20 February 2014.

[20] The Japanese Selene-2 and the Indian Chandrayaan-2 missions, initially planned to take place around 2012–13, have been postponed to 2016–17, even as some additional delays may occur due to financial constraints. See S. Laxman, Japan SELENE-2 Lunar Mission Planned for 2017, www.asian scientist.com/topnews/japan-announces-selene-2-lunar-mission-2017/, last accessed 20 February 2014; India to Launch Chandrayaan-2 by 2017, www.thehindu.com/sci-tech/science/india-to-launch-chandrayaanii-by-2017/article5562361.ece?ref=slider News, last accessed 20 February 2014.

earth's natural satellite by 2017. This mission will conclude China's lunar exploration programme.[21] After that, China is considering a manned moon landing by the mid-2020s and, eventually, the construction of a lunar base.[22] Although the Chinese government has not yet made a firm final decision on sending people to the moon's surface, scientists are actively working to develop the required technology to make these two projects possible.

As far as the United States is concerned, the official space exploration goals of the US Administration are a first manned Mars mission by 2030,[23] and 'capturing' and mining an asteroid. With regard to the latter goal the US Administration intends to ask the Senate for more than US$ 100 million in 2014 for a future mission to move a small, near-earth asteroid into orbit around the moon and then send out astronauts to bring back samples within a decade. This mission is supposed to combine several ongoing NASA space projects including asteroid detection, robotic spacecraft development, the construction of the Space Launch System, and the development of a deep space exploration capsule and technologies facilitating manned Mars missions.[24] The funding of such an ambitious project remains uncertain.

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[21] The Chinese lunar exploration programme consists of three phases: (1) the orbital phase: this phase foresaw the launch of two lunar orbiters, Chang'e-1 and Chang'e-2, and has been completed; (2) the soft lander/rover phase: this phase is ongoing and includes spacecraft capable of soft landing on the surface of the moon and deploying lunar rovers (it includes the Chang'e-3 and Chang'e-4 missions); (3) the sample return phase: the last phase aims at sending an automatic return mission to the moon, capable of collecting up to 2 kg of lunar samples and return them to the earth.

[22] See the speech given by Zhang Yuhua, deputy general director and deputy general designer of the Chang'e-3 probe system, at the Shanghai Science Communication Forum, 14 January 2014, as reported by the *People's Daily*, China Considers Manned Moon Landing Following Breakthrough Chang'e-3, www.universetoday.com/107716/china-considers-manned-moon-landing-following-breakthrough-change-3-mission-success/, last accessed 20 February 2014.

[23] On the corresponding statement of US President Barack Obama on 15 April 2010 see J. Amos, Obama Sets Mars Goal for America, BBC News, 15 April 2010, news.bbc.co.uk/2/hi/8623691.stm, last accessed on 20 February 2014.

[24] See www.mineweb.com/mineweb/content/en/mineweb-exploration?oid=185131&sn=Detail, last accessed 20 February 2014.

14.3.2 Private Extraterrestrial Mining Plans

Apart from governmental initiatives, several privately funded extraterrestrial mining projects have been announced. While the actual technical and economic feasibility of such projects is highly questionable, nevertheless they still receive extensive coverage in the media. On 24 April 2012 a company called Planetary Resources announced a plan to mine asteroids in order to obtain their mineral resources.[25] This plan also foresees the creation of a fuel depot in space by 2020, using water from asteroids, which could be broken down in space to liquid oxygen and liquid hydrogen for rocket fuel. From there, it could be sent to earth orbit for refuelling commercial satellites or spacecraft. Planetary Resources' project has been widely publicized, mostly because its founders include film director and explorer James Cameron, and investors include Google's chief executive Larry Page and its executive chairman Eric Schmidt.[26] Another similar venture, called Deep Space Industries, was initiated by entrepreneur David Gump. This company intends to begin searching for asteroids suitable for mining by 2015 and by 2016 return asteroid samples to earth.[27] Deep Space Industries plans to start asteroid mining by 2023.[28]

14.3.3 Technological and Economic Issues Relating to Extraterrestrial Mining

A number of technical and economic issues still stand in the way of extraterrestrial mining. The technology to effectively remove large quantities of minerals and other resources from the surface and subsurface of celestial bodies in the absence of gravity is not ready yet.[29] Another question is whether extraterrestrial mining activities can be carried out automatically or require constant human presence and supervision. In the latter case, adequate technology would need to be developed in order to

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25 See www.planetaryresources.com/, last accessed 20 February 2014.

26 See http://articles.washingtonpost.com/2012-04-24/business/35450807_1_planetary-resources-asteroids-for-precious-metals-mine-asteroids, last accessed 20 February 2014.

27 See http://deepspaceindustries.com/, last accessed 20 February 2014.

28 See www.businessinsider.com/deep-space-industry-asteroid-mining-plan-2013-2?op=1, last accessed 20 February 2014.

29 See R. Lochan & V. Gopalakrishnan, Lunar Exploration – The Road Ahead, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 56–67; R.J. Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space* (2012), 69–76.

enable a prolonged human presence in outer space. Furthermore, it is important to assess where the extracted resources would be utilized, either *in situ*, for example to support a human settlement,[30] or on earth. If the second option were chosen, a fast, reliable and cheap means of transportation from a celestial body to the earth and vice versa would need to be available.

Alongside technical issues there are several economic factors to be taken into account. First of all, the costs of developing the technology to harvest, collect and eventually send back to earth extraterrestrial natural resources are enormous. Due to the financial difficulties affecting the majority of states, it seems difficult to conceive that they might be able to afford to invest large sums of money in extraterrestrial mining. In this respect, the potential contribution of private operators might prove to be of vital importance, as they may be ready to dedicate such financial resources to the mining of extraterrestrial natural resources – provided that the exploitation of the natural resources of the moon and other celestial bodies were perceived as a profitable business. Do the costs of extracting and returning asteroidal materials to earth far outweigh their market value? Historically, the long time scales and uncertain returns on asteroid mining have driven most investors away from such undertakings.[31] In any case, the insertion of the extracted extraterrestrial resources in terrestrial markets should be realized gradually. Indeed, outside sources of precious metals could lower prices sufficiently to possibly doom the venture, by too rapidly increasing the available supply of such metals.

A factor potentially favouring the extraction and commercial use of extraterrestrial natural resources is the progressive exhaustion of essential minerals and fossil fuels on earth.[32] Although scientists disagree as to when these resources will be depleted, it is unquestionable that sooner or later this will happen. Humankind needs to find alternative sources to sustain its development and needs and, thus, extraterrestrial mining could become a valuable option.

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[30] See M. Hofmann, Recent Plans to Exploit the Moon Resources Under International Law, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 425.

[31] *Cf.* Lee, *supra* n. 29, 4–7.

[32] See *ibid.*, 32–45; Tronchetti, *supra* n. 1, 2.

14.4 THE LEGAL STATUS OF CELESTIAL BODIES AND EXTRATERRESTRIAL NATURAL RESOURCES

14.4.1 Preliminary Considerations

Turning to the legal issues concerning such plans as addressed above, since the beginning of space activities the legal status of celestial bodies and their natural resources has generated heated discussions within legal circles. Actually, it is partly due to the recent interest in extraterrestrial mining that these issues have vigorously returned to centre stage in the space law debate. Analysis of the relevant international space law rules reveals a distinction between the legal status of celestial bodies as a whole and that of their natural resources: while the former appears to be, to a large extent, clear and adequately elaborated, the latter is rather uncertain.

Among the reasons that can be put forward to explain this distinction one can argue that at the time the fundamental rules governing space activities were elaborated the primary concern of their drafters was to clarify the legal nature of celestial bodies, rather than that of their resources. This choice had its roots in the geo-political decisions of the two super powers and in technological and economic barriers that meant that the extraction and use of extraterrestrial resources was not a feasible option in the late 1960s.

In order to provide a comprehensive description of the legal regime applicable to the utilization of space resources the following sections will discuss the legal status of celestial bodies first, and then that of the natural resources contained therein. In doing so, attention will be paid to the two most relevant international treaties on this topic, namely the 1967 Outer Space Treaty[33] and the 1979 Moon Agreement.[34]

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[33] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[34] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979).

14.4.2 The Legal Status of Celestial Bodies

14.4.2.1 The Outer Space Treaty

The 1967 Outer Space Treaty is the cornerstone of international space law.[35] Its provisions, containing rules and principles regulating the exploration and use of outer space, have provided the legal basis on which space activities have developed in the past 47 years. The importance of the Outer Space Treaty also stems from the fact that over 100 states are parties to it, including the main spacefaring nations.

Article II of the Outer Space Treaty establishes a cardinal concept of international space law: the non-appropriative nature of outer space. Article II reads as follows: 'Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.' This non-appropriative character of outer space was one of the first principles agreed upon by states when the fundamental rules governing space activities were laid down at the dawn of the space era. This principle already appeared in both the UN Resolutions 1721[36] and 1962.[37]

When space activities began many feared that outer space could become a theatre of conflicts, as states could compete to acquire control over strategically and economically significant celestial bodies. Instead, states took another direction and agreed to renounce any territorial claims over outer space or any of its parts and to consider the space environment as not appropriable. For the creators of the space law regime, the non-appropriative nature of outer space was the best guarantee for preserving the peaceful nature of the space environment and to ensure that all mankind could benefit from its exploration and use.[38]

The text of Article II makes clear that the traditional means of acquiring property or sovereignty rights over things or lands (such as by

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35 See further *supra*, esp. §§ 1.1, 2.2.1.2, 2.3.1.

36 UNGA Res. 1721(XVI), of 20 December 1961; General Assembly – Sixteenth Session, Resolutions adopted on reports of the First Committee, at 6.

37 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, UNGA Res. 1962(XVIII), of 13 December 1963; UN Doc. A/AC.105/572/Rev.1, at 37. For an analysis of the work on the United Nations on outer space in the period 1958–66 see P.G. Dembling & D.M. Arons, Space Law and the United Nations: The Work of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, 32 *Journal of Air Law & Commerce* (1966), 329.

38 See F. Tronchetti, *supra* n. 1, 27; also *supra*, § 2.3.1.2.

use or occupation) do not apply to outer space and celestial bodies.[39] Thus, states are not allowed to extend their sovereignty rights over outer space and any of its parts. This principle has to be read in conjunction with the provisions of Article I, paragraph 1 of the Outer Space Treaty, which confer on states parties to the Treaty the right to freely explore and use outer space. These two Articles attribute outer space the status of a *res communis omnium*, an area open to all states but not capable of being appropriated by any of them.[40] Accordingly, all states are entitled to access, explore and use outer space, regardless of their level of technological development and without the need for any form of authorization, but cannot appropriate outer space and its celestial bodies.

A point which has raised controversy over the years is whether the prohibition laid down in Article II also extends to private entities. The issue has its origin in the words of Article II, which speak of prohibition of 'national appropriation of outer space'. Normally, the term 'national' is associated with states and not with private subjects. Based on this consideration, some scholars and other individuals argue that Article II has a 'loophole' and that, while banning states from appropriating outer space and the celestial bodies, it does not prohibit private subjects from doing so.[41] This argument is often utilized by companies selling 'extra-terrestrial properties' over the Internet.[42]

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[39] For an extensive analysis of Art. II, Outer Space Treaty, *supra* n. 33, see L.I. Tennen, Article II of the Outer Space Treaty, the Status of the Moon and Resulting Issues, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 520; R.S. Jakhu & S.R. Freeland, Article II, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 44–63; F. Tronchetti, The Non-Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty, 33 *Air & Space Law* (2008), 277.

[40] The concept of *res communis* comes from Roman law and it is opposed to the concept of *res nullius*, which is used with reference to a thing without an owner that can be appropriated by anyone. Early attempts to consider outer space as a *res nullius* were rejected in favour of its status as a *res communis*. On this point see e.g. M. Smirnoff, Legal Status of Celestial Bodies, 28 *Journal of Air Law & Commerce* (1961–1962), 290.

[41] See e.g. White, *supra* n. 1, 175. *Cf.* however e.g. the Statements of the Board of Directors of the International Institute of Space Law (IISL) of 2004 and 2009, at www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf and www.iislweb.org/docs/Statement%20BoD.pdf; last accessed 18 April 2014; respectively; also *supra*, § 2.3.1.2.

[42] On this point see extensively V. Pop, The Men Who Sold the Moon: Science Fiction or Legal Nonsense?, 17 *Space Policy* (2001), 195; Tronchetti, *supra* n. 1, 203–10.

Several arguments can be put forward to reject the legality of private appropriation of celestial bodies. First of all, there are some historical and conceptual reasons.[43] At the time the Outer Space Treaty was negotiated, states were the only active space actors. Private entities were only involved as contractors and suppliers to governments and truly private space activities were seen as not feasible at the time.[44] Consequently, the drafters of the Treaty did not consider it necessary to expressly prohibit the appropriation of outer space by private operators. Additionally, allowing private appropriation of outer space would go against the spirit of and the idea behind the Outer Space Treaty. As described, the prohibition of appropriation of outer space is a cardinal principle of space law. Therefore, it is not clear why private operators should be allowed to appropriate celestial bodies when states are forbidden to do so.[45]

Furthermore, more specific legal arguments to refute private claims of ownership in space can be put forward. It should be kept in mind that according to Article VI of the Outer Space Treaty states shall bear international responsibility for national activities in outer space, including the activities of non-governmental entities, and authorize and continuously supervise the authorized space activities. From this it follows that if a state is prohibited from engaging in a certain conduct (in this case from appropriating outer space), 'then it lacks the authority to license its nationals or other entities subject to its jurisdiction to engage in that prohibited activity'.[46] Significantly, in the context of Article VI the word 'national' includes also private entities. Furthermore, as also indicated by the IISL Board of Directors, the prohibition of national appropriation also precludes the application of any national legislation on a territorial basis to validate a private claim.[47] Private property exists only if a superior authority recognizes and protects it. But a private entity cannot legally rely on national law to acquire property over part of the 'global

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43 Generally see Pop, *supra* n. 1, 277; *supra*, § 2.3.1.2.

44 *Cf.* also further *supra*, § 2.2.2.3.

45 See C.W. Jenks, *Space Law*, London, (1965), 201.

46 P.M. Sterns & L.I. Tennen, Privateering and Profiteering on the Moon and Other Celestial Bodies: Debunking the Myth of Property Rights in Space, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 59.

47 See Statement, Board of Directors of the International Institute of Space Law (IISL) on Claims to Property Rights Regarding the Moon and Other Celestial Bodies, www.iafastro-iisl.com/additional%20pages/Statement_Moon.htm; last accessed 20 February 2014.

commons' of outer space. If a state were to recognize claims to extraterrestrial properties by its nationals, this would constitute an appropriation of outer space 'by other means', which is prohibited under Article II.

Apart from Article II there are other Articles of the Outer Space Treaty that are relevant to determine the legal status of celestial bodies. Article I, paragraph 1 declares that 'the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries, and shall be the province of all mankind'. The meaning and practical implications of this Article are uncertain.[48] While some argue that it only has a moral value, others point out the binding value of its provisions. In general terms this provision means that the exploration and use of outer space, being the 'province of all mankind', is not aimed at serving only the interests of those states that have the technological capability to explore and utilize outer space, but those of all states, no matter what their degree of economic and scientific development. This is an idea that has permeated space activities since their inception: indeed, the space age was deemed to be an opportunity of development for all countries, rather than for a limited group of states only.[49]

Undoubtedly, Article I, paragraph 1 is formulated vaguely. However, a few unequivocal points arise with regard to its interpretation. Firstly, the clause does not require any mandatory sharing of the benefits generated from space activities. While all states are in principle entitled to benefit from space activities, it is up to the states that have carried out such activities to decide the forms and modes of this sharing. Secondly, it imposes some limitations on the freedom of states to explore and use outer space for their exclusive benefit.[50] Thirdly, the most feasible way to enable the largest number of countries to benefit from space activities is through international cooperation.[51] Clearly, the terms of Article I, paragraph 1 have a profound impact on the legal regime governing

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[48] On Art. I, Outer Space Treaty, *supra* n. 33, see generally S. Hobe, Outer Space as the Province of All Mankind – An Assessment of 40 Years of Development, in *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 442; N. Jasentuliyana, Article I of the Outer Space Treaty revisited, 17 *Journal of Space Law* (1989), 129.

[49] See further *supra*, §§ 2.2.2, 2.3.1.2.

[50] See R.S. Jakhu, Legal Issues Relating to the Global Public Interest in Outer Space, 32 *Journal of Space Law* (2006), 31.

[51] See S. Hobe, Article I, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 38–9.

extraterrestrial mining, as they impose some important, although general, limits and conditions on such undertakings.

Alongside Article I, paragraph 1, Article IX establishes that when exploring and using outer space, including celestial bodies, states shall avoid their harmful contamination. This provision, which has a direct influence on extraterrestrial mining, is also applicable to private entities authorized by a state to carry out space activities. In a similar scenario, it would be the duty of this state to ensure that the authorized private operator complies with international obligations.

14.4.2.2 The Moon Agreement

The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, usually referred to as the Moon Agreement, was opened for signature in December 1979 and entered into force in 1984.[52] The purpose of this Agreement was to further define the legal status of the moon and other celestial bodies and to establish rules to govern the exploration, use and exploitation of the natural resources contained therein.

Unlike the Outer Space Treaty, the Moon Agreement has received to this date only a limited number of ratifications. Fifteen states, not including any of the space powers, are parties to it and four more additional states have signed it. This fact significantly reduces its legal significance and impact on present lunar and other celestial bodies' activities. It is still worthy of analysis to the extent that, due to the current interest in extraterrestrial natural resources, the Agreement has a realistic chance of being ratified by states in the future.

Among the several reasons behind the low level of acceptance of the Moon Agreement two can be highlighted.[53] Firstly, for nearly 35 years there were no moon-related activities and, consequently, there was no need to agree on a specific legal regime governing them. States become parties to treaties only if they see a clear advantage in doing so. As activities on the moon did not occur for over three decades, there was no need to ratify the Moon Agreement. Secondly, there was the controversial nature of some of its provisions, particularly the ones introducing the concept of the 'common heritage of mankind'. Such a concept is

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[52] For a detailed analysis of the Moon Agreement, *supra* n. 34, see Hobe *et al.*, *supra* n. 1, 325–426; C.Q. Christol, *The Modern International Law of Outer Space* (1982), 253–311; H.W. Bashor, *The Moon Treaty Paradox* (2004). Further also *supra*, § 2.3.5.

[53] See von der Dunk, *supra* n. 1, 100; Tronchetti, *supra* n. 1, 38–41.

considered, rightfully or not, by many as a stumbling block for the acceptance of the Agreement.[54]

As far as the legal status of the moon and other celestial bodies is concerned, the Moon Agreement, on one side, reaffirms the provisions of the Outer Space Treaty[55] and, on the other side, significantly expands them. Article 11, paragraph 2, reiterates the non-appropriative nature of the moon and other celestial bodies with a wording that mirrors that of Article II of the Outer Space Treaty. Instead, paragraph 3 of the same Article moves one step forward by addressing the issue of property rights in outer space and clarifying the position of natural and legal persons with respect to the non-appropriation of celestial bodies. Accordingly, neither the surface and subsurface of the moon nor natural resources in place shall become the property of any state, international intergovernmental or non-governmental organization, national organization or non-governmental entity, or any natural persons. Furthermore, the placement of personnel, equipment and facilities or on below the surface of the moon does not create any right of ownership over the surface and subsurface of the moon.

The most relevant provisions for the purpose of our discussion are included in the remaining paragraphs of Article 11.[56] Article 11, paragraph 1, affirms that '[t]he Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of the Article'. The 'common heritage of mankind' principle constitutes one of the most debated notions of international law and an agreed interpretation of its meaning and legal consequences does not exist.

From a legal standpoint the 'common heritage of mankind' is an evolution of the *res communis* concept.[57] As previously described,

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[54] See also further *supra*, § 2.3.5.2.

[55] See on this point F.G. von der Dunk, The Dark Side of the Moon – The Status of the Moon: Public Concepts and Private Enterprise, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 121.

[56] For an analysis of Art. 11, Moon Agreement, *supra* n. 34, see B. Rosenfield, Article XI of the Draft Moon Agreement, in *Proceedings of the Twenty-Second Colloquium on the Law of Outer Space* (1980), 209; C.Q. Christol, Important Concepts for the International Law of Outer Space, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 73; S. Hobe, Common Heritage of Mankind – An Outdated Concept in International Space Law?, in *Proceedings of the Forty-First Colloquium on the Law of Outer Space* (1999), 271; Lee, *supra* n. 2, 414.

[57] Generally on the 'common heritage of mankind' see H.S. Rana, The Common Heritage of Mankind & the Final Frontier: A Revaluation of Values

according to the latter, certain areas outside national jurisdiction may not be appropriated or occupied by any states because they represent a common concern of all mankind. At the same time, such theory calls for equality of treatment and confers on all states the right to freely explore, use and exploit the common area concerned and its resources.

The 'common heritage of mankind' concept differs from this approach in several ways. It is based on the assumption that certain areas lying outside of national jurisdiction, for reasons of the scientific and commercial value of the resources contained therein, shall be commonly managed by all states on behalf of mankind. Consequently, a 'common heritage of mankind area' cannot be appropriated by a single state or private person. Unlike under the *res communis* theory, states are not given the right to freely use and exploit a 'common' area and its resources. Instead, all activities, particularly those aimed at exploiting the area's resources, can be carried out only in accordance with principles and rules established by an international regime. The primary purpose of such a regime is the orderly management of the area and its resources, and the equitable sharing by all states of the benefits derived therefrom. This concept also calls for environmental protection and freedom of scientific investigation within the 'common heritage of mankind' area. The most controversial aspects of the 'common heritage of mankind' theory are the formulation of the principles and rules constituting the international regime and the way benefits can be shared among all states. Indeed, developed and less-developed states hold diverging positions.

The concept of the 'common heritage of mankind' has been inserted into two international legal instruments, the 1982 United Nations Convention on the Law of the Sea[58] and the 1979 Moon Agreement. The negotiation of these two treaties ran in parallel and influenced each other.[59] Thus, in order to understand the nature and scope of the

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Constituting the International Legal Regime for Outer Space Activities, 26 *Rutgers Law Journal* (1994), 225; L.M. Fountain, Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine, in 35 *Connecticut Law Review* (2003), 1753; V.S. Mani, The Common Heritage of Mankind: Implications for the Legal Status of Property Rights on the Moon and Other Celestial Bodies, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 35.

58 United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 and 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39.

59 See in detail e.g. Viikari, *supra* n. 2; Tronchetti, *supra* n. 1, 38–61, 85–130.

'common heritage of mankind' under the Moon Agreement, it is useful to briefly examine it in the general context of international law, particularly in relation to the law of the sea, keeping in mind Article 11, paragraph 1.

The late 1960s and early 1970s were characterized by dynamic geo-political developments, particularly by the presence of the newly independent developing states in the international arena. These states pushed for a re-definition of the economic relations between the North and the South of the world and for the establishment of a 'New International Economic Order'. In their view, the industrialized countries had taken advantage of the less-developed ones for centuries; therefore, it was time for the former to give something back to enable the latter to develop.[60]

Under the new international economic order theory industrialized states were under the obligation to: (1) mandatorily transfer technology to developing countries; (2) financially assist them; and (3) create a licensing system for international goods which gave preferential access to the less technologically advanced states.[61] These states considered these principles as necessary elements to be included in the legal regimes governing the exploitation of international areas, such as the deep seabed.

Consequently, the new international economic order theory significantly affected the negotiations of the United Nations Convention on the Law of the Sea (UNCLOS), which started in 1974 and ended in 1982 with the adoption of the Convention. Under Article 136, Part XI, the deep seabed was declared to be the 'common heritage of mankind' and a legal mechanism to govern the exploitation of the deep seabed resources was established. The organizational structure established in the form of an International Seabed Authority was meant to restrict the technologically and economically advanced states and their companies from using the deep seabed resources to their own exclusive benefits. Additionally, the Authority was empowered to decide on the distribution of benefits derived from such resources.[62]

The insertion of the 'common heritage of mankind' in the final text of UNCLOS met with the opposition of the industrialized countries which, eventually, largely refused to ratify the Convention. In the decade that followed, developed and developing countries worked together to reduce their differences. This process led to the adoption of the 1994

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[60] See UNGA Res. 3201(XXIX), Sixth Special Session, Supp. (N. 1), UN Doc. A/9551 (1974).

[61] See *ibid.*

[62] *Cf.* esp. Arts. 156 ff., United Nations Convention on the Law of the Sea, *supra* n. 58.

Implementation Agreement of Part XI of UNCLOS, which included a new and more liberal version of the common heritage of mankind theory.[63] Indeed, several obligations, such as the mandatory transfer of technology, were removed and the voting mechanism within the Authority, now reflecting the level of technological development and the effective involvement in the exploitative activities, was changed.

This brief summary gives rise to one important conclusion: by the beginning of the 1990s the developing countries had by and large abandoned the idea of an international economic order with asymmetric obligations for industrialized states and accepted a free-market approach to manage international areas.

In parallel with these events, negotiations for a legal framework governing human activities on the moon and other celestial bodies took place and resulted in the adoption of the Moon Agreement in 1979. Article 11, paragraph 1 declares the moon and its natural resources to be the 'common heritage of mankind'. However, unlike UNCLOS, the Moon Agreement does not fully elaborate the 'common heritage of mankind' concept; instead, its meaning and scope remain largely debatable.[64] Article 11 leaves it entirely open as to how the international regime for the exploitation of the resources of the moon and other celestial bodies should be shaped and exploitative lunar activities organized. For example, nothing similar to the International Seabed Authority is created under the Moon Agreement.

When reading the Moon Agreement it becomes evident that its drafters did not consider the exploitation of extraterrestrial natural resources as a matter of immediate urgency. Consequently, any specific decision on the rules governing such exploitation was postponed. Indeed, Article 11, paragraph 5 calls upon states parties to establish an international regime for the exploitation of the natural resources of the moon and celestial bodies, but only when such exploitation is about to become feasible. Article 11, paragraph 7 provides for the structure of the main features of

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[63] Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (hereafter New York Agreement), New York, done 28 July 1994, entered into force 28 July 1996; 1836 UNTS 3; 33 ILM 1309 (1994); UKTS 1999 No. 82; Cm. 2705; ATS 1994 No. 32.

[64] On this point see von der Dunk, *supra* n. 1, 100 ff.; P.M. Sterns, G.H. Stine & L.I. Tennen, Preliminary Jurisprudential Observation Concerning Property Rights on the Moon and Other Celestial Bodies in the Commercial Age, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 49.

the envisioned international regime, namely: (1) any exploitation of extraterrestrial resources should be undertaken in an orderly and safe manner; (2) the natural resources should be rationally managed (which means that any resource-wasting activities should be avoided); (3) the use of extraterrestrial resources should enable the expansion of opportunities; and (4) the benefits derived from the exploitation of extraterrestrial resources should be 'equitably' shared among states. Significantly, Article 11, paragraph 7(d), calls for 'equitable' and not 'equal' sharing. Such a sharing shall take into account the interests and needs of developing countries as well as the efforts of those countries which have contributed directly or indirectly to the exploration of the moon. This paragraph tries to seek a balance between the interests of investing states (that is, of states directly involved in exploitative activities) and non-investing ones.

Thus, the Moon Agreement falls short of clarifying the meaning of the 'common heritage of mankind' principle and how this concept should impact extraterrestrial exploitative activities. The Agreement only lays down general principles and future commitments. However, looking at the provisions of Article 11, paragraph 7, it is not simply one-sidedly to the benefit of developing countries: this paragraph does call for a sharing of benefits, but such a sharing should be equitable. This is the main point where the Agreement deviates from the idea of return on investment. Developing countries, which have invested nothing or very little in lunar activities, will get something in return, assuming thus a privileged and asymmetrical position, but not necessarily on the same basis as those countries investing; it is as yet uncertain according to which principles and by which authority such a sharing should be determined. Because of these uncertainties and imbalances in its provisions several authors claim that the Moon Agreement should be disregarded and considered history.[65] Others propose more constructive approaches,[66] such as an amendment of the Agreement or the insertion of a Protocol containing rules to govern

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[65] See, for example, J. Benson, Space Resources: First Come First Served, in *Proceedings of the Forty-First Colloquium on the Law of Outer Space* (1999), 46; E. Dinkin, Property Rights and Space Commercialisation, *The Space Review* (2004), www.thespacereview.com/article/141/1, last accessed 20 February 2014.

[66] See K.V. Cook, The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty, 11 *Georgetown International Environmental Law Review* (1994), 647; Viikari, *supra* n. 2, 143 ff.; R.H. O'Donnell, Staking a Claim in the Twenty-First Century: Real Property Rights on Extra-Terrestrial Bodies, 32 *Dayton Law Review* (2007), 461; Tronchetti, *supra* n. 1, 233–86.

the exploitation of extraterrestrial resources inspired by the new interpretation of the common heritage of mankind included in the 1994 Amendment to Part XI of UNCLOS by way of the New York Agreement.[67] Significantly, in recent years the Legal Sub-Committee of UN COPUOS has undertaken efforts to enhance adherence to the Moon Agreement.[68] These discussions have shown that still today many states consider it unappealing and as having uncertain economic implications.

In conclusion, as the Moon Agreement is largely non-ratified, the legal status of celestial bodies is the one provided for in the Outer Space Treaty, according to which celestial bodies cannot be appropriated but are free for exploration and use by states and their duly authorized nationals. A different issue concerns the right of governmental and private subjects to use the natural resources located in outer space. This issue is addressed in the next section.

14.4.3 The Legal Status of Extraterrestrial Natural Resources

The legal status of extraterrestrial resources is a highly controversial topic. Indeed, international space law lacks clear and internationally accepted rules governing their removal and use. On one side, the Moon Agreement, which includes dedicated provisions on the utilization of celestial bodies' resources, has not been accepted by the majority of spacefaring states. On the other side, the Outer Space Treaty is virtually silent on the issue of resources. This situation generates uncertainty and can be viewed as a factor obstructing the commencement of extraterrestrial mining activities.

It is important to clarify that controversy relates not to the scientific but to the commercial use of extraterrestrial natural resources. As to the former, consensus exists on the right of states to extract and use extraterrestrial resources for scientific purposes, such as scientific investigation and research.[69] Instead, no agreement exists on the rules and

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67 On these points see *infra* at §§ 14.5.2, 14.5.3.

68 *Cf.* Joint Statements on the Benefits of Adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies by the States Parties to the Agreement, UN Doc. A/AC.105/C.2/L. 272, Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space, Forty-Seventh Session, 3 April 2008.

69 For the analysis of the use of lunar and other celestial bodies resources for scientific purposes see for instance: M.J. Listner, The Ownership and Exploitation of Outer Space: A Look at Foundational Law and Future Challenges to Current Claims, 1 *Regent Journal of International Law* (2003), 75; G. Gál,

conditions regulating their removal and utilization for the purpose of obtaining a financial gain, whether such activities are carried out by states or by private operators.[70]

The Outer Space Treaty prohibits national appropriation of outer space broadly considered, including the moon and other celestial bodies, but it does not refer to space resources, let alone their commercial use. This fact led scholars to hold two diverging interpretations of the right to remove and appropriate natural resources contained in a celestial body.

On the one hand, a group of authors points out that the non-appropriation principle refers only to outer space as a whole and not to its natural resources.[71] Therefore, by analogy with the rules underlying the freedom of the high seas, these authors state that the right to freely explore and use outer space, which is provided in Article I of the Outer Space Treaty, also includes the right to remove and use the natural resources contained thereof.[72] This position is indirectly supported by the interpretation given by some states, such as the United States, and legal scholars, of certain provisions of the Moon Agreement.[73] Pending the establishment of a legal regime governing the exploitation of lunar resources pursuant to Article 11, paragraph 5, of the Agreement, no

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Acquisition of Property in the Legal Regime of Celestial Bodies, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 42; von der Dunk, *supra* n. 55, 121. *Cf.* also Art. I, Outer Space Treaty, *supra* n. 33, providing: 'There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies.'

[70] On the issue of use of extraterrestrial resources for commercial purposes see Tronchetti, *supra* n. 1, 218–32; A. Akbar, La lune patrimoine commun de l'humanité: comment exploiter les ressources lunaires dans le respect du droit international, *Note de l'Ifri* (2006); A. Kerrest de Rozavel, New Developments and the Legal Framework Covering the Exploitation of the Resources of the Moon, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 530.

[71] So e.g. B. Cheng, Le Traité de 1967 sur l'espace, *Journal du droit international* (1968), 533; M. Williams, The Exploration and Use of Natural Resources in the Law of the Sea and the Law of Outer Space, in *Proceedings of the Twenty-Ninth Colloquium on the Law of Outer Space* (1987), 198; Jenks, *supra* n. 44, 275; Gál, *supra* n. 69, 47.

[72] *Cf.* e.g. Art. II, Convention on the High Seas, Geneva, done 29 April 1958, entered into force 30 September 1962; 450 UNTS 82; TIAS 5200; 13 UST 2312; UKTS 1963 No. 5; Cmnd. 584; ATS 1963 No. 12; which for the first time formally and explicitly conferred upon states the freedom of fishing in international waters.

[73] So e.g. Christol, *supra* n. 52, 262–3; E. Galloway, Status of the Moon Treaty, 3-9 *Space News* (1998), 21.

express moratorium on the removal and utilization of these resources exists. This, because the rules applicable during the pre-regime era are those laid down in the Outer Space Treaty which, according to their view, do not prohibit the use, including commercial, of natural resources.

On the other hand, another group of scholars argues that the prohibition laid down in Article II applies both to outer space and its natural resources. They affirm that the absence of any reference to natural resources in the text of Article II is not relevant, because the Outer Space Treaty never makes a distinction between outer space and its natural resources. Therefore, the term outer space must be understood in a comprehensive manner so as to include both outer space broadly considered and its natural resources.[74]

Regardless of which interpretation one favours, one should rely on the existing written rules to arrive at appropriate conclusions regarding the status of extraterrestrial natural resources. The Outer Space Treaty attributes to outer space the nature of a *res communis omnium*, an area freely open to everybody but not capable of being appropriated. Traditionally, resources located within a 'global commons' can be appropriated without raising questions of ownership over the area where the resources have been removed. For example, this idea has found application in the law of the sea, according to which public and private subjects are given the right to fish in the high seas without claiming appropriation over the area where the fishing has occurred. Thus, many argue that a similar principle should be applied to outer space, allowing subjects to mine resources from celestial bodies and acquire property rights over the extracted materials; however, this should not entail ownership claims over the moon and other celestial bodies' soil and subsoil.[75]

Nevertheless, rules relevant in the high seas cannot be automatically applied to outer space. Indeed, no specific international legal parameters governing the mining and commercial use of extraterrestrial resources as well as protecting the legitimate interests of private and public entities involved in such activities exist. Furthermore, space law includes principles, which are not present in the law of the sea, that create potential obstacles to the removal and commercial use of resources.

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[74] See e.g. S. Gorove, Limitations on the Principles of Freedom of Exploration and Use in Outer Space: Benefits and Interests, in *Proceedings of the Thirteenth Colloquium on the Law of Outer Space* (1971), 74; A.A. Cocca, *ILA Report of the Fifty-Fourth Conference*, *The Hague, 1970*, 454.

[75] See e.g. O'Donnell, *supra* n. 66, 472 ff.; K.A. Baca, Property Rights in Outer Space, 59 *Journal of Air Law & Commerce* (1993), 1041.

One example concerns the idea that the exploration and use of outer space is the province of all mankind. Such an idea might collide with the economic interests of a company carrying out extraterrestrial mining and raise several legal dilemmas. To what extent would the financial profit gained by such a company be consistent with the idea of the use of outer space as the 'province of all mankind'? Additionally, extraterrestrial mining is a much more risky undertaking than fishing in the high seas. Consequently, the risk of accidents occurring in this context is rather high. This may eventually result in liability issues not necessarily regulated under the existing international space law rules. Moreover, extraterrestrial mining should be carried out avoiding harmful contamination to the space environment, particularly that of the moon and other celestial bodies. Regrettably, international space law lacks dedicated rules for the preservation of the space environment. The most relevant provisions are included in Article 7 of the Moon Agreement which, as previously stated, has not been accepted by the majority of spacefaring states.

Additional considerations should play a role with regard to possible private exploitation of extraterrestrial resources. It should be kept in mind that private operators have a special relation with their national states, as the latter are internationally responsible for the space activities of the former according to Article VI of the Outer Space Treaty. This means that a state must ensure that its nationals do not violate international rules and obligations while operating in space. Private entities must receive an authorization from their national state, usually in the form of a licence, in order to carry out space activities. Such a state is under an obligation to supervise the authorized private space activity.[76]

It is highly questionable whether a state could license and, consequently, authorize private entities to extract and commercially use extraterrestrial natural resources (in a fashion similar to mining in the high seas, where licences of this kind may theoretically be issued).[77] Outer space being a 'global commons', a state cannot without further ado use its national law to protect private (and public) business interests related to extraterrestrial mining activities. States might then also be prohibited from recognizing private property rights over the extracted

[76] *Cf.* Art. VI, Outer Space Treaty, *supra* n. 33.

[77] See for this approach e.g. P.A. Dasch, M.M. Smith & A. Pierce, Conference on Space Property Rights: Next Steps, in *Proceedings of the Forty-Second Colloquium on the Law on Outer Space* (2000), 174; G.H. Reynolds, International Space Law: Into the Twenty-First Century, 25 *Vanderbilt Journal of Transnational Law* (1992), 225.

resources through national law, as this might constitute appropriation of outer space ‘by other means’ prohibited by Article II of the Outer Space Treaty.

All in all, the legal situation governing the exploitation of extraterrestrial resources appears highly controversial, especially when the position of private operators is taken into account. This situation acts as a discouraging factor for private entities interested in extraterrestrial mining, who may choose not to invest in it because of uncertain economic gains.[78] Such an end result is detrimental to the whole international community because these subjects might be the only ones capable of devoting significant financial resources to extraterrestrial mining. For this reason, scholars have repeatedly called for development of a proper legal regime at the international level to handle such operations which is able to ensure adequate financial gain for the investors whilst properly balancing the global public interests in terms of safety, security, ecological security, and the preservation of historic sites.[79] In the search for such a regime, it would be a useful exercise to look at existing legal frameworks regulating the use, including commercial, of limited resources and to see whether lessons can be learned and adapted to the management of extraterrestrial mining.

14.5 INTERNATIONAL SEABED MINING

14.5.1 The Evolution of the Legal Regime Governing International Seabed Mining

The international legal regime regulating the exploitation of the natural resources located in the seabed and ocean floor beyond the limits of national jurisdiction is currently provided for in Part XI of the 1982 UNCLOS,[80] as amended by the 1994 New York Agreement.[81]

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[78] See S. Twibbel, Space Law: Legal Restraints on Commercialisation and Development of Outer Space, 65 *University of Missouri Kansas City Law Review* (1997), 589; E.J. Reinstein, Owning Outer Space, 20 *Northwestern Journal of International Law and Business* (1999), 59; Dinkin, *supra* n. 65.

[79] See K. Kosmo, The Commercialization of Space: A Regulatory Scheme that Promotes Commercial Ventures and International Responsibility, 61 *Southern California Law Review* (1987–1988), 1055; H.G. Lewis & L. Lewis, A Proposed International Regime for the Era of Private Commercial Utilization of Space, 37 *George Washington International Law Review* (2005), 745.

[80] *Supra*, n. 58.

[81] *Supra*, n. 63.

Originally, no international rules addressing the status of seabed mineral resources existed. The 1958 Convention of the High Seas, while opening the high seas to all nations and excluding them from national appropriation, conferred upon states parties four freedoms: (1) the freedom of navigation; (2) the freedom of fishing; (3) the freedom to lay submarine cables and pipelines; and (4) the freedom to fly over the high seas.[82] These four freedoms notably did not include the right to mineral extraction, mostly because at the time the Convention was negotiated it was not known that the international seabed contained valuable resources. Once these resources were discovered in the late 1960s, consensus emerged on the need to develop international principles to govern their extraction and (commercial) use. These principles were discussed in the context of the negotiations of the UNCLOS and eventually inserted in its Part XI.

Part XI of the Convention declared the seabed and its resources the 'common heritage of mankind' and set up a complex mechanism for their management and exploitation, with an International Seabed Authority empowered to authorize, control and direct the exploitation of the deep seabed resources being established. Any company wishing to operate within the 'common heritage of mankind' area had to apply for a licence from the Authority.[83] Such a licence had to include the request for two mining sites of equal value, one to be mined by the applicant, the other by the mining arm of the Authority, called the Enterprise (the so-called 'parallel system'). Applicants were requested to pay an initial fee of US$ 250,000 and an annual fixed fee of US$ 1 million. Levies on mining activities were to be distributed among all states parties to the Convention in accordance with the decisions taken by the Authority.[84] Furthermore, the Authority could force developed states to transfer, on fair commercial terms, mining technology that could not be obtained on the open market to developing states, in order to enable them to engage in seabed mining activities.[85] Crucially, decisions of the Authority, whose main organs were the Council and the Assembly, were to be taken on a 'one state, one

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[82] See Art. 2, Convention on the High Seas, *supra* n. 72.

[83] See Art. 153, United Nations Convention on the Law of the Sea, *supra* n. 58.

[84] See Arts. 151, 153, United Nations Convention on the Law of the Sea, *supra* n. 58.

[85] See Art. 144, United Nations Convention on the Law of the Sea, *supra* n. 58.

vote' basis, thus resulting in the Authority being directed and influenced by the developing states in most of its decision-making processes.[86]

When UNCLOS was opened for signature in 1982 it was clear that developed states, which were the only ones capable of carrying out mining activities in the international seabed, refused to accept the provisions of its Part XI. In their view they were detrimental to their political and economic interests and inspired by an anti-free market philosophy.[87]

Nevertheless, technologically advanced states were aware of the advantages deriving from the presence of a legal regime to regulate deep sea mining. Hence, a group of Western states set up an alternative regime to allow and manage mining activities before the entering into force of the Convention, especially moved by the intention to protect their domestic companies, which had already invested hundreds of millions of dollars in preparation for seabed mining.

According to this regime, which was called the 'Reciprocating States Regime', each state had to adopt similar national legislation to regulate deep seabed mining. The United States opened the way with its Deep Seabed Hard Mineral Resources Act of 1980,[88] followed by the Federal Republic of Germany's Act on the Interim Regulation of Deep Sea Bed Mining in the same year.[89] Later, the United Kingdom, France, Japan and Italy adopted similar Acts.[90] According to these national laws, citizens and companies were allowed to explore and exploit deep seabed resources upon granting of a licence from their national states. The state had the power to protect and recognize private ownership claims over the extracted resources. Licensees were obliged to pay a levy, which was substantially inferior to the one foreseen in Part XI of UNCLOS. Under the Reciprocating States Regime, states committed to coordinate and not to interfere with each other's activities.

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[86] See Arts. 159 (Authority), 161 (Council), United Nations Convention on the Law of the Sea, *supra* n. 58.

[87] See C.C. Joyner, Legal Implications of the Concept of the Common Heritage of Mankind, in 35 *International & Comparative Law Quarterly* (1986), 190 ff.; M.V. White, The Common Heritage of Mankind: An Assessment, 14 *Case Western Reserve Journal of International Law* (1982), 509 ff.; E.D. Brown, *The International Law of the Sea* (1994), 300–10.

[88] Deep Seabed Hard Mineral Resources Act, 30 U.S.C. 1401 (1980).

[89] Act on the Interim Regulation of Deep Sea Bed Mining; 20 ILM 393 (1981), 21 ILM 832 (1982).

[90] See for France, 21 ILM 808 (1982); for the United Kingdom, 20 ILM 1219 (1981); for Japan, 22 ILM 102 (1983); for Italy, 24 ILM 983 (1985).

However, the Reciprocating States Regime was only meant to be an interim regime before UNCLOS entered into force. In the late 1980s a growing understanding spread among developed states on the need for incorporating the amendments to Part XI set up in that Regime into the body of the Convention. Developed states concurred on the usefulness of having one universal system governing deep seabed mining beyond national jurisdiction. This approach was shared by the developing states as well.

Thus, in the 1990s developed and developing states engaged in a process aimed at amending Part XI of UNCLOS, which resulted in the adoption by the UN General Assembly of the New York Agreement, the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, on 28 July 1994. The Agreement was opened for signature on 29 July and was promptly signed by 50 states, including 18 developing and 18 developed states. The United States, while agreeing to apply it provisionally, eventually did not ratify either UNCLOS or its Implementation Agreement.

14.5.2 A New Approach as per the New York Agreement

The 1994 New York Agreement significantly amended Part XI of UNCLOS.[91] Its provisions resolved the criticisms levelled by the developed states at the original Part XI and applied a free-market approach to the management of the Area and its resources. In doing so, the Agreement introduced a new version of the 'common heritage of mankind' concept in which the rigid political and economic requirements had been significantly softened.

The main amendments introduced by the New York Agreement to Part XI concerned, firstly, decision-making mechanisms which give technologically and economically advanced states an impact proportionate to their economic interest and the involvement in seabed activities. Consequently, the former approach of 'one state, one vote' is abandoned. Secondly, the Agreement resulted in the abandonment of any form of

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[91] For an analysis of the New York Agreement, *supra* n. 63, see C.B. Thompson, International Law of the Sea/Seed: Public Domain versus Private Commodity, 44 *National Resources Journal* (2004), 843; A. De Marffy-Mantuano, Current Development: The Procedural Framework of the Agreement Implementing the 1982 United Nations Convention on the Law of the Sea, 89 *American Journal of International Law* (1995), 814.

mandatory transfer of technology.[92] Developing states should henceforth rather obtain deep seabed mining technology on the open market, at a fair and reasonable price, or through joint ventures with industrialized states. Thirdly, deep seabed mining is now to be carried out in accordance with sound commercial principles, and there shall be no subsidization or discriminatory practices in favour of some particular states or producers.[93] Fourthly, new procedures specifying timetables for the approval of proposed exploration work plans are established.[94] Finally, the parallel system, according to which an applicant had to submit requests for two sites of equal value, was abandoned.

14.5.3 The New York Agreement: A Useful Example for an Extraterrestrial Mining Regime?

The New York Agreement offers several useful elements from the perspective of the drafting of a legal regime governing extraterrestrial mining. To start with, it highlights some general, but significant, ideas. First, the setting up of an international regime emerges as the optimal solution for the management and exploitation of resources located beyond national borders. A *laissez-faire* approach is to be viewed as unpredictable and potentially dangerous. Second, international agreement on the formulation of the rules constituting such a regime is possible, provided that states have a clear interest in doing so. Most importantly, the Agreement introduces a new interpretation of the 'common heritage of mankind' principle which has been accepted by both developed and developing states. Remarkably, this interpretation embraces a free-market-oriented philosophy.

The New York Agreement also shows how a legal regime governing the exploitation of international resources should be created and what elements it should contain. The key to its success is represented by a balance between the interests of developing and developed states, including their private companies. When setting up an international legal framework it is, thus, necessary to make sure that, while the special needs of the developing states are recognized and protected, economic incentives and measures aimed at encouraging the involvement of developed states (and their companies) and protecting their investments are established.

92 See Sec. V, Annex, New York Agreement, *supra* n. 63.
93 See Sec. VI, Annex, New York Agreement, *supra* n. 63.
94 See Sec. I, Annex, New York Agreement, *supra* n. 63.

Additionally, an international regime must ensure that the states which contribute the most to the exploitation of resources situated in an international area have an adequate impact on the decision-making mechanism of the legal regime regulating such exploitation. Here, the New York Agreement offers useful solutions relating to the mechanism to regulate the granting and the duration of the licences to explore and exploit mineral resources located beyond national borders. The Agreement specifies the timetable for the approval of explorative working plans of seabed sites and the duration of each approved plan. This system has a very positive impact because it contributes to generating certainty among those who intend to invest money in seabed mining.

Keeping these factors in mind, one could imagine the transfer and application of this new interpretation of the 'common heritage of mankind', and the principles that it contains, to the regulation of extraterrestrial mining for commercial purposes. Such a process could theoretically occur in two ways. First, by interpreting the 'common heritage of mankind' principle in the context of the Moon Agreement in accordance with this new interpretation. Pursuant to this approach, the international regime to be established under Article 11(5) of the Moon Agreement should mirror, to the largest extent possible, the structure and functioning of the one provided for in the New York Agreement. This solution would, however, face the disagreement of those who oppose the Moon Agreement and who, consequently, may not be willing to become parties to it.

Alternatively, a dedicated legal regime regulating the extraction and commercial use of extraterrestrial natural resources, not having a formal connection with the Moon Agreement, could be formulated. On one side, such a regime, while not explicitly referring to the 'common heritage of mankind', should largely resemble the procedures and mechanism of the ones included in the New York Agreement. On the other side, this should not be directly related to the Moon Agreement but, for example, to the Outer Space Treaty. This idea could take the shape of an additional protocol to that Treaty or to a separate agreement merely referring to it.

As mentioned above, the United States is not a party to UNCLOS. Thus, explorative and exploitative activities in international waters by its nationals/companies are governed by the Deep Seabed Hard Mineral Resources Act, according to which the United States is entitled to license these kind of activities and to recognized ownership claims over the extracted resources. Some argue that a similar system should be applied to the mining and exploitation of extraterrestrial natural resources.[95]

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[95] See *supra*, at n. 88.

Anyway, not only would such an approach be in conflict with the terms of Article II of the Outer Space Treaty, but it would raise significant questions about the acceptance by other states of the granted licences and the recognition of the ownership claims.

14.6 THE USE OF THE GEOSTATIONARY ORBIT

14.6.1 The Geostationary Orbit as a Limited Natural Resource

The geostationary orbit is the circular orbit 35,786 km above the equator where a satellite rotates around the earth in 23 hours 56 minutes and 4 seconds.[96] As this period is synchronous with the time the earth needs to rotate around its axis, a satellite launched into the geostationary orbit appears to an observer on the earth's surface as being fixed, stationary over a certain point of the equator. Hence, this orbit is called 'geo-stationary'. Considering that the area visible from a satellite placed in such orbit covers one-third of the earth's surface, three satellites are in the position to provide with their signals almost global coverage, with the exclusion of the polar regions. Thanks to such features, the geostationary orbit is a strategic resource for telecommunications, broadcasting and meteorological purposes.[97]

Satellites operate through radio signals and, thus, use the radio frequency spectrum to provide their services. The radio frequency spectrum is a specific band of the electromagnetic spectrum that allows satellites to communicate with the earth. Therefore, satellites require orbital locations and allocated frequencies for space communications services in order to operate within the geostationary orbit. Because of the numerous political, economic and social advantages resulting from operating a satellite in the geostationary orbit, the request and competition for orbital slots and frequencies has dramatically increased.[98]

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[96] For a description of the characteristics of the geostationary orbit see: K.U. Schrogl, Questions Relating to the Character and Utilization of the Geostationary Orbit, in *International Space Law in the Making: Current Issues in the United Nations Committee on the Peaceful Uses of Outer Space* (Eds. K.U. Schrogl & M. Benkö) (1993); S. Cahill, Give Me My Space: Implications for Permitting National Appropriation of the Geostationary Orbit, 19 *Wisconsin International Law Journal* (2001), 231; F. Lyall, *Law and Space Telecommunications* (1989), 388.

[97] See also e.g. *supra*, § 8.2.1.

[98] *Cf.* also e.g. *supra*, § 8.2.5.

From these preliminary remarks also follow the comparisons that can be made between the geostationary orbit and the natural resources of the moon and other celestial bodies, which may perhaps be helpful in developing a regime for future resource exploitation. Firstly, both the geostationary orbit and the natural resources of the moon are limited resources which share the need for being properly managed and allocated in order to prevent their wasteful use and to maximize their value. Because of its physical characteristics, only a restricted number of states can operate satellites in the geostationary orbit at a given time. Furthermore, satellites need to be maintained at a certain distance to avoid interference and collisions. Also, special care has to be taken not to pollute the geostationary orbit, as it may endanger the activities of any other geostationary operator. Similar principles are relevant to extra-terrestrial mining, as the concurrent activities of miners should be regulated in order to preclude interferences and the deterioration of the environment. Secondly, both the geostationary orbit and celestial bodies' resources are located in areas beyond national jurisdiction and are, in principle, non-appropriable.

An international regime to govern the allocation, use, and management of the radio spectrum resource (orbital slots and frequencies) has been put in place. The following section gives a brief description of the functioning of such a regime, as far as required to address and assess its potential value as an example for a future natural space resource utilization regime.[99]

14.6.2 Allocation of the Orbit/Spectrum Resource: The ITU Regime

The organization responsible for international administration and allocation of geostationary slots and frequencies for satellites communications is the International Telecommunication Union (ITU).[100] Within the ITU

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[99] For a more comprehensive overview, see *supra*, § 8.2.

[100] The International Telecommunication Union is a specialized agency of the United Nations. According to Art. 1(1), (Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993); the purposes of the Union are: (1) 'to maintain and extend international cooperation among all its Member states for the improvement and rational use of telecommunications of all kind'; (2) 'to promote and to offer technical assistance to developing States in the field of telecommunications'; (3) 'to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of

framework the responsibility of managing the frequency spectrum, as well as the positions of geostationary satellites, is dealt with by the Radiocommunication Sector. In accordance with Article 12 of the 1992 ITU Constitution the objective of the Radiocommunication Sector is to ensure 'the rational, equitable, efficient and economical use of the radio frequency spectrum by all radiocommunication services, including those using the geostationary-satellite or other satellite orbits'. In order to fulfil these purposes the Radiocommunication Sector ensures that the Radio Regulations, read the international rules regulating the allocation of the frequency bands and containing technical parameters to be observed by operators, are respected.[101]

As a consequence of the physical limitations of the geostationary orbit described above, a tension between the goal of ensuring fair and equitable access to it on the one hand and its efficient use on the other exists. Significantly, Article 44(3) of the ITU Constitution clarifies that access to and allocation of the geostationary orbit shall be done on an equitable basis. This is in order to ensure that 'the special needs of the developing countries and the geographical situation of particular countries' are taken into account. The language of Article 44 thus fully recognizes the interests of the less-developed states in arriving at a balance in the use and management of the orbit/spectrum resource by emphasizing that equity was to be measured not simply in terms of efficiency and economy.

The main system for allocating geostationary orbital slots and frequencies is the so-called *a posteriori* method, which is based on a first-come, first-served approach.[102] This system consists of several steps: when a

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telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public'; and (4) 'to promote the use of telecommunication services with the objective of facilitating peaceful relations'.

[101] These Radio Regulations are adopted during World Radio Conferences; see further Art. 13, ITU Constitution, *supra* n. 100; Art. 7, Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71.

[102] For an analysis of the *a posteriori* method of allocation see R.S. Jakhu, The Legal Status of the Geostationary Orbit, 7 *Annals of Air and Space Law* (1982), 333; J.C. Thompson, Space for Rent: The International Telecommunication Union, Space Law, and Orbit/Spectrum Leasing, 62 *Journal of Air Law & Commerce* (1996–1997), 279; J. Wilson, The International Telecommunication

satellite operator wishes to develop a communication satellite system, it contacts the state member who informs the Radiocommunication Bureau of the intention to assign particular frequencies and geostationary positions to this operator. Such request is reviewed in the light of the Table of Frequency Allocations and of the Master International Frequency Register to make sure that no operator has claimed these frequencies before and that no interference with already existing systems is expected to take place. If no problems are encountered during the review process, the ITU adds the operator's notification to the frequency register and the frequencies and a geostationary slot are attributed to such operator on a temporarily basis, namely for the whole period in which the satellite system is operational. It is important to stress that the operator is, thus, given a temporary right to use a certain orbital slot but he does not obtain any ownership rights over it. However, the operator is protected from interference by other users.

In recent years this *a posteriori* allocation mechanism increasingly has been facing the problem of 'paper satellites'. In short, this problem consists of a growing number of slot applications submitted to the ITU to accommodate the needs of systems that will never leave the earth or are merely speculative. The ITU counteracts such practices by obliging applicants to provide detailed plans of their intended space activities and to set out a deadline for the deployment of the satellite in the assigned orbital position.

In the 1980s, pushed by the requests of the developing states, a new system for assigning the orbit/spectrum resource, which was called 'a dual system of allocation' or an *a priori* method, was set up.[103] Under

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Union and the Geostationary Satellite Orbit: An Overview, in 23 *Annals of Air & Space Law* (1994), 241; L.D. Roberts, A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union, 15 *Berkeley Technology Law Journal* (2000), 1095; F. Lyall, Paralysis by Phantom: Problems of the ITU Filing Procedures, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997), 189; O. Fernández-Brital, The Legal Status of the Geostationary Orbit and ITU Recent Activities, in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 223.

[103] For a description of the *a priori* method and of the process leading to its adoption, see: C.Q. Christol, The Legal Status of the Geostationary Orbit in the Light of the 1985–1988 Activities of the ITU, in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 215; S. Ospina, The ITU and WARC-ORB: Will the Revised Radio Regulations Result in a Sui-Generis Legal Regime for the GSO?, in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (1990), 247; T. Lozanova, Legal Status of the Geostationary Orbit in the Light of the Recent Activities of ITU, in *Proceedings*

this system, which applied only to the Fixed Satellite Services (FSS),[104] and within that service, only to the so defined ‘expansion band’, each ITU member was entitled to an orbital position, within a predetermined arc and a predetermined band. Thus, by means of an *a priori* allotment plan each state received at least an orbital slot and one frequency to be used for communication purposes.[105] However, this did not mean that the state receiving the allotment was technologically capable of using it, thus potentially leaving several slots and frequencies unused.

14.6.3 The ITU Regime: A Useful Example for an Extraterrestrial Mining Legal Regime?

Both the geostationary orbit and the minerals present on the surface and the subsurface of the moon and other celestial bodies are ‘limited natural resources’. Consequently, they have the need for a system ensuring their proper management, allocation, use and preservation in common, and an analysis of how the geostationary orbit is administered may provide useful and practical elements to be used for any future regime to be applied to extraterrestrial mining.

First of all, the legal framework governing the orbit/spectrum resource is based on the concepts of equitable access and efficiency. These two concepts should become part of the future lunar and other celestial bodies’ legal regime, as their presence is necessary to enable it to strike a balance between the requests and interests of both developed and less-developed states and to comply with the demand for non-discrimination in the exploration and use of outer space laid down in Article I of the Outer Space Treaty.[106]

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of the Thirty-Second Colloquium on the Law of Outer Space (1990), 233; S. Wiessner, Access to a Res Publica Internationalis: The Case of the Geostationary Orbit, in *Proceedings of the Twenty-Ninth Colloquium on the Law of Outer Space* (1987), 147.

[104] The 1988 WARC Final Acts defined an FSS as ‘a radiocommunication service between Earth stations at given positions, when one or more satellites are used; the given position may be a specific fixed point with specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the fixed-satellite service may also include feeder links for other space radiocommunication services’; Final Acts, 1988, Art. I, Mod. 22.

[105] See 1988 World Administrative Radio Conference (WARC) Final Acts, 39.

[106] Art. I, Outer Space Treaty, *supra* n. 33, provides in this regard that ‘[t]he exploration and use of outer space, including the Moon and other celestial

Secondly, the ITU's mechanism for the allocation of the radio spectrum resource is significant because it shows that even if resources are located in a non-appropriable area, that is outer space, they can be used also for commercial goals as long as such a use is consistent with relevant internationally agreed rules.

Furthermore, the ITU system offers practical examples of how limited resources can be allocated. This system is based on the idea that the use of positions and frequencies is limited in time. No entity, indeed, is provided with a permanent title to the geostationary resources. This aspect is of fundamental relevance for a legal regime for extraterrestrial mining. One crucial aspect of such a regime should be that entities are allowed to exploit extraterrestrial sites only for a limited and predetermined, although renewable, period of time, without gaining any permanent proprietary title to those sites. A similar provision would ensure compliance with Article II of the Outer Space Treaty, declaring outer space, including the moon and other celestial bodies, as non-appropriable.

However, there are some other elements of the allocation system of orbital slots that should arguably not be introduced into the legal regime regulating the exploitation of extraterrestrial mineral resources. For example, the *a priori* system, while being fair and appreciable from an ethical point of view, tends to cause inefficiency and the potential waste of a limited natural resource, due to the fact that many developing states would not be in a position to make use of their assignments. A similar approach should not be reproduced in the context of extraterrestrial mining because it could be perceived as detrimental to economic interests and to criteria of efficiency.

14.7 MINERAL ACTIVITIES IN ANTARCTICA

14.7.1 The Antarctic Treaty System

Activities in Antarctica are regulated by the so-called 'Antarctic Treaty System', a conventional regime consisting of several international agreements.[107] The Antarctic Treaty System is considered one of the most

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bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development'.

[107] The Antarctic Treaty System comprises: the Antarctic Treaty, Washington, done 1 December 1959, entered into force 23 June 1961; 402 UNTS 71; TIAS 4780; 12 UST 794; UKTS 1961 No. 97; Cmnd. 913; ATS 1961 No. 12; the

successful legal structures ever created to govern operations in an international area, as it has allowed for more than 50 years of peaceful scientific investigation and environmental protection of the Antarctic area.

The 1959 Antarctic Treaty[108] constitutes the foundation of the system, as it provides direction and guidance for all activities to be carried out in Antarctica. Article IV of the Treaty deals with the legal status of the continent. It should be kept in mind that, before the entry into force of the Treaty, several states successfully carried out explorative missions in Antarctic regions. As a result of these missions, there were states which claimed sovereignty over the parts of the Antarctic continent they had explored, states which, in spite of having played a crucial role in uncovering Antarctica, did not claim any territorial rights and, at the same time, refused to recognize claims made by other states although they reserved the right to make territorial claims in the future, and states which did not put forward any claim, did not reserve themselves any right to make claims in the future and refused to accept the claims made by others.[109] This complicated situation called for international management of the Antarctica area. The solution adopted by Article IV of the Antarctic Treaty was to put territorial and sovereignty claims in abeyance; in simple terms, it froze the claims and the opposition to the claims over Antarctica as they were in 1959.[110]

Convention on the Conservation of Antarctic Seals, London, done 1 June 1972, entered into force 11 March 1978; TIAS 8826; 27 UST 441; ATS 1987 No. 11; 11 ILM 251 (1972); the Convention on the Conservation of Antarctic Marine Living Resources, Canberra, done 20 May 1980, entered into force 7 April 1982; TIAS 10240; ATS 1982 No. 9; 19 ILM 841 (1980); the Convention on the Regulation of Antarctic Mineral Resources (hereafter Wellington Convention), Wellington, done 2 June 1988, not yet entered into force; 27 ILM 868 (1988); and the Protocol on Environmental Protection to the Antarctic Treaty (hereafter Madrid Protocol), Madrid, done 4 October 1991, entered into force 14 January 1998; UKTS 1999 No. 6; Cm 1960; ATS 1998 No. 6; 30 ILM 1455 (1991).

[108] For an analysis of the Antarctic Treaty, see J. Hanessian, The 1959 Antarctic Treaty, 9 *International & Comparative Law Quarterly* (1960), 436; R. Sattler, Symposium: Issues in Space Law: Transporting a Legal System for Property Rights from the Earth to the Stars, 6 *Chicago Journal of International Law* (2005), 23.

[109] See *in extenso* A. Watts, *International Law and the Antarctic Treaty System* (1992); *The Antarctic Legal Regime* (Eds. C.C. Joyner & S.K. Chopra) (1988).

[110] Art. IV, Antarctic Treaty, *supra* n. 107, thus declares that its provisions shall be interpreted neither as 'a renunciation by any Contracting Parties of previously asserted rights of or claims to territorial sovereignty in Antarctica' nor

While the Antarctic Treaty regulates the legal status of Antarctica, it does not address the issues of recovery and exploitation of the mineral resources contained therein. This is in large part due to the fact that when the Treaty was negotiated there were insufficient geological data demonstrating the presence of mineral resources in the Antarctic region. However, when, at the beginning of the 1970s, the existence and the potential economic value of Antarctic mineral resources was proven, the parties to the Antarctic Treaty felt that leaving their legal status unresolved could threaten the peaceful nature of Antarctica, forcing the topic to the centre of the political agenda.

The negotiations on the Convention on the Regulation of Antarctic Mineral Resources, the Wellington Convention, officially began in 1982.[111] These negotiations took place among the so-called 'Consultative Parties' to the Antarctic Treaty, namely those states which had undertaken 'substantial research activity' in Antarctica.[112] As the majority of developing states lacked the financial capability to carry out this type of activity, the Consultative Parties were mainly developed states. Negotiations ended on 2 June 1988, when the Wellington Convention was adopted. According to Article 62, in order to enter into force the Convention had to be ratified by all Consultative Parties which had participated to the negotiations. When France and Australia withdrew their support for the Convention, the entire ratification process collapsed.

Three years after the failure of the Wellington Convention a new instrument, the Protocol on Environmental Protection to the Antarctic Treaty, the so-called Madrid Protocol, was adopted.[113] The Protocol put

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as 'a renunciation or diminution by any Contracting Parties of any basis of claim to territorial sovereignty in Antarctica which they may have whether as a result of its activities or those of its nationals'.

[111] For an analysis of the negotiations of the Convention on the Regulation of Antarctic Mineral Resources, see C.C. Joyner, The Antarctic Minerals Negotiating Process, 81 *American Journal of International Law* (1987), 888; A. Watts, Lesson to be learned from the Mineral Resources Negotiations, in *Antarctic Challenge III* (Ed. R. Wolfrum) (1988), 319–31.

[112] *Cf.* Art. IX(1), Antarctic Treaty, *supra* n. 107, speaking of 'Contracting Parties … consulting together' taking all key political and legal decisions regarding the area. Art. IX(2) refers to 'substantial research activity' as a condition for being admitted to the consultative meetings. See further Arts. XI–XIII.

[113] For an analysis of the Madrid Protocol, *supra* n. 107, see D. Vidas, The Protocol on Environmental Protection to the Antarctic Treaty: A Ten-Year Review, in *Yearbook of International Co-operation on Environment and Development*, 2002/2003, 51.

an end to the possibility of mining and using Antarctica's mineral resources for commercial reasons by declaring: 'Any activity relating to mineral resources, other than scientific research, shall be prohibited.'[114]

Although no state party to the Antarctic Treaty System has ratified the Wellington Convention, it is still worth analysing its provisions in view of their potential impact on the development of a legal regime to regulate the exploitation of the natural resources of the moon and other celestial bodies.

14.7.2 A New Approach as per the Wellington Convention

The main purpose of the Wellington Convention is to set up a legal framework to regulate explorative and exploitative activities of the Antarctic mineral resources.[115] Ensuring the protection of the Antarctic environment is one of the primary concerns of the Convention.[116] All mineral resource operations are subject to a preventive assessment aimed at verifying their potential environmental impact. These operations will not be authorized and will be stopped where they represent a threat to the Antarctic ecosystem.

On the institutional level the Convention creates a framework including an Antarctic Mineral Resource Commission, a Regulatory Committee, a Special Meeting of Parties and a Scientific, Technical and Environmental Committee. The Commission, which is composed by the Consultative Parties which possessed this status when the Convention was open for signature,[117] adopts decisions concerning the protection and conservation of the Antarctic environment, the designation of protected areas, the identification of areas for possible exploration and development, and the review of action by the Regulatory Committee. Decisions are generally taken by a three-quarters majority, although those relating to the submission of exploration and development applications are adopted by consensus.[118] A Regulatory Committee is established for each designated area.

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[114] See Art. 7, Madrid Protocol, *supra* n. 107.

[115] For an explanation of the provisions of the Wellington Convention, *supra* n. 107, see e.g. C.C. Joyner, The Evolving Antarctic Minerals Regime, 19 *Ocean Development and International Law* (1988), 73; J.G. Starke, International Legal Notes, 62 *Australian Law Journal* (1988), 956; Note, Death of a Treaty: the Decline and Fall of the Antarctic Minerals Convention, 22 *Vanderbilt Journal of Transnational Law* (1989), 631.

[116] See Arts. 2, 3 & 4, Wellington Convention, *supra* n. 107.

[117] See Art. 21, Wellington Convention, *supra* n. 107.

[118] See Art. 41(2), Wellington Convention, *supra* n. 107.

Its main functions are to look upon applications for exploration and development permits, to approve management schemes and to monitor exploration and development.[119]

The Scientific, Technical and Environmental Committee consist of scientists of all parties to the Convention.[120] Its function is not only to give scientific or technical advice, but also to provide for a level of participation in the decision-making by all the parties that are not represented in the Commission. Mineral activities are envisioned to take place in a three-stage process: prospecting, exploration and development. Prospecting is an activity 'aimed at identifying areas of mineral resources potential for possible exploration and development'.[121] Prospecting neither provides the operator with any right to resources and prospecting, nor requires authorization from the institutions of the Convention.[122]

The rules regulating exploration and development are more complex. A detailed discussion of such rules goes beyond the limited purpose of this chapter. Here, it suffices to say that the beginning of exploration and development activities is subordinated to prior evaluation and authorization by the institutions of the regime. Once authorization is given, the authorized activities are to be carefully scrutinized. Decision-making in the context of exploration and development must undergo several stages and may be extremely slow.

The essence of the application process consists in the preparation and approval of the Management Scheme and a development permit. The Management Scheme is the instrument governing exploration and development activities. The approval of the Management Scheme provides the applicant with exclusive rights to explore the resources located in the assigned block in accordance with the Management Scheme's provisions.[123] The development permit allows the applicant to use, including for commercial purposes, the extracted resources.

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[119] See Art. 29, Wellington Convention, *supra* n. 107.

[120] See Art. 23, Wellington Convention, *supra* n. 107.

[121] Art. 1(8), Wellington Convention, *supra* n. 107.

[122] Art. 37(1) & (2), Wellington Convention, *supra* n. 107.

[123] The Management Scheme is approved if accepted by a two-thirds majority, which majority shall include a simple majority of the group of claimant states and a simple majority of non-claimant states. Thus, a Management Scheme needs the affirmative vote of seven members of a ten-member Regulatory Committee, which must include at least two from the group of claimant states and three from the group of non-claimant states. As a consequence, it is beyond the power of a single claimant state to provide for or even to block the approval of a Management Scheme.

The approved Management Scheme and the respective permit may be modified and suspended if the activities are likely to generate or have provoked unacceptable impacts over Antarctica's environment or if the operator has failed to comply with the Convention's requirements. Monetary sanctions can be imposed upon the operator as well.

14.7.3 The Wellington Convention: A Useful Example for an Extraterrestrial Mining Regime?

The Wellington Convention constitutes a valuable precedent for two reasons: it contains several elements which can be inserted in a legal regime to govern the exploitation of extraterrestrial resources, and at the same time it shows mistakes that should be avoided when establishing such a regime. As to the latter point, one of the reasons behind the Wellington Convention's failure was its lack of economic incentives for mining operators; its system was actually perceived to impede mining operations of Antarctica's resources as a profitable business. In this regard, the consensus-based procedure for the concession of an authorization to explore and use a certain area was considered a major stumbling block. In particular, the fact that such an authorization could be rejected due to the refusal of one state member of the Regulatory Commission only, regardless of the fact that the applicant might have successfully carried out the prospecting phase with full respect for environmental requirements and may already have devoted huge financial and technical resources to it, constituted a tremendous disincentive from an economic point of view.

Then, a major problem of the system governing Antarctic mineral resource activities was the length of its decision-making mechanism. The three-stage process which leads to the concession of an authorization to operate was extremely slow and acted as a discouraging factor on potential investors. Finally, the institutional framework established by the Convention was inefficient and over-complicated.

Thus, taking into consideration the causes of the failure of the Wellington Convention, it is possible to affirm that a legal instrument governing mineral activities within an international area should contain the following elements:

1. economic incentives for operators and certainty of the legal regime governing mineral activities;
2. a reasonable timetable to provide the operator with the authorization to proceed in mineral activities;

3. a simple institutional framework in which each institution has a clear and distinct function;
4. efficient and fair voting procedures; and
5. mechanisms to ensure international participation in mineral activities.

Despite its limits, however, the Convention provides some useful elements to be inserted in the regime governing future exploitation of extraterrestrial resources. Firstly, its strong emphasis on the protection of the Antarctic environment is to be applauded; its provisions establishing environmental parameters and requirements to be respected when prospecting and exploring in Antarctica. Similar rules should be applied to extraterrestrial mineral activities as well. Indeed, the respect for and preservation of the lunar and other celestial bodies' environment is to be considered a prerequisite for exploitative operations to be carried out. Secondly, the Wellington Convention sets up a mechanism to settle disputes among mining operators. A similar mechanism should be included in the legal regime regulating mineral activities in outer space. Indeed, an international regime is more likely to be successful if it contains a procedure to settle controversies among the participating parties.

14.8 A LEGAL REGIME FOR THE EXPLOITATION OF EXTRATERRESTRIAL NATURAL RESOURCES

Considering the elements highlighted in the previous sections the following considerations should be taken into account with respect to any further international regulation of the exploitation of extraterrestrial natural resources:

1. The moon and the other celestial bodies in our solar system contain vast amounts of economically valuable natural resources.
2. A concrete interest in removing and commercially using extraterrestrial resources exists, particularly with the private sector.
3. Technical barriers still stand in the way of mining activities in outer space.
4. The existing international legal framework does not clarify the legal status of extraterrestrial natural resources and to what extent and in which forms these resources can be used for commercial purposes.
5. Such uncertainty acts as a discouraging factor for private investors.

Thus, internationally agreed rules to govern the removal and commercial use of resources should be put in place. Certainly, this is a highly challenging goal which raises several issues related, for example, to the forum where these rules should be negotiated, which states should be involved in the negotiation process, and what chances of success these rules might have.

The limited purpose of this chapter does not allow these issues to be addressed adequately. It is, nevertheless, worth briefly addressing three points: (1) Why do we need internationally agreed rules? (2) What should be the content of these rules? (3) Which legal form should they take?

It is argued here that rules to manage the public and private exploitation of extraterrestrial natural resources should be commonly agreed by states at the international level rather than developed individually by single states on a national basis. In principle, following the example of national regulation of mining the deep seabed, states could adopt national legislation allowing and authorizing private entities to exploit extraterrestrial sites and recognizing property rights over the extracted materials. Apart from the already analysed problems of consistency with existing space law principles, however, similar practices would hardly be recognized by other states. Furthermore, it is likely that, once a state has adopted legislation of this kind, other states would do the same. This situation could potentially lead to conflicting claims, a race to the most profitable resources, and, eventually, to dangerous tensions among international actors. This risky scenario could be avoided if an international regulation of governmental and private exploitation of natural space resources were in place.

This does not mean that national law would be irrelevant in the context of such exploitation. Private operators wishing to carry out space activities would need to receive an authorization, in the form of a licence, from their national state. Once the state has granted such a licence it shall exercise supervision and be internationally responsible for the authorized activities. Thus, private entities willing to mine extraterrestrial sites would always need to apply for a national licence. However, pursuant to the approach suggested in this chapter, the permission and right given to a private operator to exploit extraterrestrial resources would not come from the national licence per se but from the international system and procedures put in place by states to regulate extraterrestrial mining.

As to the second point, based also on the experience gained with the regulation of Antarctica, the deep seabed, and the geostationary orbit, it is suggested that a legal regime to govern the exploitation of lunar resources should include the following elements:

1. A concise and simple framework – complex and lengthy rules are difficult to interpret and implement.
2. Measures to protect the environment: any exploitative activity should be authorized, carried out, reviewed, and even interrupted, based on its compliance with strict environmental criteria.
3. Economic incentives: the legal regime should be able to attract public and private investors for the appropriate economic reasons. This could be done, in particular, by ensuring returns on investments made, protecting exploiters' rights against third parties and clarifying the proprietary title of a miner over the extracted resources.
4. An international body or authority empowered to manage, authorize and control the exploitation of extraterrestrial natural resources. This is the most challenging point, as the idea of creating international authorities has progressively lost appeal among (developed) states. It is, however, true that the management and allocation of limited resources in international areas, such as the deep seabed and earth orbits, is in the hands of organizations at an international level, even if composed of individual states. Consequently, a similar approach should be followed with respect to extraterrestrial mining.
5. A proportionate and time-efficient decision-making mechanism: states should be given the power to influence decisions of the international authority in a manner proportionate to their impact on and investments in exploitative activities. Furthermore, a fixed timetable should regulate the decision-making within the authority, such as the concession of a licence.
6. A system of licences to regulate the exploitation of extraterrestrial natural resources. A licence would give a licensee a temporary right to mine and use, also for commercial purposes, the resources located in a lunar or other celestial body's site. Upon expiration of the licence that site would theoretically be put on the market again and open for other users – a licence should not confer the licensee any proprietary title over the related site.
7. A dispute settlement mechanism regulating disputes arising from the exploitation of space resources. The presence of such mechanism would contribute to strengthening the legal regime and the enforcement of its rules.
8. The presence of practical solutions aimed at ensuring that the exploitation of extraterrestrial resources is not only beneficial to those directly involved in it, but also to all mankind. While no mandatory sharing of benefits should be required, the implementation of this concept would be necessary not only to guarantee the

general acceptance of such a legal regime, particularly by the developing states, but also to comply with the provisions laid down in Article I of the Outer Space Treaty.

9. The promotion of international cooperation in extraterrestrial exploitative activities.

As to the final question, the legal regime regulating extraterrestrial mining could arguably take three different shapes: (1) it could be formally linked to the Moon Agreement; (2) it could be annexed to the Outer Space Treaty; (3) it could be developed without a direct link with a specific existing space law instrument. Under the first option, the regime should be negotiated pursuant to Article 11, paragraphs 5 and 7 of the Moon Agreement. Clearly, this would require states to first become parties to the Agreement, a choice that many states do not seem to be ready to make at the present time. Following the second option, the rules governing the exploitation of extraterrestrial resources should be included in a protocol annexed to the Outer Space Treaty. This could be a more feasible option, as all spacefaring states are parties to the Treaty and annexing an additional instrument to a pre-existing treaty is not an uncommon practice in international law. Finally, the legal regime could be inserted in a legal instrument which would be formally independent of international space law treaties.

14.9 CONCLUSION

For some three decades the legal status of extraterrestrial natural resources did not constitute a primary topic of discussion for the international space law community. Nowadays, thanks to the growing interest of private investors in such resources and the gradual depletion of natural resources on earth, however, that situation has changed. Many, inside and outside legal circles, have begun wondering whether it is possible, especially for a private operator, to extract natural resources located in outer space and use them for profit purposes.

Such a possibility still faces technical and legal barriers. While the former are expected to be progressively solved, the latter represent obstacles that may be difficult to overcome. The existing international space law instruments leave the legal status of extraterrestrial natural resources substantially unaddressed, thus generating a great deal of uncertainty about the rights and duties of ‘extraterrestrial miners’. Such uncertainty not only discourages potential investors but also gives room to national practices – a state authorizing one of its nationals to exploit an extraterrestrial site and recognizing property rights over the extracted resources – having a potentially destabilizing effect on the peaceful nature of outer space.

The international community should therefore take steps towards agreeing on international rules governing the extraction and use of extraterrestrial mining, with particular attention to the involvement of private operators. This would certainly be a challenging task, as states take diverging approaches on how this should be put into practice. Nevertheless, it would be in the common interest to follow this path rather than leaving extraterrestrial resources open to individual and internationally uncoordinated practices.

15. International trade aspects of space services

Frans von der Dunk[*]

15.1 INTRODUCTION: THE DEVELOPMENT OF AN INTERNATIONAL TRADE REGIME

15.1.1 The Background to the International Trade Regime

The origins of substantial aspirations and efforts to establish a global regime regulating international trade, and in particular trying to liberalize such international trade, go back to the worldwide economic crises of the late 1920s and 1930s, the Second World War, and their aftermath, including the gradual evolvement of the opposition of capitalist and communist ideologies and systems.

On the one hand, there was the concern that competition for markets and the desire to strive for economic autonomy had to a considerable extent fuelled the belligerence of several nations playing a key role in igniting the Second World War.[1] On the other hand, at least on the Western side of the Cold War divide, two more general perceptions played a major role: that international trade would be a major tool both to help avoid the poverty and economic crises which had also contributed to the war breaking out, and at an even more ideological level, to generate the global understanding which should hopefully heighten the barriers to

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* The author is very grateful to Matthew Schaefer, Law Alumni Professor of Law and Director of the Space, Cyber, & Telecom Law Program, University of Nebraska-Lincoln, College of Law, for his valuable comments and suggestions; of course any responsibility for shortcomings continues to rest with the author.

[1] *Cf.* e.g. A.F. Lowenfeld, Bretton Woods Conference, in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. I (2012), 1055; J.H. Jackson, *The Jurisprudence of GATT and the WTO* (2000), 21; J.H. Jackson, *World Trade and the Law of the GATT* (1969), 9–10; R. Bhala, *International Trade Law: Interdisciplinary Theory and Practice* (3rd edn., 2008), 6; H. Saitoh, International Trade Regulation, in *The Law of International Relations* (Ed. K. Tatsuzawa) (1997), 317–20.

racism, xenophobia and other forms of discrimination which rose to such shocking levels in the course of the Second World War.[2] Finally, though this remained largely implicit, international trade, in particular its liberalization, would help to counteract the communist ideology which was taking hold on the Eastern side of the fence, soon to turn into the major opponent in a Cold War determining geopolitics for the next four decades.

15.1.2 The GATT and the International Trade Rounds

It was thus that in 1947 the General Agreement on Tariffs and Trade (GATT)[3] was concluded, a treaty of potential (and hoped-for) global application providing a framework for the breaking down of barriers to international trade in goods, notably import tariffs and quotas. Though formally not an intergovernmental organization, a secretariat in Geneva started functioning as a *de facto* permanent institutional basis to promote and support the actual undertakings to lower such trade barriers, as the GATT itself provided the framework and the principles, but not the details and the implementation of trade liberalization.[4]

Those actual undertakings in short amounted to application of the generic regime of the GATT rules and obligations, such as the most favoured nation (MFN) and National Treatment (NT) principles,[5] to sets or categories of goods, as agreed upon in long and complicated international negotiations, the so-called 'Rounds'.[6] The first one of those, the Geneva Round, actually started before the GATT was even agreed upon,

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[2] *Cf.* e.g. J.H. Jackson, *The World Trading System* (2nd edn., 1997), 11–3; Jackson, *supra* n. 1, 21; W. Benedek, General Agreement on Tariffs and Trade (1947 and 1994), in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IV (2012), 313.

[3] General Agreement on Tariffs and Trade (hereafter GATT 1947), Geneva, done 30 October 1947, entered into force 1 January 1948; 55 UNTS 194; TIAS 1700; ATS 1948 No. 23. See e.g. Jackson, *supra* n. 2, 31 ff.; Jackson, *supra* n. 1, 17 ff.; Benedek, *supra* n. 2, 312–23; R. Bhala & K. Kennedy, *World Trade Law* (1998), 1 ff.; A.T. Guzman & J.H.B. Pauwelyn, *International Trade Law* (2009), 82–4.

[4] *Cf.* Jackson, *supra* n. 2, 31–78; Benedek, *supra* n. 2, 315; P.T. Stoll, World Trade Organization (WTO), in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. X (2012), 969; also Bhala, *supra* n. 1, 5–9.

[5] See further *infra,* § 15.2.2.1 and § 15.2.2.2.

[6] See for a general overview of the GATT and the various Rounds, from which much of the following is taken, http://en.wikipedia.org/wiki/General_

running from April through December 1947, with the participation of 23 states and achieving 45,000 tariff concessions affecting US$ 10 billion worth of trade.

So far seven more Rounds have followed, plus a ninth overall at Doha currently still ongoing.[7] The Annecy Round of 1949 had 13 GATT parties exchange some 5,000 tariff concessions, the 1950–1 Torquay Round saw 38 GATT parties exchange some 8,700 tariff concessions cutting the 1948 tariff levels by some 25 per cent, the Geneva II Round of 1956 led 26 GATT parties to agree on the admission of Japan as well as on a total of US$ 2.5 billion in tariff reductions, and the 1960–1 Dillon Round achieved tariff concessions worth US$ 4.9 billion of world trade among the same number of states. Then, with the enormous rise of parties to the GATT, the Rounds started to comprise many years. The 1964–7 Kennedy Round with 62 states achieved tariff concessions worth US$ 40 billion of world trade, the 1973–9 Tokyo Round tariff reductions worth more than US$ 300 billion among 102 states, and the 1986–93 Uruguay Round major reductions in tariffs (about 40 per cent) and agricultural subsidies, an agreement to allow full access for textiles and clothing from developing countries, and an extension of intellectual property rights protection worldwide among 123 states, whereas the Doha Round, starting in 2001 and still not concluded, involves 159 WTO member states.[8] In short: the GATT provided a basic framework regime for international trade liberalization, rather than in and of itself a detailed substantive regime therefore – that was left to further negotiations as per these various trade Rounds.

Of course, for many years 'outer space' was not at all an issue in this context. At the time of establishing the GATT, the closest mankind had been to space were a few V-2 rocket launches,[9] and (in a virtual sense) some epochal and visionary articles by scientists.[10] And as long as outer space remained a domain accessible only to a handful of states, state

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Agreement_on_Tariffs_and_Trade, last accessed 26 March 2014; further e.g. Bhala, *supra* n. 1, 9–139; Bhala & Kennedy, *supra* n. 3, 5–9.

[7] Though a so-called 'Bali package' was signed on 7 December 2013, the Round has not yet been formally concluded; see http://en.wikipedia.org/wiki/General_Agreement_on_Tariffs_and_Trade, last accessed 26 March 2014.

[8] See http://en.wikipedia.org/wiki/World_Trade_Organization, last accessed 26 March 2014.

[9] *Cf.* e.g. http://en.wikipedia.org/wiki/Sub-orbital_spaceflight, last accessed 26 March 2014; referring to a 1944 V-2 launch reaching an altitude of 189 km.

[10] Most notable amongst those of course was A. Clarke, Extra-Terrestrial Relays – Can Rocket Stations Give Worldwide Radio Coverage?, *Wireless World* (October 1945), 305–8.

agencies and state-run intergovernmental organizations for politico-military or scientific rather than commercial purposes, there was little relevance in considering a free trade regime with respect to outer space, space activities or space-based services in any event.

15.1.3 The GATS and the WTO – and Satellite Communications

The above started to change more or less at the same time that the overall success of the GATT was giving rise to a desire to broaden the general trade liberalization in the 1990s. That desire resulted most prominently in 1994 in the agreement on a similar framework regime for trade in services to complement the trade in goods, the General Agreement on Trade in Services (GATS),[11] and an agreement to underpin and institutionalize the whole range of trade liberalization efforts by establishing a proper intergovernmental organization, the World Trade Organization (WTO).[12]

The 1990s also witnessed a major paradigm change in telecommunications, including satellite communications, at least in the developed countries, moving away from a government-dominated public service environment to a private-enterprise-oriented commercial business environment.[13] For the first time consequently questions arose as to the

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[11] General Agreement on Trade in Services (hereafter GATS), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1869 UNTS 183; UKTS 1996 No. 58; Cm. 3276; ATS 1995 No. 8. See further e.g. Jackson, *supra* n. 2, 306–10; M. Krajewski, General Agreement on Trade in Services (1994), in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IV (2012), 323–34; Bhala, *supra* n. 1, 1539 ff.; Bhala & Kennedy, *supra* n. 3, 1242–70; Guzman & Pauwelyn, *supra* n. 3, 553 ff.

[12] Agreement Establishing the World Trade Organization (hereafter WTO Agreement), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1867 UNTS 154; UKTS 1996 No. 57; ATS 1995 No. 8; 33 ILM 1125, 1144 (1994). See generally Jackson, *supra* n. 2, 44 ff.; further e.g. Stoll, *supra* n. 4, 968 ff.; Bhala, *supra* n. 1, 27–43; Guzman & Pauwelyn, *supra* n. 3, 80 ff.; Saitoh, *supra* n. 1, 323–4.

[13] See e.g. P.K. McCormick, Neo-Liberalism: A Contextual Framework for Assessing the Privatisation of Intergovernmental Satellite Organisations, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 1–34; also M.J. Mechanick, The Role and Function of Residual International Intergovernmental Satellite Organisations Following Privatisation, in *The Transformation of Intergovernmental Satellite Organisations* (Eds. P.K. McCormick & M.J. Mechanick) (2013), 176–81; F. Lyall, *Law and Space Telecommunications* (1989), 421 ff.; I. Walden, Telecommunications Law and Regulation: An Introduction, in *Telecommunications Law*

desirability, feasibility and likelihood of achieving liberalization in the trade in those telecommunication services, originally comprising a government-exclusive and domestically fenced-off economic sector.

This also raised the issue for the first time as to what extent other space activities becoming of economic and commercial importance might (have to) be subjected to the general international trade liberalization promoted in the GATT, GATS and WTO context. Notably this concerned launching, more tentatively satellite remote sensing and satellite navigation, in the near future perhaps private commercial spaceflight – all the while noting that in none of those sectors, so far, has any such discussion given rise to actual and formal involvement of GATT, GATS and the WTO.

Before those processes, and any resulting legal regimes, are addressed, however, it is appropriate to first address the general aspects of the GATT, GATS and WTO regimes as they developed without much thought being given to any possible application in the context of space activities or space-based products or services.

15.2 THE GENERAL ASPECTS OF THE GATT, GATS AND WTO REGIMES

15.2.1 The Framework: GATT, GATS and WTO

As already indicated, the GATT and then GATS, as underpinned by the institutional framework established by way of the WTO, provide for a framework regime directing global trade in products and services to become ever more liberalized by way of positing a handful of fundamental legal principles and legal and institutional mechanisms, as well as mechanisms to sort out trade disputes that will inevitably arise in view of the crucial role of international trade in the international community.

15.2.1.1 The WTO Agreement: The essentials

Formally, within the international trade regime thus established the WTO Agreement now constitutes the overarching document at the highest level, as '[t]he WTO shall provide the common institutional framework

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and Regulation (Ed. I. Walden) (3rd edn., 2009), 9–11; more generally C. Venet, The Economic Dimension, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 55 ff.; E. Walter, The Privatisation and Commercialisation of Outer Space, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 493–9.

for the conduct of trade relations among its Members in matters related to the agreements and associated legal instruments included in the Annexes to this Agreement'.[14] At a second level, there is a set of agreements referred to as 'Multilateral Trade Agreements', which 'are integral parts of this Agreement, binding on all Members' as annexes to the WTO Agreement.[15] The first three, dealing with substantive trade law principles and rules, are the GATT in a revised version (labelled GATT 1994, as Annex 1A),[16] the GATS (as Annex 1B) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (the TRIPS Agreement, as Annex 1C).[17] In addition, two procedural annexes also belong to these Multilateral Trade Agreements: Annex 2, the Understanding on Rules and Procedures Governing the Settlement of Disputes, and Annex 3, the Trade Policy Review Mechanism.[18]

At a third level, and formally incorporated in the WTO Agreement even though they 'do not create either obligations or rights for Members that have not accepted them' but are only binding upon 'those Members that have accepted them', the 'Plurilateral Trade Agreements' come into

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[14] Art. II(1), WTO Agreement, *supra* n. 12. *Cf.* further e.g. Stoll, *supra* n. 4, 971 ff.; Bhala, *supra* n. 1, 34–5.

[15] Art. II(2), WTO Agreement, *supra* n. 12.

[16] See Art. II(4), WTO Agreement, *supra* n. 12. Actually, GATT 1994 comprises GATT 1947 as amended plus 12 Agreements dealing with specific subjects: Agriculture, Application of Sanitary and Phytosanitary Measures, Textiles and Clothing, Technical Barriers to Trade, Trade-Related Investment Measures, Implementation of Article VI of the GATT 1994 (on dumping), Implementation of Article VII of the GATT 1994 (on customs valuation), Preshipment Inspection, Rules of Origin, Import Licensing Procedures, Subsidies and Countervailing Measures, and Safeguards; see List of Annexes, WTO Agreement. *Cf.* specifically on the GATT 1994 e.g. Benedek, *supra* n. 2, 315–6.

[17] Agreement on Trade-Related Aspects of Intellectual Property Rights (hereafter TRIPS Agreement), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1869 UNTS 299; UKTS 1996 No. 10; Cm. 3046; ATS 1995 No. 38. See further e.g. Jackson, *supra* n. 2, 310–3; Guzman & Pauwelyn, *supra* n. 3, 589 ff.; Bhala, *supra* n. 1, 1611 ff.; T.N. Srinavan, The TRIPS Agreement, in *The Political Economy of International Trade Law* (Eds. D.L.M. Kennedy & J.D. Southwick) (2002), 343–7; on its application in the satellite communications context e.g. P.A. Salin, *Satellite Communications Regulations in the Early 21st Century* (2000), 76–81; in great detail K.H. Böckstiegel, P. Krämer & I. Polley, Patent Protection for the Operation of Telecommunication Satellite Systems in Outer Space?, 47 *Zeitschrift für Luft- und Weltraumrecht* (1998), 3–17, 166–78; on the TRW case e.g. S. Mosteshar, Satellite Constellation Patent Claim, 4 *Telecommunications and Space Journal* (1997), 251–5, also *supra* § 8.2.5.4.

[18] See Art. II(2), WTO Agreement, *supra* n. 12, *cf.* also Art. III(2), (3).

play.[19] Annex 4 currently lists four of these, of which only the Agreement on Government Procurement could be implicated in the context of space activities.[20]

Whilst the Multilateral Trade Agreements are 'binding upon all Members', it should be pointed out that the WTO Agreement effectively provides for an opt-out clause for individual WTO member states from such agreements, available at the moment of a state becoming a member of the WTO.[21] The main difference between Multilateral and Plurilateral Trade Agreements therefore – apart from their focus on overarching structural regimes and substantive sectors respectively – is more a matter of the default position being the opposite in the two cases than of a fundamental difference in the appreciation of state sovereignty. In both cases sovereign discretion ultimately rules whether a state will be bound by a particular regime – where newly joining member states have an opt-out possibility whilst the WTO members in the Uruguay Round, following a single package approach, had to join virtually all agreements with the exception of the Plurilateral Trade Agreements.

It is the main function of the WTO as an organization to 'facilitate the implementation, administration and operation, and further the objectives, of this Agreement and of the Multilateral Trade Agreements, and … also [to] provide the framework for the implementation, administration and operation of the Plurilateral Trade Agreements'.[22] Thus, the WTO

> shall provide the forum for negotiations among its Members concerning their multilateral trade relations in matters dealt with under the agreements in the Annexes to this Agreement. The WTO may also provide a *forum for further negotiations among its Members concerning their multilateral trade relations,*

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[19] Art. II(3), WTO Agreement, *supra* n. 12.

[20] Agreement on Government Procurement, Marrakesh, done 15 April 1994, entered into force 1 January 1996; 1915 UNTS 103; UKTS 1996 No. 53; see also J. Boucher & J.F. Dennin, 1996 WTO Agreement on Government Procurement, in *Law & Practice of the World Trade Organization* (Ed. J.F. Dennin), Booklet E, Release 95-4 (1995), 1–14. The other three Plurilateral Trade Agreements listed in Annex 4 are the Agreement on Trade in Civil Aircraft, the International Dairy Agreement and the International Bovine Meat Agreement. Meanwhile, agreements on financial services, shipping and telecommunications (as to the latter, see further *infra*, § 15.4.2) have been added.

[21] See Art. XIII, WTO Agreement, *supra* n. 12; *cf.* also B. Hindley, What Subjects Are Suitable for WTO Agreement?, in *The Political Economy of International Trade Law* (Eds. D.L.M. Kennedy & J.D. Southwick) (2002), 158–60.

[22] Art. III(1), WTO Agreement, *supra* n. 12.

> *and a framework for the implementation of the results of such negotiations, as may be decided by the Ministerial Conference.*[23]

This function applies to all five Multilateral Trade Agreements and, as applicable, to the Plurilateral Trade Agreements. It also would obviously provide the baseline for any addressing of space sectors through the WTO framework regime currently not so addressed – once sufficient political and economic will had developed. With respect to the dispute settlement procedures of Annex 2 and the trade policy review mechanisms the WTO is specifically charged to administer them, in order to achieve a major level of transparency.[24]

This then finally brings analysis to a fourth level. This concerns agreements which provide the bulk of the substantive trade regimes, by applying – following the negotiations in such Ministerial Conferences as mentioned in this clause or the various 'Rounds' referred to earlier – the above general regime to specific issues or specific sectors (other than the sector-specific Plurilateral Trade Agreements on civil aircraft, government procurement, dairy products and bovine meat products, already regulated through Annex 4).[25]

15.2.1.2 The WTO: Institutional aspects

The institutional structure of the WTO is generally similar to that of other 'classical' international organizations, with the two highest organs exclusively the domain of sovereign member states[26] – and the European Commission representing the European Union as the exception.[27]

These organs are the Ministerial Conference, convening at least every two years and comprised of all member state representatives with the ultimate authority to 'carry out the functions of the WTO and take actions necessary to this effect' and 'to take decisions on all matters

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[23] Art. III(2), WTO Agreement, *supra* n. 12 (emphasis added).

[24] See Art. III(3), (4), WTO Agreement, *supra* n. 12.

[25] Specific issues concern e.g. trade-related investment measures or rules of origin; the special sectors thus arranged concern agriculture and textiles and clothing respectively; see Annex 1A.

[26] See further e.g. www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm, last accessed 26 March 2014.

[27] See e.g. P.J. Kuijper, External Relations, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn., 2008), 1304–5, ff.; Bhala & Kennedy, *supra* n. 3, 198–239; P.L.H. Van den Bossche, The European Community and the Uruguay Round Agreements, in *Implementing the Uruguay Round* (Eds. J.H. Jackson & A.O. Sykes) (1997), 23–6.

under any of the Multilateral Trade Agreements',[28] and the General Council, equally representing all member states running the WTO as between Ministerial Conferences.[29] The General Council *inter alia* guides the activities of three Councils for the three substantive Multilateral Trade Agreements: the Council for Trade in Goods, the Council for Trade in Services and the Council for TRIPS, in charge of overseeing the functioning of the three respective agreements.[30]

Assisting the Ministerial Conferences and the General Council is the third, 'standard' organ of intergovernmental organizations, the Secretariat, headed by a Director-General.[31] Also, along traditional lines of functional immunities,

> [t]he responsibilities of the Director-General and of the staff of the Secretariat shall be exclusively international in character. In the discharge of their duties, the Director-General and the staff of the Secretariat shall not seek or accept instructions from any government or any other authority external to the WTO. They shall refrain from any action which might adversely reflect on their position as international officials. The Members of the WTO shall respect the international character of the responsibilities of the Director-General and of the staff of the Secretariat and shall not seek to influence them in the discharge of their duties.[32]

Thus, the Secretariat as well as other organs of the WTO benefit from legal personality, privileges and immunities in the same vein as those to be accorded by the member states to the organization.[33]

15.2.1.3 The WTO Agreement: The dispute settlement procedures

One of the major flaws of the GATT system as it had operated since 1947 was the lack of a coherent and overarching mechanism for the settlement of disputes on any international trade issues coming up in that context.[34] The institutionalization of the global trade regime by way of

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[28] Art. IV(1), WTO Agreement, *supra* n. 12; further e.g. Bhala & Kennedy, *supra* n. 3, 16–7.

[29] See Art. IV(2)–(4), WTO Agreement, *supra* n. 12.

[30] See Art. IV(5), WTO Agreement, *supra* n. 12; further e.g. Bhala & Kennedy, *supra* n. 3, 17–9.

[31] See Art. VI(1), WTO Agreement, *supra* n. 12; further e.g. Bhala & Kennedy, *supra* n. 3, 19.

[32] Art. VI(4), WTO Agreement, *supra* n. 12.

[33] See Art. VIII, WTO Agreement, *supra* n. 12.

[34] See extensively Jackson, *supra* n. 1, 111–92; also Guzman & Pauwelyn, *supra* n. 3, 84; Bhala, *supra* n. 1, 143 ff.; further M.L. Busch & E. Reinhardt, Testing International Trade Law: Empirical Studies of GATT/WTO Dispute

establishment of the WTO offered an excellent opportunity to address also this major problem. Consequently, as indicated, partisanship to the WTO Agreement entailed also acceptance of the dispute settlement procedures offered by its Annex 2.

This system consisted of a system of 'escalating' dispute settlement mechanisms, starting with consultation and then moving up through panels, the Appellate Body and ultimately a Dispute Settlement Body (DSB), where, however, parties may also decide on arbitration.[35] Whilst certainly constituting a major step forward compared to the pre-WTO situation, the WTO dispute settlement regime continues to suffer from a few shortcomings when viewed in the overall context of a global commercial sector, still being unable to fully address one key characteristic of the global trade arena: that most stakeholders by now are private companies actually undertaking the trade activities at issue.

Firstly, the regime does not (necessarily) give rise to a binding solution imposed by a neutral third party, although it comes rather close by 'creating a reverse consensus rule that maintains arbitral or appellate decisions unless a consensus vote rejects them'.[36] Whilst Annex 2 consistently speaks of 'recommendations and rulings'[37] of the DSB, suggesting the former would be non-binding as different from the latter, this is nowhere explicitly stated – rulings, once adopted (which is essentially automatic), are legally binding at the international level.[38] When trade disputes concern multi-million dollar issues for categories of private commercial companies having to operate in a multi-government-regulated environment, possibilities of avoiding binding dispute settlement would risk being made use of all too often.

Settlement, in *The Political Economy of International Trade Law* (Eds. D.L.M. Kennedy & J.D. Southwick) (2002), 457–66; Saitoh, *supra* n. 1, 324–6.

35 Annex 2, WTO Agreement, *supra* n. 12, further to Art. III(3) provides for this dispute settlement system. See Art. 4, Annex 2, on consultations; Art. 5 on good offices, conciliation and mediation; Arts. 6–16 and 18–19 on panels; Arts. 17–19 on the Appellate Body; Arts. 20–24 on the Dispute Settlement Body; and Art. 25 on arbitration. See further e.g. Guzman & Pauwelyn, *supra* n. 3, 115–64; I. Walden, International Telecommunications Law, in *Telecommunications Law and Regulation* (Ed. I. Walden) (3rd edn., 2009), 756–9.

36 G. Goh, *Dispute Settlement in International Space Law* (2007), 212.

37 See Art. 21, Annex 2, WTO Agreement, *supra* n. 12.

38 *Cf.* e.g. Art. 3, Annex 2, WTO Agreement, *supra* n. 12, which seems to skirt the issue, referring to member states 'affirm[ing] their adherence to the principles for the management of disputes' as per Annex 2 (in § (1)) and also otherwise merely asserting the value of conforming to decisions arising out of the dispute settlement system.

Secondly, the regime does not even formally allow private companies having issues with a particular WTO-devolving regulation or the interpretation, implementation or application thereof to assert a claim on its own behalf in the framework of the WTO dispute settlement regime.[39] This is of course not surprising given the character of the WTO as a classical international intergovernmental organization, yet automatically means many important actors and stakeholders in international trade will not have direct access to such dispute settlement procedures – and this analysis also applies squarely to satellite communications, the more so as space law itself does not even provide for a state-to-state dispute settlement mechanism, with the exception of the Liability Convention, of rather limited scope,[40] and the – as of yet untested – Permanent Court of Arbitration (PCA) Rules on Outer Space Disputes.[41]

Thirdly – and this is perhaps particular to the space communications environment – the WTO is obviously very focused on trade and commercial aspects. While expertise in those areas as necessary for dispute settlement will in principle be broadly available, many potential other important angles to a trade and commerce dispute involving satellite communications, such as the technical/operational,[42] politico-security and social approaches, might easily be left out of the considerations or treated insufficiently or incorrectly – unless of course panels or parties would actively involve appropriate experts themselves.

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[39] *Cf.* e.g. Art. 3, esp. (2), (3), (7), Annex 2, WTO Agreement, *supra* n. 12. See also e.g. P. Cowhey & M.M. Klimenko, The WTO Agreement on Basic Telecommunications Services and Its Implications for Developing and Transition Economies, IR/PS Policy report No. 99-06, 1999, University of California, 7, at n. 4; *cf.* further Jackson, *supra* n. 2, esp. 127 ff.; Jackson, *supra* n. 1, 133 ff.

[40] Convention on International Liability for Damage Caused by Space Objects (Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971). See further *infra*, § 19.1.3; also *supra*, § 2.3.3.7, § 2.3.3.8.

[41] Optional Rules for Arbitration of Disputes Relating to Outer Space Activities (Rules on Outer Space Disputes), The Hague, 6 December 2011, www.pca-cpa.org/showpage.asp?pag_id=1188, last accessed 2 February 2014. See further *infra*, § 19.3.

[42] This is of course where in particular the ITU, which also has its complicated dispute settlement mechanisms, might present a more appropriate tool for solving international disputes. See e.g. on the ITU in general *supra*, § 8.2, esp. 8.2.2; on the dispute settlement system *infra*, § 19.2.2.

15.2.1.4 The GATT and the GATS: The essentials

The GATT deals with the trade in goods[43] or products[44] which are not defined by the GATT itself, but could generally be defined as 'tangible or movable personal property other than money' and 'usu[ally] (1) tangible personal property, (2) the result of fabrication or processing, and (3) an item that has passed through a chain of commercial distribution before ultimate use or consumption' respectively.[45] In other words: it concerns something tangible, which in the context of, for example, trade can be measured in distinctly visible units. This is usually broadly interpreted; for example electricity has also been defined as being a 'good'.[46]

When the GATS in 1994 essentially transposed the main elements of the GATT regime to the context of services, it did not define those as such either, but only listed the categories of (international) services in principle subject to its regime, as respectively being

> the supply of a service
>
> (a) from the territory of one Member into the territory of any other Member;
> (b) in the territory of one Member to the service consumer of any other Member;
> (c) by a service supplier of one Member, through commercial presence in the territory of any other Member; [or]

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43 The term 'goods' is used e.g. in § 1, Preamble, GATT 1947, *supra* n. 3.

44 The term 'products' is generally used throughout the operative provisions of the treaty; see e.g. Arts. I(1), III(1), GATT 1947, *supra* n. 3. *Cf.* also Jackson, *supra* n. 1, 59–60.

45 *Black's Law Dictionary* (9th edn., 2009), 762, 1328; *cf.* also A. Marsoof, A Case for *Sui Generis* Treatment of Software under the WTO Regime, 20 *International Journal of Law & Information Technology* (2012), 291–3 ('the term "goods" presupposes tangibility', at 293), also 296–304; J. Bhagwati, Economic Perspective on Trade in Professional Services, in *Legal Problems of International Economic Relations* (Eds. J.H. Jackson, W.J. Davey & A.O. Sykes) (4th edn., 2002), 855–8, focusing on storability and (absence of) user–producer interaction; Bhala, *supra* n. 1, 322. Furthermore, it may be noted that under EU law the terms 'goods' and 'products' are often used interchangeably, goods being defined *i.a.* as 'products which can be valued in money and which can be capable, as such, of forming the subject of commercial transactions'; Case 7/68 *Commission v. Italy*, at 428, as quoted by K.J.M. Mortelmans, The Functioning of the Internal Market: The Freedoms, in *The Law of the European Union and the European Communities* (Eds. P.J.G. Kapteyn *et al.*) (4th edn., 2008), 599.

46 See Mortelmans, *supra* n. 45, 600, quoting jurisprudence of the Court of Justice of the European Union on the matter. *Cf.* also Marsoof, 308–9, *supra* n. 45, on UN classifications.

(d) by a service supplier of one Member, through presence of natural persons of a Member in the territory of any other Member.[47]

The GATS excludes 'services supplied in the exercise of governmental authority', the latter being defined as 'any service which is supplied neither on a commercial basis, nor in competition with one or more service suppliers'.[48] By that token 'all services except those supplied in the exercise of governmental authority and certain air traffic rights … are covered by the GATS'.[49]

Obviously there are major differences between international trade in products and international trade in services.[50] The former simply involves the physical movement of the product from one state to another where dealing with the passing of borders consequently suffices to arrive at the desired level of liberalization, whereas the latter requires the above-mentioned, more complicated fourfold definition:

> Services are unlike goods, which can be built by a company in one part of the world one day, shipped on a boat from another part of the world another day, only to arrive and be stored to await sale in a warehouse in a third country the next day. In contrast, services require direct and simultaneous interaction between the service producer and the service consumer. This is especially true for telecommunications, as a recent Organisation for Economic Co-operation and Development report stated, because the provision of such 'services depends on infrastructure which is not mobile across borders. Therefore, foreign direct investment is required or, alternatively, access to existing infrastructure on a fair and non-discriminatory basis.'[51]

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[47] Art. I(2), GATS, *supra* n. 11. Usually, those four categories are respectively referred to as cross-border supply, consumption abroad, commercial presence and presence of natural persons. See again Marsoof, *supra* n. 45, 293–304; Bhagwati, *supra* n. 45, 855–8, for the distinction of 'services' from 'goods'.

[48] Art. I(3)(b) & (c) respectively, GATS, *supra* n. 11.

[49] Krajewski, *supra* n. 11, 325.

[50] See e.g. Stoll, *supra* n. 4, 973–8, esp. 977; also Marsoof, *supra* n. 45, 293–6, 300–4, on the legal differences following therefrom.

[51] E. Senunas, The 1997 GATS Agreement on Basic Telecommunications: A Triumph for Multilateralism, or the Market?, 1997 *Boston College Intellectual Property & Technology Forum*, 111401, www.bc.edu/bc_org/avp/law/st_org/iptf/articles/content/1997111401.html, last accessed 19 April 2014, *sub* The Importance and Unique Character of Services, referring *i.a.* to T.H.E. Stahl, Liberalizing International Trade in Services: The Case for Sidestepping the GATT, 19 *Yale Journal of International Law* (1994), 411, and quoting the Committee for Information, Computer and Communications Policy Report

Consequently,

> the unique character of services create exceptional challenges to their liberalization. By their nature, services often require the transfer across borders of capital assets – such as construction equipment or telecommunications networks – and individuals. Such activity logically invites government regulation. 'The cross border projections of capital assets and individuals that international trade in services usually entails often raise political concerns of national autonomy and sovereignty … which in turn engender a high degree of trade-inhibiting government regulation.' An equally challenging aspect of services is their difficulty to be accurately measured. Since services are less tangible than goods, and 'do not necessarily enter and exit countries as discrete, quantifiable units at convenient customs ports,' they are more difficult to measure, which in turn makes negotiating the removal of trade barriers more difficult. 'When the values of reciprocal concessions cannot be quantified or compared … negotiations may degenerate into irrational political exercises not conducive to reciprocal reductions of comparable trade barriers.'[52]

The fundamental conceptual difference between the two regimes consequently has been summarized as: 'GATT entails complete trade liberalization and applies to all products. Conversely, GATS involves a positive list approach, whereby Members negotiate commitments to open and keep open service sectors.'[53] Nevertheless, at heart both the GATT and the GATS, further to the role of the WTO as addressed, take the same approach to such trade, and hence have most of their major legal principles and concepts in common – even if not (always) applied to a similar extent.[54]

To start with, trade liberalization is generally equated to firstly breaking down trade barriers at national borders, most simply in the form of import duties or quantitative trade barriers such as maximum import quota,[55] and secondly levelling the playing field within such national borders. Increasingly then, it also encompasses more sophisticated instruments to obstruct free trade such as taxes having equivalent effects or

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OCDE/GD(95)107, International Telecommunications: A Review of Issues and Developments, of 17 August 1995, at 14.

52 Senunas, *supra* n. 51, *sub* The Importance and Unique Character of Services; the internal quotations are from Stahl, *supra* n. 51, 411–3.

53 Marsoof, *supra* n. 45, 294.

54 See further Marsoof, *supra* n. 45, 294–300, noting e.g. a major discrepancy in approach as between the United States and the European Union.

55 *Cf.* already Art. XI, GATT 1947, *supra* n. 3.

legislation using technological, operational, safety or security criteria to provide obstacles to such free trade.[56]

A second key element is 'non-discrimination': the general conception that international trade and, indeed, the international community would be best served by the broad abolishment of favours for specific trade partners and the introduction of a maximum achievable level of global non-discrimination in this respect.[57] A corollary of non-discrimination in terms of nationality of producers, service providers and consumers is the concept of 'technical neutrality', whereby the principled requirement not to promote or favour in any manner one technology over another is considered another key component of establishing a true level playing field and a truly liberalized international trade environment.[58]

Still, as to non-discrimination strictly speaking, usually implicitly but often explicitly, WTO member states are allowed to go *further* in the direction of complete trade liberalization in their national measures regulating international trade than is formally required under the GATT and the GATS – these serve as *minimum* standards of liberalization.[59] Indeed, regional and bilateral free trade agreements further developing baseline GATT and GATS requirements to break down trade barriers have flourished in the past two decades, now numbering over 400, such that roughly half of world trade now occurs at preferential (that is better than MFN) rates.[60] This is important, for example, when addressing regional arrangements effectively discriminating in their trade

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[56] See e.g. Stoll, *supra* n. 4, 972–3.

[57] See e.g. Stoll, *supra* n. 4, 972; Krajewski, *supra* n. 11, 326–7; also www.wto.org/english/docs_e/legal_e/26-gats_02_e.htm#anntel, last accessed 26 March 2014; at n. 15 specifically on telecommunications: 'The term "non-discriminatory" is understood to refer to most-favoured-nation and national treatment as defined in the Agreement, as well as to reflect sector-specific usage of the term to mean "terms and conditions no less favourable than those accorded to any other user of like public telecommunications transport networks or services under like circumstances"'.

[58] See e.g. Marsoof, *supra* n. 45, 297–300.

[59] *Cf.* also e.g. Art. XIX(4), GATS, *supra* n. 11, on 'progressive liberalization' by way of the international trade negotiation rounds referred to *supra*, § 15.1.2.

[60] See e.g. www.wto.org/english/news_e/sppl_e/sppl46_e.htm, last accessed 26 March 2014.

liberalization by allowing regional partners liberalized access to their markets beyond that agreed on a global scale.[61]

15.2.2 The Key Substantive Elements of the GATT and GATS Regimes

15.2.2.1 The most favoured nation (MFN) clauses

One of the cornerstones of international trade liberalization is the treatment enshrined in MFN clauses, a specific economic form of 'non-discrimination' which imposes an obligation to treat any external trade partner and its companies no worse than it treats its 'most-favoured nation' and *its* companies.[62] In the terminology of the GATT:

> With respect to customs duties and charges of any kind imposed on or in connection with importation or exportation or imposed on the international transfer of payments for imports or exports, and with respect to the method of levying such duties and charges, and with respect to all rules and formalities in connection with importation and exportation, and with respect to all matters referred to in paragraphs 2 and 4 of Article III, any advantage, favour, privilege or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties.[63]

The trade liberalization of products under the GATT, in other words, essentially operates *per product or category of products*, and what products are subjected to which levels of, for example, maximum allowable import and export duties, is to be further regulated in subsequent agreements and arrangements such as notably those arrived at during the international trade Rounds.

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[61] This especially concerns the European Union, where in many respects, including satellite communications, pro-free trade legislation has moved considerably farther than on a global scale. See further *supra*, esp. § 4.3.2; *cf.* also Jackson, *supra* n. 1, 99–109; Van den Bossche, *supra* n. 27, 23 ff.

[62] The MFN principle is also found in the TRIPS Agreement, *supra* n. 17; see Art. 4. Further Senunas, *supra* n. 51, *sub* Multilateral Ideas in the GATS, on the 'free-rider problem' which results from the unconditional application of the MFN clause, i.e. also vis-à-vis states themselves *not* offering similar levels of liberalized access.

[63] Art. I(1), GATT 1947, *supra* n. 3. See further Jackson, *supra* n. 2, 157–73; Jackson, *supra* n. 1, 58–63; Benedek, *supra* n. 2, 316–7; Bhala, *supra* n. 1, 321–48; Bhala & Kennedy, *supra* n. 3, 60–78; Guzman & Pauwelyn, *supra* n. 3, 287–314.

In the GATS this is phrased as follows: 'With respect to any measure covered by this Agreement, each Member shall accord immediately and unconditionally to services and service suppliers of any other Member treatment no less favourable than that it accords to like services and service suppliers of any other country.'[64] In other words, 'Art. II GATS prohibits the discrimination of services and service suppliers from different foreign countries if they can be considered [a] "like" [service]'.[65]

Exemptions from this straightforward regime are possible, but under the GATT only if preferences as between various foreign states do not exceed certain levels[66] and under the GATS only as far as allowed by the Annex on Article II Exemptions.[67] Nevertheless, the latter present an important deviation from the otherwise mandatory and unconditional application of the MFN clause in the context of services.[68]

Both GATT and GATS provide further clauses on details of implementation, such as distinguishing (prohibited) import duties from (allowable) 'fees or other charges commensurate with the cost of services rendered',[69] exemption on local cross-border services,[70] as well as more general measures regarding transparency[71] – necessary to allow consistent monitoring of compliance with the GATT and GATS – or the disclosure of confidential information which may sometimes be called for.[72]

15.2.2.2 The National Treatment (NT) clauses

The second major substantive principle enshrined in the GATT and the GATS (as well as the TRIPS Agreement[73]) is in essence going one step further than the MFN clauses in applying non-discrimination: under the concept of NT, discrimination between foreign providers of products or services and national providers of the same goods and services respectively is in principle now also outlawed. As this applies only once a product, service or item subject to intellectual property has entered the

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64 Art. II(1), GATS, *supra* n. 11. See also e.g. Marsoof, *supra* n. 45, 296.
65 Krajewski, *supra* n. 11, 326–7.
66 *Cf.* Art. I(2), (4), GATT 1947, *supra* n. 3.
67 See Art. II(2), GATS, *supra* n. 11; also Krajewski, *supra* n. 11, 327.
68 See Senunas, *supra* n. 51, *sub* Multilateral Ideas in the GATS.
69 Art. II(2) (c), GATT 1947, *supra* n. 3.
70 See Art. II(3), GATS, *supra* n. 11.
71 See Art. III, GATS, *supra* n. 11.
72 See Art. III *bis*, GATS, *supra* n. 11.
73 See Art. 3, TRIPS Agreement, *supra* n. 17.

national market, charging customs duties on importation as such does not constitute a violation of NT even if locally produced products are not charged an equivalent duty: it is *after* having entered a specific national market that foreign goods are entitled to be treated equal to domestic goods.

Under the GATT, this principle was applied nominally to internal regulation:

> The contracting parties recognize that internal taxes and other internal charges, and laws, regulations and requirements affecting the internal sale, offering for sale, purchase, transportation, distribution or use of products, and internal quantitative regulations requiring the mixture, processing or use of products in specified amounts or proportions, should not be applied to imported or domestic products so as to afford protection to domestic production.[74]

Its effect, in practice, essentially covered all opportunities for governments to try and favour domestic providers of products as against foreign providers of the same or like products. Likewise also with respect to taxation,

> [t]he products of the territory of any contracting party imported into the territory of any other contracting party shall not be subject, directly or indirectly, to internal taxes or other internal charges of any kind in excess of those applied, directly or indirectly, to like domestic products. Moreover, no contracting party shall otherwise apply internal taxes or other internal charges to imported or domestic products in a manner contrary to the principles set forth in paragraph 1.[75]

Once again, the *actual* treatment of both domestic and foreign goods under this regime depended upon further agreements and arrangements dealing with specific (categories of) goods as per the various international trade Rounds.

Prima facie, the same approach was applied by the GATS to services, as 'each Member shall accord to services and service suppliers of any other Member, in respect of all measures affecting the supply of services, treatment no less favourable than that it accords to its own like services

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[74] Art. III(1), GATT 1947. See further Jackson, *supra* n. 2, 213–28; Benedek, *supra* n. 2, 317; Bhala, *supra* n. 1, 373–414; Bhala & Kennedy, *supra* n. 3, 90–105; Guzman & Pauwelyn, *supra* n. 3, 225–85.

[75] Art. III(2), GATT 1947, *supra* n. 3.

and service suppliers'.[76] However, as compared to the GATT this approach was actually prefaced by the phrase '[i]n the sectors inscribed in its Schedule, and subject to any conditions and qualifications set out therein'.[77] This meant that NT was not a general obligation *ipso facto* stemming from WTO and GATS membership but was dependent on market access as per Schedules of Specific Commitments being offered per sector.[78]

Once NT applies, WTO member states are allowed to deviate from such an obligation of non-discrimination only by actually *favouring* foreign service providers.[79] Likewise, they are also in this context entitled to do *more* in the direction of lowering of trade barriers than the minimum required by the GATS: 'Members may negotiate commitments with respect to measures affecting trade in services not subject to scheduling under Articles XVI or XVII, including those regarding qualifications, standards or licensing matters.'[80]

15.2.2.3 Schedules of Concessions and Commitment

Since the GATT and the GATS posit the general principles of MFN and NT to be applied in the context of obstacles to international trade without specifying substantive liberalization measures to be taken in accordance therewith for (categories of) products and services, this role falls to the so-called 'Schedules of Concessions' (for the GATT) and 'Schedules of Commitment' (for the GATS) respectively.[81]

The GATT Schedules of Concessions apply MFN treatment to (the relevant categories of) products ('commerce') from other states by setting maximum levels of allowable 'ordinary customs duties' and 'all other duties and charges of any kind imposed on or in connection with the importation'.[82]

For the GATS, Schedules of Commitment determine the level of access to foreign markets that service providers are to be allowed under the MFN principle for specific service sectors, including lists of types of

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[76] Art. XVII(1), GATS, *supra* n. 11. See also e.g. Marsoof, *supra* n. 45, 295–6.

[77] Art. XVII(1), GATS, *supra* n. 11.

[78] See Krajewski, 326–9, *supra* n. 11.

[79] See Art. XVII(2), (3), GATS, *supra* n. 11.

[80] Art. XVIII, GATS, *supra* n. 11.

[81] See again e.g. Krajewski, *supra* n. 11, 328 ff.; Bhala & Kennedy, *supra* n. 3, 1256 ff.

[82] Art. III(1)(b), (c), GATT 1947, *supra* n. 3.

services where individual states can opt out of applying MFN treatment.[83] 'Access to foreign markets' here is then further subdivided along the lines of the fourfold categorization of services into cross-border supply, consumption abroad, commercial presence and presence of natural persons, as per Article I(2) of the GATS.[84]

The GATS, however, also allows states to go one step further and apply NT to the service sector by way of specific commitments: 'With respect to market access through the modes of supply identified in Article I, each Member shall accord services and service suppliers of any other Member treatment no less favourable than that provided for under the terms, limitations and conditions agreed and specified in its Schedule.'[85]

Further liberalization is then to be achieved by way of additional and specific commitments:

> Each Member shall set out in a schedule the specific commitments it undertakes under Part III of this Agreement. With respect to sectors where such commitments are undertaken, each Schedule shall specify:
>
> (a) terms, limitations and conditions on market access;
> (b) conditions and qualifications on national treatment;
> (c) undertakings relating to additional commitments;
> (d) where appropriate the time-frame for implementation of such commitments; and
> (e) the date of entry into force of such commitments.[86]

Whilst it remains possible for sovereign states also to withdraw concessions earlier agreed upon through the GATT, GATS and Schedules of Concessions and Commitment, the treaties at least require an extended procedure allowing other affected states to exert strong pressure, even use arbitration in certain cases, to try and prevent a member state from taking such a unilateral anti-liberalization measure.[87]

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83 See Art. II(1) & (2) respectively, GATS, *supra* n. 11.

84 See also *supra*, text at n. 47.

85 Art. XVI(1), GATS, *supra* n. 11; see § (2) for detailed obligations for compliance with NT in this respect.

86 Art. XX, GATS, *supra* n. 11; see also Arts. XVII, XVIII. See *infra*, § 15.4.3, for the specific example of commitments regarding telecommunications.

87 See esp. Art. XXI(2), (3), GATS, *supra* n. 11.

15.2.2.4 Exceptions

With regard to application of MFN, exceptions are allowed within the strict boundaries of the treaties.[88] Such exceptions are made explicit, especially in the GATT,[89] as the basic commitment is to apply MFN and/or NT across the board, whereas the Schedules of Commitment under the GATS by their nature already allow for more individual variation in the acceptance of certain obligations.[90]

Most importantly also from a space perspective, states can be parties to (usually regional) free trade or economic integration agreements which allow preferential conditions to goods produced within the member states, thus discriminating against goods coming from third states.[91] The most 'famous' example is the European Union having developed out of the European (Economic) Community and its core foundational concept of the 'Common Market',[92] but other notable free trade areas concern the North American Free Trade Agreement (NAFTA),[93] the Latin American Mercosur/Mercosul,[94] the ASEAN Free Trade Area (AFTA),[95] the Common Market for Eastern and Central Southern Africa (COMESA),[96] the

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[88] See Annex on Article II Exemptions, GATS, *supra* n. 11; also e.g. Bhala, *supra* n. 1, 337–40; Senunas, *supra* n. 51, *sub* Multilateral Ideals in the GATS.

[89] See esp. Arts. XIV, XX, GATT 1947, *supra* n. 3.

[90] See Krajewski, *supra* n. 11, e.g. 331–2.

[91] *Cf.* Benedek, *supra* n. 2, 317; S. von Schorlemer, Telecommunications, International Regulation, in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IX (2012), 837–8.

[92] See further *supra*, § 4.3. Actually, the European Union is the only one among these organizations which has started (relatively recently) to become substantively involved in issues of outer space and space activities.

[93] North American Free Trade Agreement, San Antonio, done 17 December 1992, entered into force 1 January 1994; 32 ILM 289 (1993); see further http://en.wikipedia.org/wiki/North_American_Free_Trade_Agreement, last accessed 26 March 2014.

[94] Treaty Establishing a Common Market between the Argentine Republic, the Federal Republic of Brazil, the Republic of Paraguay and the Eastern Republic of Uruguay, Asunción, done 26 March 1991, entered into force 29 November 1991; 30 ILM 1042 (1991); see further http://en.wikipedia.org/wiki/Mercosur, last accessed 26 March 2014.

[95] Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area, Singapore, done 28 January 1992, entered into force 28 January 1992; 31 ILM 506 (1992); see further http://en.wikipedia.org/wiki/ASEAN_Free_Trade_Area, last accessed 26 March 2014.

[96] Agreement Establishing the Common Market for Eastern and Southern Africa (COMESA), Kampala, done 5 November 1993, entered into force 8

Southern African Development Community (SADC)[97] and the Gulf Cooperation Council (GCC).[98] Also several special regimes, being exempted from the general non-discrimination requirement of MFN, allow for preferential trade agreements with (groups of) developing states, often related to historical ties from the colonialist eras.[99]

More specific exemptions can be invoked when a state wishes to raise barriers against products that are considered to be traded unfairly from specific countries – called 'dumping';[100] when national security issues are at stake;[101] in cases of serious threats to economic survival of domestic producers;[102] or in cases of severe balance of payment problems.[103]

15.2.3 GATT, GATS, the WTO and Outer Space Activities and Applications

The international trade regime provided by GATT, GATS and WTO summarily sketched above is generally applicable to all sectors of the global economy, all goods and all services somehow brought within its scope, through Plurilateral Trade Agreements or Schedules of Concessions or Commitment. There is, thus, no inherent reason why space activities, as long as not of (purely or overwhelming) politico-military-strategic or scientific character, could not be subjected to this regime as well[104] – while it does, obviously, in the WTO framework require

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December 1994; 33 ILM 1067 (1994); see further http://en.wikipedia.org/wiki/Common_Market_for_Eastern_and_Southern_Africa, last accessed 26 March 2014.

[97] Treaty of the Southern African Development Community, Windhoek, done 17 August 1992, entered into force 30 September 1993; 32 ILM 116 (1993); see further http://en.wikipedia.org/wiki/Southern_African_Development_Community, last accessed 26 March 2014.

[98] As per the Charter establishing the Cooperation Council for the Arab States of the Gulf, Abu Dhabi, done 25 May 1981, entered into force 11 November 1981; 26 ILM 1131 (1987); see further http://en.wikipedia.org/wiki/Cooperation_Council_for_the_Arab_States_of_the_Gulf, last accessed 26 March 2014.

[99] See e.g. Benedek, *supra* n. 2, 318, on the GATT.

[100] *Cf.* also Art. VI, GATT 1947, *supra* n. 3.

[101] *Cf.* Art. XXI, GATT 1947, *supra* n. 3; also Stoll, *supra* n. 4, 980.

[102] *Cf.* Art. XIX, GATT 1947, *supra* n. 3.

[103] See Art. XII, GATT 1947, *supra* n. 3; also Stoll, *supra* n. 4, 980–1.

[104] *Cf.* again e.g. Venet, *supra* n. 13, 56 ff.; Walter, *supra* n. 13, 502–3.

political will to arrive at a specific agreement to so include (a particular sector of) space activities.

If economic size and international economic interdependency (of markets, consumers and producers, and traders) are the key criteria for becoming eligible for inclusion in the WTO's international trade framework regime, there would presently be at least four sectors of space activities and closely related space applications where such a case could be made (with a fifth possibly around the corner): launching, satellite communications, satellite remote sensing and satellite navigation, plus private commercial spaceflight. Yet, in only one of those has such an inclusion taken place to any fundamental extent: the satellite communication sector. For a full picture of how international trade regimes actually as well as potentially impact the space sector, however, it is still interesting to address all five space sectors mentioned above.

15.3 LAUNCH SERVICES: INTERNATIONAL TRADE REGIME ISSUES

15.3.1 The Commercialization of International Launch Services and the TCI Case

As evidenced by such key events as the establishment in 1980 of Arianespace in Europe, a private company mandated to market the Ariane launch vehicle and offer launch services on a commercial basis,[105] and the enunciation of the first version of the Commercial Space Launch Act in the United States in 1984,[106] in the late 1970s to early 1980s prospects arose for a global commercial market for launch services.[107]

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[105] As per the *Statuts de la Société Arianespace*, 26 March 1980; see further *supra*, § 4.2.6.1. *Cf.* also C. Baudin, A Brief History of the Ariane Programme and its Evolving Legal Infrastructure, 24 *Air & Space Law* (1999), 62–9; N. Horsley, The Arianespace Monopoly, EU Competition Law, and the Structure of Future European Launch Markets, 30 *Air & Space Law* (2005), 87 ff.; K. Iserland, Ten Years of Arianespace, 6 *Space Policy* (1990), 341–3.

[106] Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law – Basic Legal Documents*, E.III.3; see further *supra*, § 3.3.1.1; § 12.3.4.2.

[107] See in greater detail *supra*, § 7.5.4. Also e.g. R.W. Scott, The Challenge to Commercial Space Transportation in the 21st Century, 24 *Journal of Space Law* (1996), 152 ff.; J. Scarborough, Free Trade and the Commercial Launch Industry, 8 *Space Policy* (1992), 109–10; Venet, *supra* n. 13, 56–8, 64–5; Walter, *supra* n. 13, 496–9.

Almost immediately also a first dispute over fair trade in this area arose: the US private launch services provider Transpace Carriers Inc. (TCI) filed a complaint on 25 May 1984 against Arianespace, charging the latter of being grossly subsidized by the European Space Agency (ESA) and its member states.[108] Notably, all research and development costs for the Ariane vehicle were borne by the majority of ESA member states as these participated in the Ariane programme.[109]

Vigorous opposition on the side of the ESA delegation in the ensuing bilateral trade negotiations, backed by the Commission of the then-European Communities, forestalled the application of stringent US measures under Section 301 of the US Trade Act.[110] A major argument on the European side referred to the closure of the US governmental satellite market to anyone other than US launch service providers, providing US private operators with a captive market and a major anchor tenant.[111] Whilst there was a mirror-wise tendency on the side of the ESA member states to favour 'their' Ariane rocket for any launch of a European space object, contrary to the US case this was not legally mandatory – and the

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[108] See on this case e.g. extensively H.P. van Fenema, *The International Trade in Launch Services* (1999), 79–86; J. Krige, The Commercial Challenge to Arianespace: The TCI Affair, 15 *Space Policy* (1999), 87–94.

[109] The Ariane programme was an optional programme under Art. V(1)(b), Convention for the Establishment of a European Space Agency (ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; UKTS 1981 No. 30; Cmnd. 8200; 14 ILM 864 (1975); *Space Law – Basic Legal Documents*, C.I.1. See further on this *supra*, §§ 4.2.2–4.2.5; also e.g. Horsley, *supra* n. 105, 98–107; B.C. Lai, National Subsidies in the International Launch Market, 9 *Space Policy* (1993), 23–5.

[110] The US Trade Act, of 1974, as amended by the Trade Agreements Act of 1979; 19 U.S.C. 2411. Sec. 301, provides that the US President can 'take all appropriate and feasible action within his power' to enforce the rights of the United States under any trade agreement, or to respond to unreasonable or discriminatory trade practices harmful to the United States. See further Van Fenema, *supra* n. 108, 80–2; Krige, *supra* n. 108, 89–90; A. Hansson & S. McGuire, Commercial Space and International Trade Rules: An Assessment of the WTO's Influence on the Sector, 15 *Space Policy* (1999), 203–4.

[111] *Cf.* e.g. Horsley, *supra* n. 105, 99–100; Lai, *supra* n. 109, 19–23. Interestingly, in aircraft manufacturing a similar dispute raged – and remains essentially unsolved to this day: US manufacturers being protected by a strong 'Buy America' policy with the US government as exclusive anchor tenant; the sole European competitor a multi-national effort with many research and development costs defrayed by government subsidies.

size of the European governmental satellite market was considerably smaller than that of the US one at that.[112]

In the Memorandum of 17 July 1985 concluding this particular dispute, the US President acknowledged the arguments brought forward in defence by the European delegation. Yet, he reserved the right to 'approach other interested nations and reach an international understanding on guidelines for commercial satellite launch services at some point in the future'.[113] So, in spite of launch vehicles *inter alia* constituting the closest thing to rockets and missiles, and consequently security issues being very prominent and closely intertwined with more commercial ones,[114] the scene was set for approaching launch services as at least partly a commercial business, as compared to its traditional character as a government service.[115] With the WTO and the GATS yet to be established at the time, the services properly speaking could not even in theory benefit from the global liberalization efforts in those contexts, but the trade in launchers for the purpose of offering the services could – again, at least in theory – have been made subject to a GATT approach in conformity with the system discussed above, had key stakeholders been willing to so consider.

15.3.2 Towards an International Trade Regime in Launch Services?

As long as the only competitors were a few US and one European launch service providers, the general tensions referred to above could still be solved through bilateral negotiations between two, in terms of economic systems roughly comparable, economic powers. This, however, changed fundamentally when China's Great Wall Industrial Corporation (GWIC), established in 1980 as a government entity, started to offer its launch services to foreign satellite operators in 1985 and the Soviet Union fell apart a few years later, causing the heritage of the Soviet space

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[112] *Cf.* Van Fenema, *supra* n. 108, 289–97; also *supra*, § 7.5.3.

[113] Determination under Section 301 of the Trade Act of 1974, Memorandum for the U.S. Trade Representative of July 17, 1985; 50 Fed. Reg. 29631 (July 22, 1985); see also Van Fenema, *supra* n. 108, 82; Lai, *supra* n. 109, 25; Krige, *supra* n. 108, 92–4.

[114] *Cf.* also e.g. Venet, *supra* n. 13, 62–3; extensively H.R. Hertzfeld & R.L. Jones, International Aspects of Technology Controls, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 638–59.

[115] See e.g. Hansson & McGuire, *supra* n. 110, 200–3, on the role of governments, including the issue of subsidies.

programme, in particular in Russia and Ukraine, to start looking for global – read largely Western – clients to remain in business.[116]

In both cases, with financing and control structures of the (former) government operators being rather non-transparent and labour costs being considerably below Western standards, fears arose in the Western world that Chinese, Russian and Ukrainian launchers would undercut their global market shares by offering services at a much lower price.[117] As the United States controlled the satellite manufacturing industry, the major clients of the launch providers, and held the politico-economic power to that extent whereas its private launch providers were suffering more in this connection than Arianespace,[118] it took the first steps to provide 'rules of the road' for establishment of a somewhat level playing field in global launch services.

Noticeably – partly also because of the security aspects involved – the United States did *not* try to achieve a multilateral regime along the lines of what the GATS would achieve in 1994, but took an essentially bilateral approach. Thus resulted a small series of bilateral launch service agreements, whereby the US government used its competence to prohibit export for launching purposes of satellites with US-manufactured components – at the time usually considered indispensable for fruitful satellite operations – to enforce its ideas on the three entrants into the global marketplace with profound communist heritages.[119]

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[116] See e.g. L.F. Martinez, The Future Dimension of East-West Space Markets, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 2–9; H.P. van Fenema, Recent Parallel Developments in Aviation and Space Launch Regulation, 22-I *Annals of Air & Space Law* (1997), 365–7; Lai, *supra* n. 109, 25–9; on China, G. Pike, Chinese Launch Services: A User's Guide, 7 *Space Policy* (1991), 103–15; on Russia, J.L. Twigg, The Russian Space Programme: What Lies Ahead?, 10 *Space Policy* (1994), 19–31; V. Zaborskiy, Space Engagement with Russia and Ukraine: Preventing Conflicts and Proliferation, 4 *Astropolitics* (2006), 179 ff.

[117] See also Pike, *supra* n. 116, 111–2; Lai, *supra* n. 109, 17 ff.; Q. He, Legal Issues of China's Entry into International Space Market, 40 *Zeitschrift für Luft- und Weltraumrecht* (1991), 280–1; H.P. van Fenema, Cooperation and Competition in Space Transportation, in *The Highways of Air and Outer Space Over Asia* (Eds. C.J. Cheng & P.M.J. Mendes de Leon) (1992), 283 ff.

[118] This was partly because of Arianespace's success in capturing a 50–60% share of the world market in its first ten years of existence; see e.g. Iserland, *supra* n. 105, 341–3; H.P. van Fenema, Cooperation and Competition in Space Transportation, 19 *Air & Space Law* (1994), 81.

[119] See for a more extended analysis *supra*, § 7.5.4; also D.J. Burnett & D. Lihani, U.S. National Space Policy and Bilateral Launch Service Agreements, in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space* (1997),

The agreements with China (concluded in 1989,[120] renewed in 1995[121]), Russia (concluded in 1993,[122] amended in 1996[123]), and with Ukraine (concluded in 1996[124]) in general terms aimed at establishing what the United States considered a level playing field for international commercial launch services. Two limitations unilaterally imposed upon the three targeted states in particular stood out as reflecting such aims: the number of international commercial satellite launches (at least as far as satellites with US components were concerned) they were allowed to compete for (the 'quota') and the minimum prices they were allowed to ask for such services, somehow defined in relation to Western commercial prices.[125]

263–70; in great detail Van Fenema, *supra* n. 108, 183–301; further Van Fenema, *supra* n. 117, 285–90; F.G. von der Dunk, *Private Enterprise and Public Interest in the European 'Spacescape'* (1998), 78–84; C. Kohlhase & P.S. Makiol, Report of the 'Project 2001' Working Group on Launch and Associated Activities, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 83–4; Scott, *supra* n. 107, 153–4; R.S. Jakhu, Legal Issues Relating to the Global Public Interest in Outer Space, 32 *Journal of Space Law* (2006), 66–8; Pike, *supra* n. 116, 110–4.

[120] Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding International Trade in Commercial Launch Services, Washington, done 26 January 1989, entered into force 16 March 1989; 28 ILM 599 (1989).

[121] Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding the International Trade in Commercial Launch Services, done 27 January 1995, entered into force 13 March 1995; 1998 BDIEL AD LEXIS 12.

[122] Agreement between the Government of the United States of America and the Government of the Russian Federation regarding international trade in commercial space launch services, Washington, done 2 September 1993, entered into force 2 September 1993; Treaties in Force 1994, US Dept. of State.

[123] Agreement Between the Government of the United States of America and the Government of the Russian Federation to amend the 'Agreement Between the Government of the United States of America and the Government of the Russian Federation Regarding International Trade in Commercial Space Launch Services', Washington, done 30 January 1996, entered into force 30 January 1996; 24 *JSL* 183 (1996).

[124] Agreement Between the Government of the United States of America and the Government of Ukraine Regarding International Trade in Commercial Space Launch Services, done 21 February 1996, entered into force 21 February 1996; 24 *JSL* 187 (1996).

[125] See also D.J. Burnett & F.O. Schroeder, Development in US Bilateral Launch Service Agreements, 19 *Air & Space Law* (1994), 326–7; von der Dunk,

From a GATS perspective, such an approach of quantitative limits and quotas is contrary to the normal approach, although GATS NT obligations and market access commitments (as giving rise *inter alia* to bans on quantitative limits) only apply to the extent the sector is listed in a state's GATS Schedule and only to the extent no limits or exceptions are included in that state's Schedule.[126]

The unilateral character of these agreements notwithstanding, the result of an embryonic global trade regime in launch services – in the place, as it were, of any GATS/WTO-oriented approach – continued to shimmer through. At the time, the United States explained the agreements with China and Russia as part of an effort to establish a multilateral fair trade agreement in which it also wanted to include Europe.[127] Even more tellingly, while Europe essentially had stood at the side lines when the trade agreements were negotiated and had never reached similar agreements itself,[128] Arianespace in 1990 accused GWIC of dumping its launch services on the market, basing this accusation upon a perceived violation of the United States–China agreement of 1989, an agreement to which it was not a party – which is a rather peculiar construction under international law.[129]

15.3.3 A Role for the GATS/WTO in the Global Launch Services Markets?

Conclusion of the WTO Agreement and the GATS in the mid-1990s thus took place also in the middle of the era in which the United States, closely watched and sometimes followed by Europe, tried to introduce some general free trade principles into the international launch services markets. Theoretically at least, rather than renewing the bilateral agreements with China and Russia and adding one with Ukraine, efforts could have been undertaken to arrive at an annex to the GATS concerning launch services, causing such principles as transparency or the baseline

supra n. 119, 78 ff.; Van Fenema, *supra* n. 118, 85–6; Scott, *supra* n. 107, 154; Lai, *supra* n. 109, 25–9; Zaborskiy, *supra* n. 116, 182–4; also *supra*, § 7.5.4.

126 *Cf.* Arts. XVI(1), XVII(1), GATS, *supra* n. 11.

127 *Cf.* Van Fenema, *supra* n. 118, 86. See also Martinez, *supra* n. 116, 6–7.

128 In June 1993 the Commission negotiated an agreement with Russia which included a quota of seven geostationary launches and four LEO launches through to the year 2000, coupled with some further requirements, but this agreement never entered into force. See e.g. Scott, *supra* n. 107, 155.

129 See Van Fenema, *supra* n. 118, 87; *cf.* also Van Fenema, *supra* n. 117, 290–1; Lai, *supra* n. 109, 27.

ban on state subsidies to become applicable (the prohibition on dumping, by contrast, would only apply in the GATT context).[130] However, for several profound reasons that was indeed to remain theory.

Firstly, with a growing global market for satellite launches and increasing East–West cooperation in commercial launch operations by and large the political need to maintain or expand such an international trade regime essentially dissipated – and indeed the bilateral agreements were not renewed in the early 2000s. A Sea Launch consortium now combined US, Russian, Ukrainian and Norwegian companies;[131] Starsem similarly was established as a joint venture of French/European and Russian operators;[132] the German company Eurockot started converting the 'swords' of Russian SS-19 missiles into the 'ploughshares' of launch vehicles;[133] Lockheed Martin combined forces with Energia and Khrunichev through International Launch Services (ILS);[134] and the Lockheed Martin Intersputnik (LMI) joint venture even brought together a US company and a Russian-dominated intergovernmental organization under a single corporate roof.[135]

Nevertheless, the question in theory remains and in practice might come back on the table as more countries become involved in offering

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130 *Cf.* e.g. Hansson & McGuire, *supra* n. 110, 201–3.

131 See http://en.wikipedia.org/wiki/Sea_Launch, last accessed 26 March 2014; also e.g. A. Kerrest de Rozavel, The Launch of Spacecraft from the Sea, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (1997), 217–33; E.A. Frankle & E.J. Steptoe, Legal Considerations Affecting Commercial Space Launches From International Territory, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 300–2; Kohlhase & Makiol, *supra* n. 119, 67–8; Scott, *supra* n. 107, 156; L. Bzhilianskaya, Russian Launch Vehicles on the World Market: A Case-Study of International Joint Ventures, 13 *Space Policy* (1997), 329–31; Zaborskiy, *supra* n. 116, 191–2.

132 See http://en.wikipedia.org/wiki/Starsem, last accessed 26 March 2014; also Kohlhase & Makiol, *supra* n. 119, 65–6; Bzhilianskaya, *supra* n. 131, 327–9, 334–6.

133 See http://en.wikipedia.org/wiki/Eurockot_Launch_Services, last accessed 26 March 2014; also e.g. Bzhilianskaya, *supra* n. 131, 331–2.

134 See http://en.wikipedia.org/wiki/International_Launch_Services, last accessed 26 March 2014; also e.g. Scott, *supra* n. 107, 155; Bzhilianskaya, *supra* n. 131, 326–7, 335–6; Zaborskiy, *supra* n. 116, 197.

135 *Cf.* http://en.wikipedia.org/wiki/Intersputnik, last accessed 26 March 2014; also e.g. V.S. Veschunov, Lockheed Martin Intersputnik (LMI) as a Form of Commercialization in the Activity of the Intergovernmental Satellite Organization, in *Proceedings of the Forty-Second Colloquium on the Law of Outer Space* (2000), 218–23.

launch services on the global market (India, Japan, Brazil, South Korea and others[136]) and in particular as more truly private operators become active: could, should and/or would this sector have to be regulated under GATS/WTO principles such as expounded above, and what would or should the parameters be?

Secondly, however – and more profoundly – the inherent and inescapable security-related aspects of all launch activities continue to present a formidable obstacle to serious consideration of using the WTO and GATS regime for achieving a truly 'liberalized', truly 'commercial' market. The exceptions regarding security already available in a more standard GATS context[137] would effectively come to provide the baseline rule rather than the exception, if ever the GATS regime were to be applied to launch services as these are being offered today.

Thus, at present it does not seem likely that such a fundamental change in the launching landscape will take place any time soon – that might well require a multi-player and much more truly privatized environment, perhaps only once private spaceflight has truly arrived at the level of routine of international aviation. Still, once that would occur, the main GATS/WTO principles and concepts would be the closest to internationally agreed trade and commerce principles available, and would likely provide the point of departure, or at least point of reference, for any such future regime.

15.4 THE INTERNATIONAL TRADE REGIME FOR SATELLITE COMMUNICATIONS

15.4.1 The Commercialization of Telecommunications and Satellite Communications

With the general paradigm change in the late 1980s and early 1990s of telecommunications at large becoming a commercial sector best run by private operators instead of a public service typically for governments to provide,[138] satellite communications also increasingly became subject to

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[136] *Cf.* e.g. Venet, *supra* n. 13, 65; Van Fenema, *supra* n. 108, 6–23; further *supra*, § 7.2.1.

[137] *Cf.* e.g. Art. I(3)(b) & (c), GATS, *supra* n. 11.

[138] See McCormick, *supra* n. 13, 1–14; J.N. Pelton, The Economic and Social Benefits of Space Communication, 6 *Space Policy* (1990), 311–22; S. Ospina, International Satellite Telecommunications: Regulation by States or by Private Parties?, 25 *Air & Space Law* (2000), 273–80; Hansson & McGuire,

pressure to liberalize the market environment and privatize formerly governmental satellite operators. This was evidenced by such developments as the appearance on the scene of major private satellite communication service providers,[139] the pressure to privatize the international satellite operators,[140] and the domestic liberalization of markets and privatization of operators, such as in Europe as per the 1994 Satellite Directive[141] and in the United States ultimately as per the 2000 ORBIT Act.[142]

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supra n. 110, 199; R. Bender, *Launching and Operating Satellites* (1998), 105–50; Salin, *supra* n. 17, e.g. 9–10; S. Courteix, International Legal Aspects of Television Broadcasting by Satellite, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 102; R.S. Jakhu, International Regulation of Satellite Telecommunications, in *Legal Aspects of Space Commercialization* (Ed. K. Tatsuzawa) (1992), 97–8; Jakhu, *supra* n. 119, 69–72; Venet, *supra* n. 13, 56 ff., esp. 66–7; Walter, *supra* n. 13, 494–6.

[139] See e.g. Salin, *supra* n. 17, 208–22, 374–6; P.A. Salin, An Illustration of the Privatization Process of Outer Space, 50 *Zeitschrift für Luft- und Weltraumrecht* (2001), 220–2; S. Ospina, International Satellite Telecommunications: An Assessment of Their Past and Future, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 283 ff.

[140] See e.g. McCormick, *supra* n. 13, 9–25; Mechanick, *supra* n. 13, 175–81; U.M. Bohlmann, K.U. Schrogl & I. Zilioli, Report of the 'Project 2001' Working Group on Telecommunication, in *'Project 2001' – Legal Framework for the Commercial Use of Outer Space* (Ed. K.H. Böckstiegel) (2002), 216–20; J.N. Pelton, Organizing Large Space Activities, 8 *Space Policy* (1992), 239 ff.; D. Wright, Changing the Guard at the ISOs, 10 *Space Policy* (1994), 107–14; Salin, *supra* n. 139, 218–32; Ospina, *supra* n. 139, 295–300; S. Ospina, International Satellite Organizations: Their Evolution from 'ISOS' to 'GSCS', in *Proceedings of the International Institute of Space Law 2010* (2011), 338 ff.; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 337–43, 349–55, 360–4, 368–75; also Salin, *supra* n. 17, 101 ff.; D. Sagar, Mobile Satellite Communications: Challenging the Regulatory Barriers, 25 *Journal of Space Law* (1997), 150–5.

[141] Commission Directive amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications (Satellite Directive), 94/46/EC, of 13 October 1994; OJ L 268/15 (1994). See further e.g. S. Le Goueff, Satellite Services Licensing in the European Union, 25 *Space Policy* (1997), 40–4; S. White, S. Bate & T. Johnson, *Satellite Communications in Europe: Law and Regulation* (1996), 166 ff.; Salin, *supra* n. 17, 353–4; Bender, *supra* n. 138, 142–4; also *supra*, § 4.3.2.2.

[142] Open-market Reorganization for the Betterment of International Telecommunications Act (ORBIT Act), Public Law 106-180, 106th Congress, 17 March 2000. See further e.g. Walden, *supra* n. 35, 723–4; Ospina, *supra* n. 139, 292–5; Lyall & Larsen, *supra* n. 140, 341–2, 351.

15.4.2 The GATS Baseline Regime on International Satellite Communication Services

These developments also gave rise to the establishment of a global trade framework regime for the provision of telecommunication services, following the recent establishment of the GATS as one of the sectorial regimes of the latter.[143] The GATS Annex on Telecommunications, which entered into force concurrently with the GATS itself, already provided for some baseline obligations concerning transparency, general access to infrastructure and markets, and public service-related conditions – without, however, as yet applying the key principles of MFN and/or NT in that context and thereby actually liberalizing those markets, as that was made dependent on actual Schedules of Commitment.[144]

Within a few years, however, 54 WTO member states plus the European Commission on behalf of the then-15 EU member states[145] came to a more substantive agreement to liberalize the global markets for basic telecommunication services. For the purpose of efficiency and coherence, telecommunication services were classified in 15 categories; and although that classification has been criticized as imperfect,[146] it unequivocally included several categories of satellite communication services. At the time, these 69 states together accounted for more than 90 per cent of global telecommunications revenues.[147]

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[143] See P. Malanczuk, The Relevance of International Economic Law and the World Trade Organization (WTO) for Commercial Outer Space Activities, in *International Organisations and Space Law* (Ed. R.A. Harris) (1999), 305 ff.; S. McGuire & A. Hansson, Regulating Commercial Space: Is the WTO the Answer?, 16 *Space Policy* (2000), 8–9; Krajewski, *supra* n. 11, 330; Walden, *supra* n. 35, 747 ff.; S. Lessard, International Trade in Telecommunications Services: Towards Open Markets, 22-I *Annals of Air & Space Law* (1997), 405–7; Bhala & Kennedy, *supra* n. 3, 1289 ff.; Bender, *supra* n. 138, 147–9.

[144] GATS Annex on Telecommunications, www.wto.org/english/docs_e/legal_e/26-gats_02_e.htm#anntel, last accessed 26 March 2014. See further Von Schorlemer, *supra* n. 91, 830–1; Bhala & Kennedy, *supra* n. 3, 1292–4; Walden, *supra* n. 35, 750; Salin, *supra* n. 17, 72–4; Malanczuk, *supra* n. 143, 312–3.

[145] See on the EU membership of the WTO in conjunction with its own member states e.g. Van den Bossche, *supra* n. 27, 23 ff.; M. Hilf, Negotiating and Implementing the Uruguay Round: The Role of EC Member States – The Case of Germany, in *Implementing the Uruguay Round* (Eds. J.H. Jackson & A.O. Sykes) (1997), 121 ff.

[146] See Von Schorlemer, *supra* n. 91, 828–9.

[147] See P. Malanczuk & H. de Vlaam, International Trade in Telecommunications Services and the Results of the Uruguay Round of GATT, in *The Future*

The agreement to liberalize international telecommunication markets, often referred to as the 'Agreement on Basic Telecommunications' or 'Agreement on Basic Telecommunication Services', formally comprised the Fourth Protocol to the GATS[148] plus the required individual Schedules of Specific Commitments and a list of exemptions from Article II of the GATS.[149]

To date, the number of WTO members having made such commitments in their Schedules to allow international trade in telecommunication services within their territories has risen to 108.[150] In addition, 82 WTO member states have now committed to the regulatory principles of the WTO Reference Paper of 24 April 1996,[151] the policy paper which provided a major impetus to the establishment of the Fourth Protocol and the attendant Schedules of Commitments.[152]

By way of the Fourth Protocol to the GATS these states agreed that

> a Schedule of Specific Commitments and a List of Exemptions from Article II concerning basic telecommunications annexed to this Protocol relating to a Member shall, in accordance with the terms specified therein, supplement or modify the Schedule of Specific Commitments and the List of Article II Exemptions of that Member.[153]

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of EC Telecommunications Law (Eds. C. Scott & O. Audéoud) (1996), 154; L.B. Sherman, Introductory Note, in 36 *International Legal Materials* (1997), 354.

148 Fourth Protocol to the General Agreement on Trade and Services of 15 April 1994 (hereafter Fourth Protocol to the GATS), Geneva, done 15 April 1997, entered into force 5 February 1998; WTO Doc. S/L/20 of 30 April 1996 (96-1750); 2061 UNTS 209; ATS 1998 No. 9; 33 ILM 1167 (1994); 36 ILM 354 (1997). Quickly, the 69 governments were augmented by some nine further ones, raising the percentage of global revenues in telecommunications covered under the Fourth Protocol to slightly over 92. See Von Schorlemer, *supra* n. 91, 832–3; Bhala & Kennedy, *supra* n. 3, 1296–300; Walden, *supra* n. 35, 750–4; also Salin, *supra* n. 17, 81–4, 465–6; Bohlmann, Schrogl & Zilioli, *supra* n. 140, 220–1; McGuire & Hansson, *supra* n. 143, 9.

149 See Von Schorlemer, *supra* n. 91, 831–2.

150 See www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_e.htm, last accessed 26 March 2014.

151 Telecommunications Services; Reference Paper, Negotiating group on basic telecommunications, 24 April 1996; at www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm, last accessed 26 March 2014.

152 See e.g. Cowhey & Klimenko, *supra* n. 39, 7–8; Von Schorlemer, *supra* n. 91, 831–2.

153 Art. 1, Fourth Protocol to the GATS, *supra* n. 148.

This major effort at liberalization was hailed as a triumph, with the services covered extending to almost every sector of the telecommunications sector, and liberalization enforced 'not only in cross-border supply of telecommunications, but also [allowing] for services to be provided through the establishment of foreign firms, or commercial presence in foreign countries, including "the ability to own and operate independent telecom network infrastructure"'.[154] Thus, '[t]his agreement combined binding commitments on market access from its participants with a statement of "procompetitive regulatory principles" that have rapidly become the definition of the policy revolution under way in this market'.[155]

15.4.3 The Schedules of Specific Commitments and Satellite Communications

In terms of satellite communications, the Schedules of Specific Commitments thus provided the substance of the liberalization achieved. In sum, 51 states (by way of 37 Schedules) committed themselves to allow foreign operators to offer some or all types of mobile satellite services or the related transport capacity in their national markets, while 50 states (by way of 36 Schedules) did so with respect to fixed satellite services or the transport capacity involved therein.[156]

The Schedules of Commitments were generally structured by way of a matrix, with horizontal rows also encompassing other communication services but 'Telecommunication Services' (Category 2.C) being the relevant category here. Within Category 2.C a range of services are further distinguished, of which for example, 'public voice telephone services' under (a) may also implicitly involve satellite communications whilst – if applicable – specific arrangements on, or explicit mentioning

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[154] Senunas, *supra* n. 51, *sub* Introduction, *i.a.* quoting Background Document, The WTO Negotiations on Basic Telecommunications, of 17 February 1997.

[155] Cowhey & Klimenko, *supra* n. 39, 3.

[156] See Senunas, *supra* n. 51, *sub* The Success of the Agreement On Basic Telecommunications, referring to The WTO Negotiations on Basic Telecommunications: Informal Summary of Commitments and MFN Exemptions, of 6 March 1997, at 1. Note that the then-15 EU member states offered a joint Schedule of Commitments courtesy of the European Commission. *Cf.* also e.g. Malanczuk, *supra* n. 143, 314.

of satellite services could be found either within specific boxes, or as a subset of 'other services' under (o).[157]

The vertical columns of the matrix in turn, for each of the sectors and subsectors as described above, refer to limitations on market access and limitations on NT, as reflecting the main GATS principles applied here,[158] plus additional comments and notes as appropriate. Within each 'box' of the matrix then the relevant commitments are set out, subdivided into the four generic modes of international service provision that the GATS recognizes; cross-border supply, consumption abroad, commercial presence and presence of natural persons.[159] Finally, horizontal commitments – that is, applicable not just to the communications sector, but to all service sectors falling within the scope of the GATS – are referenced; they pertain to such general aspects of appropriate corporate behaviour and respect for local, sub-national or national law and regulations applicable to economic operations and service provision on a broad range of subjects.[160]

Without in any way attempting to provide a comprehensive overview and analysis of these commitments, the following survey should provide a clear understanding of the variety and complexity of the liberalization process resulting from the Fourth Protocol to the GATS and the attendant Schedules of Specific Commitments – noting moreover that in many instances satellite services are not referenced explicitly but somehow (partly or wholly) subsumed in other categories.[161]

Within the European Union, liberalization was quite comprehensive as far as basic telecommunication services, including satellite services and other services using those satellite networks, were concerned. 'Domestic and international services … using any network technology' can be provided without any limitations as such by non-EU service providers, and this includes mobile and personal communication services and

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157 See individual Schedules accessible via http://i-tip.wto.org/services/ComparativeReports.aspx, last accessed 26 March 2014; choose '2 COMMUNICATION SERVICES' under 'Select a sector'.

158 Note that the MFN principle is by definition applied under the GATS, unless specifically exempted; *cf. supra*, § 15.2.2.1, § 15.2.2.4.

159 *Cf.* also *supra*, § 15.2.1.4.

160 *Cf.* these horizontal commitments as accessible through http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157.

161 This survey is based on Senunas, *supra* n. 51, *sub* Region-by-Region Analysis. For a full overview of the individual schedules of commitment in the telecommunications realm, see Member/Sector Matrix Report, 2 COMMUNICATION SERVICES, see *supra* n. 157; and www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_commit_exempt_list_e.htm, last accessed 26 March 2014.

systems. Even the major restrictions pertaining to allowable maxima of foreign equity in EU member states such as Spain, Belgium, France and Portugal have meanwhile been removed.[162]

The United States maintained the exclusivity of uplink rights of Comsat with respect to the INTELSAT and INMARSAT satellite infrastructure,[163] and listed an indefinite MFN exemption for one-way satellite transmission services, but otherwise allowed for a rather broadly liberalized access to US markets for foreign satellite service providers for all basic telecommunication services, including those that are satellite-based. Foreign equity in national common carriers meanwhile remains limited to 20 per cent of direct ownership.[164]

Canada within a few years after the entry into force of the Fourth Protocol to the GATS did away with the exclusive rights of Telesat on the use of satellite facilities and ground stations serving them, as well as derestricting all mobile and international fixed satellite services. Thus, for example the erstwhile requirement that Canadian equity in mobile satellite systems was to equal the levels of usage in Canada of such systems was now removed.[165]

Australia conditioned satellite service provision in a number of areas upon the use of state-owned satellite facilities for international traffic purposes, thus maintaining direct government control over such activities, but otherwise allowed for unrestricted competition in virtually all basic telecom services including personal communication services, with no limits on foreign equity for new carriers and a limitation to just two primary suppliers in the satellite service sector being removed.[166]

The Russian Federation committed to phasing out its restrictions on satellite services provided by foreign satellite operators to any juridical person of the Russian Federation, first with respect to fixed satellite services, a few years later also with respect to other satellite services.

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162 As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157.

163 See on those international satellite operators *supra*, §§ 5.4, 5.5.

164 As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157.

165 As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, last accessed 26 March 2014.

166 As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

Restrictions on maximum foreign equity in operators within Russia were also duly phased out.[167]

Japan did not single out satellite services anywhere in its Schedule of Commitments, so that these commitments apply across all telecommunication subsectors including as relevant satellite communications. They allow for open market access in all basic telecom services; the existing major companies KDD and NTT henceforth the only ones being limited to a maximum of 20 per cent foreign equity, whereas all their board members must have Japanese nationality.[168]

The People's Republic of China presented an interesting case as it had not yet become a member of the WTO at the time of the discussions on the Fourth Protocol to the GATS and the individual Schedules of Specific Commitments. Thus, its commitments – such as allowing foreign service providers in areas relevant from a satellite perspective into the Chinese market only through joint ventures with Chinese operators – were all made contingent upon its pending membership, usually aiming for applicability within a few years of China's formal entry into the WTO.[169]

India, by contrast, was a member of the WTO already at the establishment of the organization. Also India did not make any specific reference to satellite communications, to which therefore the same regime applies under its commitments as applies to non-satellite telecommunications. These commitments have meanwhile resulted in opening up all national long-distance and international services within India to foreign competition, although competitors to the national governmental operator are to be licensed only as economic need for them arises. In addition, some restrictions to foreign equity participation continue to apply.[170]

Indonesia likewise did not make specific reference to satellites, but more generally committed itself to phase out the exclusivity for international telecommunication services, long-distance domestic services and even local services – in that chronological order, the category last mentioned by 2011. International traffic, however, is required to use the

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[167] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157.

[168] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157.

[169] *Cf.* http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157. China's membership eventually was formalized on 11 December 2001; see http://en.wikipedia.org/wiki/World_Trade_Organization_accession_and_membership, last accessed 26 March 2014.

[170] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

networks of one of the two incumbent Indonesian satellite service operators, PT Indosat and PT Satelindo. Foreign equity in any operators servicing the Indonesian market is limited to 35 per cent, except for personal communication services, which require a joint venture with a state-owned company.[171]

Interestingly (as developing countries are usually somewhat wary of allowing developed-world technology and services into their territories without certain guarantees that the domestic economies will also benefit and hence generally imposing certain constraints on free competition and trade), Nigeria has no limitations as regards any foreign service provision in the telecommunications sector *largo sensu* – except that under the horizontal commitments foreign service providers are to incorporate or establish their business locally in accordance with relevant provisions of Nigerian law.[172]

South Africa committed itself to end the existing monopoly in a number of telecommunication services including satellite-based services and to aim at introduction of alternative suppliers to the incumbent ones, whereby the provision of cross-border services requires using the networks of either of the two suppliers henceforth admitted in that subsector. Foreign equity in satellite service providers active in South Africa however remains limited to 30 per cent.[173]

Argentina offered a range of commitments on opening up the basic telecommunication service sectors, including international and mobile, for competition, differentiating essentially only time-wise between voice telephony and other basic services. However, it exempted the supply of fixed satellite services by geostationary satellites from its MFN obligations.[174]

In Brazil competition was henceforth allowed in satellite services, subject to the requirement that satellites with orbital positions notified and registered by Brazil following the relevant ITU obligations must be

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[171] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

[172] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

[173] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

[174] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

used unless their services were not equivalent to those of satellites notified and registered by other states. Existing foreign equity limits of 49 per cent on satellite services were to be phased out as early as 1999; and a further commitment was made to full competition in many value-added services including satellite-related ones.[175]

Mexico finally, a Latin American country closely intertwined economically with the United States and Canada through NAFTA,[176] committed itself to gradually liberalize the telecommunications environment, for example raising the foreign equity maximum from 40 per cent to 49 per cent and ending regional duopolies in cellular telephony. In the satellite area, however, some restrictions remained; services other than international long-distance requiring the use of satellites were to use Mexican satellites until 2000, satellite broadcast transmissions were specifically excluded, whereas Telecomm held the exclusive rights to access to the INTELSAT and INMARSAT space segments (until those two organizations were privatized less than a decade later[177]).[178]

15.4.4 The Role of the GATS/WTO in the Global Satellite Communications Markets

In sum, over the past decades within the framework established by the GATS and WTO regimes a largely liberalized international trade environment for satellite services has evolved encompassing the largest economies of the world, including leading developing nations. At the same time, the above summary testifies to a somewhat haphazard process leaving many individual idiosyncrasies intact, due to the Specific Schedules of Commitments and the fact that generally four modes of foreign service provision are at issue.

Sometimes satellite communications are implicitly included in all or most of such commitments to liberalize foreign access to national markets, as per the MFN and NT principles, sometimes they are expressly singled out. In the latter case, moreover, they are often subject to specific but varying limitations concerning foreign equity in terms of

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[175] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

[176] See also *supra*, § 15.2.2.4, incl. n. 93.

[177] See further *supra*, §§ 5.4.2, 5.5.2.

[178] As per http://i-tip.wto.org/services/ComparativeReports.aspx, *supra* n. 157; www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_highlights_commit_exempt_e.htm, *supra* n. 165.

commercial presence or obligatory use of national operators and/or facilities. In many cases, therefore, only extended investigation and close inspection and analysis of the relevant commitment in the light of general GATS obligations allow for a final determination of the actual legal situation concerning the rights of foreign satellite service providers to a certain national market.

The situation is further complicated by the role which the ITU regime, dealing with the key assets of frequencies and orbital slots or orbits,[179] plays in underpinning an international legal framework for satellite communications. Here, the considerable leeway for sovereign states to control the use of these assets within their jurisdiction for security or other public (policy) reasons may interfere with (and would sometimes be abused for those purposes) an otherwise existing level playing field.

Specifically from a space perspective, furthermore, the involvement of at least a minimum of satellite communications in other quasi- or proto-commercial space sectors raises the issue of the extent to which such other sectors would currently or could in the future be subsumed under this generic GATS/WTO approach to satellite communications. This notably concerns satellite remote sensing and satellite navigation, and to a more limited extent private commercial spaceflight – which brings analysis to those specific sectors of space activities, as (prospective) candidates for an international trade regime.

15.5 PROSPECTIVE CANDIDATES FOR APPLICATION OF THE GATS/WTO REGIME?

15.5.1 The Commercialization of Space Activities and Major Space Applications

As seen, satellite communications and launch services so far constitute the two sectors of space activities and applications where discussions on an international regime for trade in services have reached a substantial level of practicality. It may be noted that most goods themselves – such as telecommunications equipment – are already subject to GATT commitments, so the real question is indeed whether services could become covered by the GATS. Interestingly, again GATS NT and market access commitments only apply to sectors listed in a country's Schedule and only to the extent of any limitations quoted in such a schedule; in

179 See further *supra*, §§ 8.2.3, 8.2.4.

contrast GATT NT and anti-quota obligations apply to all goods whereas tariff limitations are done via scheduling.[180]

In the one case those discussions gave rise to inclusion of the sector in the GATS/WTO regime, in the other to a more limited plurilateral regime, which, moreover, lasted for a dozen or so years only. In addition, however, three more such sectors deserve attention from the same perspective, as a substantial measure of commercialization and privatization has also taken place and is about to take place in those sectors: satellite remote sensing,[181] satellite navigation[182] and private commercial spaceflight[183] – the latter in some ways an extension of launch services, in others differing rather fundamentally therefrom so as to warrant separate treatment also at this point.

15.5.2 Towards an International Trade Regime for Satellite Remote Sensing?

15.5.2.1 Commercialization and privatization of satellite remote sensing

For a proper understanding of possible application of any part of the GATS/WTO regime to satellite remote sensing, it is firstly important to understand the level and character of commercial and private development in this sector of space activities – which was, like any other space activity, originally very much a government endeavour with overriding security- and other public interest-related overtones. Nevertheless, in the 1980s it was perceived that sufficient down-to-earth applications of satellite data were developing for gradually ushering in commercialization and privatization in this field.[184]

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[180] See further *supra*, § 15.2.2.

[181] See in general on satellite remote sensing *supra*, Chapter 9.

[182] See in general on satellite navigation *supra*, Chapter 10.

[183] See in general on private commercial spaceflight *supra*, Chapter 12.

[184] *Cf.* e.g. L.J. Levy & S.B. Chodakewitz, The Commercialization of Satellite Imagery, 6 *Space Policy* (1990), 209–20; G. Harris, Global Remote Sensing Programmes, Global Science, Global Change, 9 *Space Policy* (1993), 129–32; R. Mansell & S. Paltridge, The Earth Observation Market: Industrial Dynamics and Their Impact on Data Policy, 9 *Space Policy* (1993), 286–91; J.I. Gabrynowicz, The Promise and Problems of the Land Remote Sensing Policy Act of 1992, 9 *Space Policy* (1993), 319–24; Hansson & McGuire, *supra* n. 110, 199; Walter, *supra* n. 13, 495–6.

In the United States, the establishment of the 1984 Land Remote-Sensing Commercialization Act[185] presumed that non-military US government needs for remote sensing data could soon be provided by (a) private operator(s),[186] more generally established a licensing system for licensing private commercial satellite remote sensing operators,[187] and awarded EOSAT a licence the next year as the first private downstream commercialization company to market and sell the Landsat data.[188] The assumption was that gradually EOSAT and prospective other private operators would be able to finance more and more parts of the entire chain of satellite remote sensing, which ran from developing the satellite itself to the marketing and sales of data and services to be provided thereby.

Along similar lines, in Europe the private company SpotImage was incorporated under French law in 1982 and established in Toulouse to market and sell the remote sensing data collected by the SPOT satellites, which at the time had yet to be launched by the French government, with

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[185] Land Remote-Sensing Commercialization Act, Public Law 98-365, 98th Congress, H.R. 5155, 17 July 1984; 98 Stat. 451; *Space Law – Basic Legal Documents*, E.III.4. See also *supra*, § 9.4.2.3.

[186] *Cf.* Secs. 101(6), (8)–(12), 102(1), Land Remote-Sensing Commercialization Act, *supra* n. 185; also M. Bourbonnière, A Critical Review of American Regulations Pertaining to Commercial Remote Sensing Market Structures, in 22-I *Annals of Air & Space Law* (1997), 480; S. Johnston & J. Cordes, Public Good or Commercial Opportunity? Case Studies in Remote Sensing Commercialization, 19 *Space Policy* (2003), 23–6; Lyall & Larsen, *supra* n. 140, 437–8; S. Parisien, La commercialisation des activités de teledetection spatiale aux États-Unis, in 20-II *Annals of Air & Space Law* (1995), 243 ff.

[187] *Cf.* Secs. 401, 402, Land Remote-Sensing Commercialization Act, *supra* n. 185; also e.g. Bourbonnière, *supra* n. 186, 461 ff.; M.A. Roberts, US Remote Sensing Data from Earth Observation – Law, Policy and Practice, 22 *Air & Space Law* (1997), 37 ff.; P.A. Salin, The Land Remote Sensing Policy Act of 1992, 42 *Zeitschrift für Luft- und Weltraumrecht* (1993), esp. 265–8; Lyall & Larsen, *supra* n. 140, 438–42.

[188] See e.g. Johnston & Cordes, *supra* n. 186, 23–6; S. Zenker, Vertical Integration in the Earth Observation Market Place, in *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 81; E. Sadeh, Politics and Regulation of Earth Observation Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 448–9; P.A. Salin, LANDSAT Contracts Signed by US Agencies with Foreign Ground Stations: Commercial Remote-Sensing from NASA Scientific Experiments to EOSAT Private Endeavours, 41 *Zeitschrift für Luft- und Weltraumrecht* (1992), 169–73; Gabrynowicz, 320–1; M. Bourély, Space Commercialization and the Law, 4 *Space Policy* (1988), 140–1. *Cf.* further *supra*, § 9.4.2.3.

some involvement of a few other European governments.[189] SpotImage collected the revenues from the foreign receiving stations involved in SPOT operations, and operates the primary ground station of Toulouse itself (and, through SSC Satellitbild, another in Kiruna) and processes and markets the data received there.[190] SpotImage was bestowed with a monopoly in terms of marketing and selling SPOT data on the open market, and in order to broaden its portfolio, also increasingly became involved in acting as retailer for the data generated by other remote sensing satellite systems.[191]

However, the gradual upstream coverage of operating costs which was hoped for, to be funded by increasing revenues from increasing commercial markets, never materialized to the extent originally envisaged.[192] SpotImage, while gradually able to at least contribute to some of those upstream costs, remains crucially dependent upon the French government for developing, launching and operating the satellites, including financially, whereas in the United States EOSAT eventually folded and the 1992 Land Remote Sensing Policy Act[193] had to ensure that in the absence of private licensees the US government would not be stuck without necessary satellite data.

Only following the more recent advent of private companies offering very high-resolution data could a revival of more substantial commercial interest in satellite remote sensing data be discerned, albeit that the consolidation of various operators into now one – Digital Globe – and the key role of the US government as anchor tenant continues to pose serious

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189 See e.g. P. Achilleas, French Remote Sensing Law, 34 *Journal of Space Law* (2008), 1–6; P.L. Meredith & G.S. Robinson, *Space Law: A Case Study for the Practitioner* (1992), 26; M. Harr & R. Kohli, *Commercial Utilization of Space* (1990), 39–41. SpotImage was created as a '*Groupement d'Intérêt Economique*' (GIE), subsidiary to CNES.

190 See e.g. Harr & Kohli, *supra* n. 189, 40.

191 See e.g. Zenker, *supra* n. 188, 81 ff.; M. Bourély, Legal Problems Posed by the Commercialization of Data Collected by the European Remote Sensing Satellite ERS-1, 16 *Journal of Space Law* (1988), 130, 145; Bourély, *supra* n. 188, 141; further D. Rosenholm & R. Harris, Structural Analysis of the Competitive Environment of the Earth Observation Industry, in *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 67 ff.; von der Dunk, *supra* n. 119, 215–7. *Cf.* also *supra*, § 9.4.2.6.

192 *Cf.* e.g. L.R. Shaffer & P. Backlund, Towards a Coherent Remote Sensing Data Policy, 6 *Space Policy* (1990), 48–9; Salin, *supra* n. 187, 269.

193 Land Remote Sensing Policy Act, Public Law 102-555, 102nd Congress, H.R. 6133, 28 October 1992; 15 U.S.C. 5601; 106 Stat. 4163. See also *supra*, § 9.4.2.3.

questions regarding the viability of a truly private and commercial market in this area.[194]

15.5.2.2 Applying the GATT/GATS/WTO regime to satellite remote sensing: The issues

Satellite remote sensing obviously presents a global environment. The satellites concerned, normally not using the geostationary orbit with its fixed positions above the equator but lower orbits allowing the generation of more detailed sensing data, usually cover all or at least major parts of the globe throughout their orbits, and in principle could generate data on any part of the earth's surface thus overflown. In order to operate such a system at least a handful of ground stations scattered over the globe would be desirable, if not indeed required. Also, in view of the limited size of the overall markets, commercial satellite operators would have a basic interest in selling their data and value-added products to as many customers in as many countries as possible, calling for a global market place.

Such elements could well conspire to call for a regime guaranteeing a certain amount of trade liberalization, as the application of GATS and the WTO regime could achieve.[195] It may be noted that the UN Remote Sensing Principles, though not at all concerned as such with commercial remote sensing operations and market issues, provide for access for the so-called sensed states 'on a non-discriminatory basis and on reasonable cost terms' to data concerning their own territory.[196]

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[194] See e.g. M. Bonazountas, High Resolution Satellite Imagery and Earth Observation Data Policy, in *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 95–100; A. Ito, *Legal Aspects of Satellite Remote Sensing* (2011), 11–5. *Cf.* also Sadeh, *supra* n. 188, 454–8; Johnston & Cordes, *supra* n. 186, 23–9.

[195] Note that under prevailing definitions, data itself would constitute a service; only if imbedded on a CD or similar information carrier could it be qualified as a product subject to the GATT regime; *cf.* Bhagwati, *supra* n. 45, 855, on (non-)storability; also Marsoof, *supra* n. 45, 292–4; Mortelmans, *supra* n. 45, 600–1.

[196] Princ. XII, Principles Relating to Remote Sensing of the Earth from Outer Space (hereafter Remote Sensing Principles), UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986); see further *supra*, § 9.4.1.2. For example, the reference to 'reasonable cost terms' might seem to echo concerns with 'dumping', but in truth tried to achieve exactly the opposite effect: that operators of remote sensing satellites would not require unreasonably *high* fees for their data, in particular from respective sensed states.

However, it will also be clear from the above that commercialization and privatization in the satellite remote sensing sector have remained of a rather partial, even peculiar character. With the exception now of Digital Globe, the satellites, their operations and the assorted ground infrastructure involved all continue to remain largely a matter of governmental or intergovernmental responsibility and control. Only in the downstream parts of marketing and selling the data as well as more value-added information products have (a handful of) private companies carved out their own independent position. It should be reiterated here that the GATS does not apply respectively to 'services supplied in the exercise of governmental authority' or to 'any service which is supplied neither on a commercial basis, nor in competition with one or more service suppliers'.[197]

In addition, satellite remote sensing is also a space sector with many security-related aspects. In particular in the United States the erstwhile 'shutter control' policy, allowing the US government for security reasons to limit the opportunities for commercial satellite operators to market and sell remote sensing data of a certain resolution or concerning a particular area (such as Israel[198]), has shown that security reasons may constantly interfere with any prospective liberalized trade regime – albeit not so much by hindering others from competing, but rather by hindering one's own companies from competing on a level playing field.[199]

In the end, both this limited and rather special extent to which satellite remote sensing could be said to have been commercialized and privatized and the continuing security-related elements of this type of space activities make it fairly unlikely that it will in the short term become subject to an international trade regime under the auspices of the WTO and/or the GATS. Any such discussion, furthermore, would first have to

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[197] Art. I(3)(b), (c), GATS, *supra* n. 11.

[198] *Cf.* a 1998 Amendment to the Land Remote Sensing Policy Act by way of the Kyl-Bingaman Amendment, Pub. L. 104-201, div. A, title X, Sec. 1064, Sept. 23, 1996, 110 Stat. 2653, providing that: '(a) Collection and Dissemination. – A department or agency of the United States may issue a license for the collection or dissemination by a non-Federal entity of satellite imagery with respect to Israel only if such imagery is no more detailed or precise than satellite imagery of Israel that is available from commercial sources. (b) Declassification and Release. – A department or agency of the United States may declassify or otherwise release satellite imagery with respect to Israel only if such imagery is no more detailed or precise than satellite imagery of Israel that is available from commercial sources.'

[199] *Cf.* also Lyall & Larsen, *supra* n. 140, 437–42; Sadeh, *supra* n. 188, 452–5.

solve the issue to what extent international marketing and sales of remote sensing data would concern goods so as to fall within the scope of the GATT, or services so as to fall within the scope of the GATS. As indicated above,[200] these terms have not been defined by the GATT or the GATS respectively for their own purposes.

Generally, goods are seen as something tangible and easily measureable in quantities, whereas services are essentially intangible – even if often involving tangible goods or using tangible infrastructure – and measured more often in indirect quantities, such as hours or monetary values.[201] The discussion as far as relevant for remote sensing forms part of the broader discussion regarding software, which remote sensing data essentially amount to – which may qualify only as goods to the extent of their physical storage on information carriers such as CD-ROMs or USB sticks.[202]

Whilst the activity of remote sensing itself could well be envisaged to qualify as a service – a service of information, more precisely – these activities as indicated are generally outside of the scope so far of any commercial and private activity (with the sole exception of Digital Globe). Consequently, the focus of analysis should be on the results of that service, the remote sensing data. The UN Remote Sensing Principles provide for some definitions in this respect as follows:

> (b) The term 'primary data' means those raw data that are acquired by remote sensors borne by a space object and that are transmitted or delivered to the ground from space by telemetry in the form of electromagnetic signals, by photographic film, magnetic tape or any other means;
> (c) The term 'processed data' means the products resulting from the processing of the primary data, needed to make such data usable;
> (d) The term 'analysed information' means the information resulting from the interpretation of processed data, inputs of data and knowledge from other sources.[203]

Likely the first, and at least in terms of terminology also the second definition would indeed give rise to consideration of remote sensing

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200 See *supra*, § 15.2.1.4.

201 See also *supra*, § 15.2.1.4.

202 See extensively Marsoof, *supra* n. 45, 291–2, ff., also separating 'the intellectual property aspect of software … from the physical medium containing the software, which brings it within the ambit of goods' (at 301, quoting V.R. Hallikeri, Taxation of Software: Tackling the Issue of Software as 'Goods' in India, 36 *Intertax* (2008), 132).

203 Princ. I, Remote Sensing Principles, *supra* n. 196.

activities as essentially delivering a ‘product’ even if of a *sui generis*, electronic and intangible nature.[204] With the ‘information resulting from the interpretation’ of data such a conclusion would already be considerably more equivocal in any event. More generally, however, to the extent commercial practice would provide subscribers on a continuing basis with access to certain databases, rather than selling individual data sets, one should probably start viewing such a continuing delivery of electronic ‘products’ as provision of a service. If a desire to start applying (parts of) the international trade regime as per the GATT and/or the GATS were ever to arise, this issue of course would have to be solved.

Finally, an interesting point from the WTO angle concerns intellectual property rights, in view of the great importance of such rights for commercial remote sensing operators to develop a viable commercial business[205] – as well as the focus of intellectual property rights on the ‘contents’ of data (the service in essence being provided) instead of its ‘carrier’ (a physical product).[206] It may be noted for instance that the European Union enunciated a specific Database Directive[207] to ensure protection of electronic databases to the extent that ‘normal’ copyrights could not provide the desirable level of protection, and this protection notably includes satellite remote sensing databases if electronic in nature.

With regard to such intellectual property rights issues of course the TRIPS Agreement becomes relevant, under which WTO member states are required to apply its provisions regardless of whether any goods (or services) subject to such intellectual property rights would (also) fall under the GATT (respectively the GATS).[208] Once the TRIPS Agreement applies under its own terms, WTO member states first of all have to apply NT to intellectual property right protection:

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[204] *Cf.* however Marsoof, *supra* n. 45, 291–4, 300–7.

[205] See e.g. T. Brisibe, Outer Space Activities and Intellectual Property Protection in Nigeria, 32 *Journal of Space Law* (2006), 241–5; J.D. Cromer, How on Earth Terrestrial Laws Can Protect Geospatial Data, 32 *Journal of Space Law* (2006), esp. 257–60, 269 ff.; M. Mejía-Kaiser, Copyright Claims for *Meteosat* and *Landsat* Images under Court Challenge, 32 *Journal of Space Law* (2006), 293–317, on two leading cases.

[206] See again Marsoof, *supra* n. 45, 301.

[207] Directive of the European Parliament and of the Council on the legal protection of databases (hereafter Database Directive), 96/9/EC, of 11 March 1996; OJ L 77/20 (1996). See further e.g. Cromer, *supra* n. 205, 282–4; also *supra*, § 4.3.2.3; *infra*, § 18.2.1.

[208] See Art. 1(1), TRIPS Agreement, *supra* n. 17.

> Each Member shall accord to the nationals of other Members treatment no less favourable than that it accords to its own nationals with regard to the protection[209] of intellectual property, subject to the exceptions already provided in, respectively, the Paris Convention (1967),[210] the Berne Convention (1971),[211] the Rome Convention[212] or the Treaty on Intellectual Property in Respect of Integrated Circuits.[213, 214]

Similarly, with a few exceptions mentioned,[215] member states would have to apply MFN: 'With regard to the protection of intellectual property, any advantage, favour, privilege or immunity granted by a Member to the nationals of any other country shall be accorded immediately and unconditionally to the nationals of all other Members.'[216]

Finally, with respect to copyrights it is *inter alia* provided:

> Compilations of data or other material, whether in machine readable or other form, which by reason of the selection or arrangement of their contents constitute intellectual creations shall be protected as such. Such protection, which shall not extend to the data or material itself, shall be without prejudice to any copyright subsisting in the data or material itself.[217]

This provision is less far-reaching than the protection accorded under the EU Database Directive to electronic databases, as the latter does not

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[209] 'Protection' is defined in a footnote to Art. 3(1), TRIPS Agreement, *supra* n. 17, as 'includ[ing] matters affecting the availability, acquisition, scope, maintenance and enforcement of intellectual property rights as well as those matters affecting the use of intellectual property rights specifically addressed in this Agreement'.

[210] Paris Convention for the Protection of Industrial Property of 20 March 1883 as revised (Paris Convention), Stockholm, 14 July 1967, entered into force 19 May 1970; 828 UNTS 305; TIAS 6923, 7727; 24 UST 2140; UKTS 1970 No. 61; Cmnd. 3474; ATS 1972 No. 12; 6 ILM 806 (1967).

[211] Berne Convention for the Protection of Literary and Artistic Works (Berne Convention), September 9, 1886, as revised, Paris, done 24 July 1971, entered into force 15 December 1972 / 10 October 1974; 1161 UNTS 3; 102 Stat. 2853; ATS 1978 No. 5.

[212] International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations, Rome, done 26 October 1961, entry into force 18 May 1964; 496 UNTS 43; UKTS 1964 No. 38 (Cmnd. 2425); ATS 1992 No. 29.

[213] Treaty on Intellectual Property in Respect of Integrated Circuits, Washington, done 26 May 1989, not yet entered into force; 28 ILM 1484 (1989).

[214] Art. 3(1), TRIPS Agreement, *supra* n. 17; internal quotations added.

[215] See Art. 4 *sub* (a)–(d), TRIPS Agreement, *supra* n. 17.

[216] Art. 4, TRIPS Agreement, *supra* n. 17.

[217] Art. 10(2), TRIPS Agreement, *supra* n. 17.

require ‘intellectual creation’ but merely a demonstration ‘that there has been qualitatively and/or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database’ for the *sui generis* right of protection under the Directive to apply.[218] Yet, following the terms of Article 10(2) of the TRIPS Agreement as quoted, to the extent ‘intellectual creation’ is involved also satellite remote sensing databases would fall within the scope of that regime, read the holders of intellectual property rights with respect to such databases would enjoy the applicability of NT and MFN to that extent.

15.5.3 Towards an International Trade Regime for Satellite Navigation?

15.5.3.1 Commercialization and privatization of satellite navigation

Commercialization and privatization of satellite navigation itself is, at best, an issue for the future.[219] As compared to the case of satellite remote sensing, involvement of private parties in the upstream segments of satellite navigation – the development, launch, operation and maintenance of the satellite system and the supporting ground infrastructure – is totally absent currently, and likely not to be expected soon.

The two systems presently operational, the US GPS and the Russian GLONASS systems, are both owned, operated and completely controlled by the respective military establishments of the two states concerned.[220]

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[218] Art. 7(1), Database Directive, *supra* n. 207. Note that Art. 3, Database Directive, *also* provides protection under copyright under essentially identical terms as Art. 10(2), TRIPS Agreement, *supra* n. 17, i.e. to those databases that meet the ‘intellectual creation’ requirement.

[219] See also in general on satellite navigation *supra*, Chapter 10. *Cf.* further W. von Kries, Thoughts on European GNSS Options, 14 *Space Policy* (1998), 211–3; N. Frischauf, Satellite Navigation, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 124–33; Venet, *supra* n. 13, 66–9; Walter, *supra* n. 13, 495.

[220] See e.g. B.M. Orschel, Assessing a GPS-Based Global Navigation Satellite System Within the Context of the 2004 U.S. Space-Based Positioning, Navigation, and Timing Policy, 70 *Journal of Air Law & Commerce* (2005), 611–7; P. Hartl & M. Wlaka, The European Contribution to a Global Civil Satellite Navigation System, 12 *Space Policy* (1996), 167–8; Frischauf, *supra* n. 219, 124–30; Salin, *supra* n. 17, 86–90; Jakhu, *supra* n. 119, 81–2; Lyall & Larsen, *supra* n. 140, 391–5; also *supra*, § 10.2.2.1 and § 10.2.2.2.

As neither of the two systems moreover has more than a consultative structure in place with respect to civil and commercial usages,[221] where the timing, positioning and navigation services are essentially offered for free and without any contractual relationship, this is not likely to change either.

The downstream commercial operators using such services – who do indeed currently comprise a considerable, and growing, industry – consequently would be on their own in regulating any market access for their services in other states, which could involve both products (receivers and assorted application technologies) and services (such as fleet management or road sector services), although the latter currently compromise a minor element of the markets in view of the fundamental absence of guarantees and warranties as regards the (quality of the) signals offered by the GPS and GLONASS systems.

The same general analysis would very likely also apply to the prospective satellite navigation systems and the signals to be produced thereby currently being developed by China,[222] India,[223] and Japan.[224] All

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[221] *Cf.* for the US case Orschel, *supra* n. 220, 609 ff., esp. 616–7, 624; S. Pace, The Global Positioning System: Policy Issues for an Information Technology, 12 *Space Policy* (1996), 265 ff., esp. 275; W. von Kries, Some Comments on the U.S. Global Positioning System Policy, 45 *Zeitschrift für Luft- und Weltraumrecht* 45 (1996), 407–10; P.B. Larsen, Regulation of Global Navigation and Positioning Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 460–2; Lyall & Larsen, *supra* n. 140, 393–4; L. Bond, The GNSS Safety and Sovereignty Convention of 2000 AD, 65 *Journal of Air Law & Commerce* (2000), 445 ff.

[222] This concerns the Beidou system; see *supra*, § 10.2.2.4, § 10.2.3.1; further e.g. N. Peter, Developments in Space Policies, Programmes and Technologies Throughout the World and Europe, in *Yearbook on Space Policy 2007/2008* (Eds. K.U. Schrogl, C. Mathieu & N. Peter) (2009), 99; W. Rathgeber & C. Venet, Developments in Space Policies, Programmes and Technologies Throughout the World and Europe, in *Yearbook on Space Policy 2008/2009* (Eds. K.U. Schrogl *et al.*) (2010), 134; R. Du, Shaping Legal Framework for Compass – Regulating GNSS in Chinese Context, in *Proceedings of the International Institute of Space Law 2011* (2012), 63–8; Lyall & Larsen, *supra* n. 140, 399.

[223] This concerns the IRNSS & GAGAN systems; see *supra*, § 10.2.3.3, § 10.2.6.4; further e.g. R. Kaul, Legal Regime for GNSS for CNS/ATM for India: Application of Articles VI and VII Outer Space Treaty to the GAGAN SBAS, in *Proceedings of the International Institute of Space Law 2011* (2012), 349–58; Peter, *supra* n. 222, 99–100; Rathgeber & Venet, *supra* n. 222, 135; Lyall & Larsen, *supra* n. 140, 401.

[224] This concerns the QZSS & MSAS systems; see *supra*, § 10.2.3.2, § 10.2.6.3; see further e.g. H. Shiroyama, Recent Development of Japan's Space

of these are (going to be) government-owned and government-operated, with no discernible private input other than perhaps in the manufacturing of component parts and the downstream uptake of any free signals by commercial enterprises to develop further non-critical applications, such as is already happening with GPS signals.[225]

The only case where the original approach is rather different, that of the European Galileo system currently being brought into operation with the intention to provide certain guaranteed services in return for user fees,[226] has also suffered from a lack of commercial interest. At least for the time being the original PPP-approach, whereby a private concessionaire would operate the system and sell its services under the auspices of a public supervisor, has been shelved, and on behalf of the combined member states of the European Union and ESA the European Commission is currently in charge of the development of the system, financially and otherwise.[227]

Policy: The Quasi-Zenith Satellite Programme and the Space Policy Making Process, in *Yearbook on Space Policy 2010/2011* (Eds. P. Hulsroj, S. Pagkratis & B. Baranes) (2013), 207–21; also Peter, *supra* n. 222, 99; Rathgeber & Venet, *supra* n. 222, 135.

225 *Cf.* e.g. Hartl & Wlaka, *supra* n. 220, 169–70; Orschel, *supra* n. 220, 614–8; Pace, *supra* n. 221, 269 ff.; W.F. Blanchard, Achieving GPS-Galileo Interoperability: The Challenges Ahead, 19 *Space Policy* (2003), 96–7; Von Kries, *supra* n. 221, 407–10.

226 See e.g. L. Mantl, The European Union, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 420–1; Orschel, *supra* n. 220, 612–3; Frischauf, *supra* n. 219, 130–2; Lyall & Larsen, *supra* n. 140, 395–6; also F.G. von der Dunk, Liability for Global Navigation Satellite Services: A Comparative Analysis of GPS and Galileo, 30 *Journal of Space Law* (2004), 145–50. See also *supra*, § 4.4.4.1 and § 10.2.2.3.

227 See also Regulation of the European Parliament and of the Council setting up the European GNSS Agency, repealing Council Regulation (EC) No 1321/2004 on the establishment of structures for the management of the European satellite radio navigation programmes and amending Regulation (EC) No 683/2008 of the European Parliament and of the Council, No. 912/2010/EU, of 22 September 2010; OJ L 276/11 (2010). Further e.g. Mantl, *supra* n. 226, 423–6; S. Pagkratis, Developments in Space Policies, Programmes and Technologies Throughout the World and Europe, in *Yearbook on Space Policy 2009/2010* (Eds. K.U. Schrogl, S. Pagkratis & B. Baranes) (2011), 159–60; M. Ferrazzani, Recent Legal Developments of GNSS in Europe, in *Proceedings of the International Institute of Space Law 2011* (2012), 359–63; L. Boureghda, The Galileo Programme Framework, in *Proceedings of the International Institute of Space Law 2011* (2012), 364–7.

15.5.3.2 Applying the GATT/GATS/WTO regime to satellite navigation: The issues

Like satellite remote sensing, satellite navigation would be a global business: the satellite systems – which largely operate or are planned to operate in medium earth orbits – cover the whole globe and would in principle be able to provide receivers anywhere on earth with timing, positioning and navigation signals, and require a number of ground stations spread across the earth for operating and controlling purposes. Tellingly, however, efforts at establishing an international regime, even if only embryonic, have so far been confined to discussions on frequency use and interference in the context of the ITU,[228] giving rise only to a bilateral treaty-like agreement between the United States and the European Union on GPS and Galileo,[229] as well as a few intra-European regulations on Galileo.[230]

At the same time, satellite navigation also gives rise to some distinct security-related issues, as intentional temporary degradation or unavailability of GPS signals by the US authorities for security-related reasons have evidenced in recent years.[231] Also, again the non-applicability of the GATS to what would qualify as governmental services should be reiterated.[232] This, however, predominantly plays out at the level of the upstream satellite operations. Since, moreover, to date the downstream commercial development has remained largely confined to the manufacturing of various sorts of receivers, which already would seem to fall under the GATT rules to the extent they cover such electronic receiving

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[228] See e.g. Orschel, *supra* n. 220, 622–4, 631–2.

[229] Agreement on the Promotion, Provision and Use of Galileo and GPS Satellite-Based Navigation Systems and Related Applications, U.S.-E.C., done 26 June 2004; see further in great detail M. Dodge, The *GPS-Galileo* Agreement and Treaty Law, 38 *Journal of Space Law* (2012), 227–87; also Orschel, *supra* n. 220, 634; Blanchard, *supra* n. 225, 95–9. In addition, Orschel, 633–4, refers to joint US–Russia and US–Japan statements of a policy nature.

[230] *Cf.* Regulation No. 912/2010, *supra* n. 227; also, earlier, Council Regulation on the establishment of structures for the management of the European satellite radio-navigation programmes, No. 1321/2004/EC, of 12 July 2004; OJ L 246/1 (2004); Regulation of the European Parliament and of the Council on the further implementation of the European satellite navigation programmes (EGNOS and Galileo), No. 683/2008/EC, of 9 July 2008; OJ L 196/1 (2008).

[231] See further e.g. Orschel, *supra* n. 220, 609–10, 624–30; Von Kries, *supra* n. 221, 409.

[232] See again Art. I(3) (b) & (c), GATS, *supra* n. 11.

and transmitting devices as these constitute essentially telecommunications equipment,[233] only occasionally could security exceptions be invoked to limit international trade in such devices.[234]

With service provision – adding technology to provide true tracking, routing, fleet management and other value-added services on top of the straightforward determination of positions in time – the situation is more complicated however. Whilst many states would be inclined, at least in principle, to allow the use of such timing, positioning and navigation devices on their territory because of the obvious benefits these would bring to their populations and economies, it might well be preferred to limit possibilities to provide actual *services* using such technology to national operators for both security and economic reasons. Hence, the interest in considering such services to become subject to a GATS regime of MFN and/or NT will not likely be very widespread any time soon.

Nevertheless, this may of course change. There may be just a few economies which operate their own satellite navigation systems, these being the US and Russian, and soon European, Chinese, Indian and Japanese ones; this *does* concern most of the world's largest economies. If Galileo were to manage to push the envelope of downstream commercialization of satellite navigation services even further, by creating and growing new markets out of its own direct business interests, there might well be a point where discussion of application of the GATS regime would be undertaken in earnest. After all, satellite navigation from a technical and operational standpoint is not much more than a specific subset of satellite telecommunications *largo sensu*, and as the latter has been generally subjected to a trade liberalization regime under GATS/WTO principles, it should be relatively easy to extend the scope of that regime to satellite navigation services – if only by simply allowing inclusion thereof in Specific Schedules of Commitments.[235]

For the purposes of the GATS Annex on Telecommunications, for example, 'telecommunications' is defined as 'the transmission and reception of signals by any electromagnetic means'.[236] So far, the liberalization process has been restricted to so-called *basic* telecommunication

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[233] *Cf.* P.A. Salin, Impact of Recent US Legislation and Regulations on International Satellite Communication Regulations, 48 *Zeitschrift für Luft- und Weltraumrecht* (1999), 51–2.

[234] *Cf.* also *supra*, § 15.2.2.4, referencing Art. XXI, GATT 1947, *supra* n. 3.

[235] See *supra*, §§ 15.4.2, 15.4.3.

[236] Art. 3(a), GATS Annex on Telecommunications, *supra* n. 144. *Cf.* further again the discussion at Orschel, *supra* n. 220, 622–4, 631–4, on ITU involvement and interference issues.

services, but as these more or less comprise 'voice telephony, data transmission, telex, telegraph, facsimile, private leased circuit services (resale), fixed and mobile satellite systems and services, cellular telephony, mobile data services, paging, and personal communications services (PCS)',[237] the term 'basic' seems to have been interpreted rather broadly. There would be no inherent reason why satellite navigation services could not be added to that list relatively simply – once political will and/or economic necessity pushed for such developments.

15.5.4 Towards an International Trade Regime for Private Manned Spaceflight?

15.5.4.1 The impending commercialization and privatization of manned spaceflight

The international trade environment for launch services has already been addressed above,[238] and assessed as to the application and possible applicability of an international trade regime as per the GATS/WTO – which turned out to be rather unlikely. Even such private commercial launch activities as currently stimulated by the US authorities to serve the International Space Station, notably by SpaceX and Boeing, would not change this conclusion.[239]

Whilst the support for those activities through NASA by way of the Commercial Orbital Transportation Services (COTS) programme[240] certainly amounts to government subsidies for private operators and private operations in the broad sense of the word, the unique character of those operations, including their security-related aspects, makes it rather difficult to fathom that such government subsidization would become

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[237] Senunas, *supra* n. 51, *sub* Introduction.

[238] See *supra*, § 15.3.

[239] See in general M.J. Kleiman, J.K. Lamie & M.V. Carminati, *The Laws of Spaceflight* (2012), 51 ff.; also T. Brannen, Private Commercial Space Transportation's Dependence on Space Tourism and NASA's Responsibility to Both, 75 *Journal of Air Law & Commerce* (2010), 647 ff., esp. 650, 660–8; G.P. Smith & A.D. Thompson, Creating a Sustainable Manned Orbital Spaceflight Industry, 10 *Astropolitics* (2012), esp. 69.

[240] *Cf.* for further details e.g. T.B. Dickerson, Patent Rights under Space Act Agreements and Procurement Contracts: A Comparison by the Examination of NASA's *Commercial Orbital Transportation Services (COTS)*, 33 *Journal of Space Law* (2007), 342–8; R.D. Launius & D.R. Jenkins, Is It Finally Time for Space Tourism?, 4 *Astropolitics* (2006), 271–2; Kleiman, Lamie & Carminati, *supra* n. 239, 53.

subject to an international trade regime which, at least in the abstract, would not condone such support.

Currently, the GATS regime does not yet address subsidies but does foresee negotiations on the topic;[241] also the GATS provides that MFN, NT and market access obligations do not apply to government procurement. However, the Agreement on Government Procurement (albeit endowed with a much more limited number of states parties than the GATT and the GATS) does apply to trade in services – but only by listed entities, and of course it has a security exception as well.[242]

Interestingly, moreover, with the exception of China (and perhaps India, Brazil and Ukraine) the states possibly most worried because of their own launch services – Russia, the major European spacefaring nations and Japan – are themselves on board the ISS project with the United States,[243] and hence agree with NASA's replacing the previously available shuttle flights with other means to travel to and from the ISS rather than thinking of protesting at any behaviour potentially considered anti-competitive.

The one development that could possibly fundamentally change these paradigms would be that of manned commercial sub-orbital spaceflight.[244] Notably, companies like Virgin Galactic and XCOR/SXC seem to be on the verge of flying dozens of paying 'space tourists' in hyperbolical arcs extending just above the (informal) boundary of air space and outer space at 100 km.[245]

Virgin Galactic, originally a British company, has relocated to the United States *inter alia* for ITAR-related reasons, and will fly with US technology (a two-stage-to-space vehicle developed by The Space Company) from spaceports in the United States, and later probably also elsewhere.[246] SXC, originally a Dutch company but meanwhile relocated

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241 *Cf.* Art. XV, GATS, *supra* n. 11.

242 See Art. XXIII(1), Agreement on Government Procurement, *supra* n. 20.

243 See further *supra*, §§ 11.2, 11.3.

244 See further *supra*, Chapter 12. *Cf.* also in a broader context S.H. Bromberg, Public Space Travel – 2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier, 70 *Journal of Air Law & Commerce* (2005), 639 ff.; also Brannen, *supra* n. 239, 639–68; Venet, *supra* n. 13, 69–70; Walter, *supra* n. 13, 498–502.

245 See on the boundary issue e.g. *supra*, § 2.3.1.3.

246 See e.g. F.G. von der Dunk, Passing the Buck to Rogers: International Liability Issues in Private Spaceflight, 86 *Nebraska Law Review* (2007), 405–7; F.G. von der Dunk, Space Tourism, Private Spaceflight and the Law: Key Aspects, 27 *Space Policy* (2011), 147–8; Kleiman, Lamie & Carminati, *supra* n. 239, 48–50; M. Gerhard, Space Tourism – The Authorisation of Suborbital

to the Caribbean island of Curacao, will similarly start flying soon with a single-stage-to-space vehicle developed, operated and maintained by the US XCOR company, presumably from Curacao but possibly also from elsewhere.[247] Slightly less articulate plans involve other US companies, and even non-US locations and projects.[248]

While thus very much focused on US technology and business entrepreneurship, it is presumed that the actual flights will soon become available in other parts of the world. For the time being, as sub-orbital hops of short duration and returning to the same site from where take-off took place, these flights will likely not give rise to much discussion on an international *trade* regime – although it should already be noted that under the GATS, foreign service provision includes consumption abroad.[249] To the extent lawyers are discussing these impending operations, the focus is on safety, security, liability, certification and other technology-related issues, not on commercial ones.[250]

Space Transportation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2001), 263–4; R.S. Jakhu & Y.O.M. Nyampong, International regulation of emerging modes of space transportation, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2011), 217–20; *cf.* also Brannen, *supra* n. 239, 656–9; M.C. Mineiro, Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges, 73 *Journal of Air Law & Commerce* (2008), 763–5, 800–2.

[247] See e.g. F.G. von der Dunk, Sun, Sea, Sand … and Space: Launching Tourists into Outer Space from the Dutch Caribbean, in *Proceedings of the International Institute of Space Law 2010* (2011), 349–50; also Kleiman, Lamie & Carminati, *supra* n. 239, 50; *cf.* also Mineiro, *supra* n. 246, 763–5, 800–2; Brannen, *supra* n. 239, 656–9.

[248] See further e.g. Kleiman, Lamie & Carminati, *supra* n. 239, 50–1; Brannen, *supra* n. 239, 654–6; T.L. Masson-Zwaan, Regulation of Sub-orbital Space Tourism in Europe: A Role for EU/EASA?, 35 *Air & Space Law* (2010), 263–4.

[249] As per Art. I(2)(b), GATS, *supra* n. 11; see further *supra*, § 15.2.1.4, text at n. 47.

[250] See J.N. Pelton, The International Challenges of Regulation of Commercial Space Flight, in *Space Safety Regulations and Standards* (Eds. J.N. Pelton & R.S. Jakhu) (2011), 289–300; Jakhu & Nyampong, *supra* n. 246, 215–38; S.N. Menon, Space Tourism and Aerospace Vehicle: Re-tracing the Boundary between Air Space and Outer Space, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 47–55; M. Walker, Suborbital Space Tourism Flights: An Overview of Some Regulatory Issues at the Interface of Air and Space Law, 33 *Journal of Space Law* (2007), 397–404; for Europe, Masson-Zwaan, *supra* n. 248, 269–72.

However, whilst the special character of this impending new economic sector may even cause applicability of concepts such as 'launch' and 'outer space' into question, precisely for that reason many of the 'classical' security- and public service-related constraints would be absent, or at least have a fundamentally different effect in this area, so as to make it potentially less sensitive to open up international trade, for example along the lines of the GATS/WTO regimes. In particular, it may be noted that several of the impending operators intend to evolve their sub-orbital flight capabilities from point-A-to-point-A 'sensation experience' flights to point-A-to-point-B transportation,[251] at which point an international market may start to develop in this context – and discussions thereof in a GATS/WTO context would not seem so outrageous anymore.

15.5.4.2 Applying the GATS/WTO regime to private manned spaceflight: The issues

Such an evolution towards A-to-B transportation also would essentially transform sub-orbital spaceflight into a kind of aviation, merely involving flights higher and faster than normal aviation could offer – and quite likely of course much more expensive as well. Here, it may be noted that within the GATS context an Annex on Air Transport Services has provided already for a first measure of trade liberalization of international aviation in the WTO/GATS context.[252]

This Annex provides:

> 1. This Annex applies to measures affecting trade in air transport services, whether scheduled or non-scheduled, and ancillary services. It is confirmed that any specific commitment or obligation assumed under this Agreement shall not reduce or affect a Member's obligations under bilateral or

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[251] See e.g. F.G. von der Dunk, The Integrated Approach – Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventure Tourism, 92 *Acta Astronautica* (2013), 200, 208; also von der Dunk, Passing the Buck, *supra* n. 245, 403.

[252] See further D. Kreymborg, Developments Relevant to International Air Transport in the World Trade Organization (WTO), 28 *Annals of Air & Space Law* (2003), 477–81; L. Tomas, Air Transport Agreements, Regulation of Liability, in *The Max Planck Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. I (2012), 244; U. Balasubramaniam, Market Access and the GATS Air Transport Annexure: Possible Approaches for India, 72 *Journal of Air Law & Commerce* (2007), 45 ff., esp. 54–60; Y. Zhao, Air Transport Services and WTO in the New Epoch, 50 *Zeitschrift für Luft- und Weltraumrecht* (2001), 48–67.

multilateral agreements that are in effect on the date of entry into force of the WTO Agreement.

The Agreement, including its dispute settlement procedures, shall not apply to measures affecting:

(a) traffic rights, however granted; or
(b) services directly related to the exercise of traffic rights,

except as provided in paragraph 3 of this Annex.

The Agreement shall apply to measures affecting:

(a) aircraft repair and maintenance services;
(b) the selling and marketing of air transport services;
(c) computer reservation system (CRS) services.

The dispute settlement procedures of the Agreement may be invoked only where obligations or specific commitments have been assumed by the concerned Members and where dispute settlement procedures in bilateral and other multilateral agreements or arrangements have been exhausted.

5. The Council for Trade in Services shall review periodically, and at least every five years, developments in the air transport sector and the operation of this Annex with a view to considering the possible further application of the Agreement in this sector.

6. Definitions:

(a) 'Aircraft repair and maintenance services' mean such activities when undertaken on an aircraft or a part thereof while it is withdrawn from service and do not include so-called line maintenance.
(b) 'Selling and marketing of air transport services' mean opportunities for the air carrier concerned to sell and market freely its air transport services including all aspects of marketing such as market research, advertising and distribution. These activities do not include the pricing of air transport services nor the applicable conditions.
(c) 'Computer reservation system (CRS) services' mean services provided by computerised systems that contain information about air carriers' schedules, availability, fares and fare rules, through which reservations can be made or tickets may be issued.
(d) 'Traffic rights' mean the right for scheduled and non-scheduled services to operate and/or to carry passengers, cargo and mail for remuneration or hire from, to, within, or over the territory of a Member, including points to be served, routes to be operated, types of traffic to be carried, capacity to be provided, tariffs to be charged and their conditions, and criteria for designation of airlines, including such criteria as number, ownership, and control.[253]

[253] GATS, Annex on Air Transport Services, www.wto.org/english/docs_e/legal_e/26-gats_02_e.htm, last accessed 26 March 2014.

Much of this would be easily transferable or translatable into a sub-orbital space transportation environment serving, just like international aviation, pairs of cities on earth. As such types of sub-orbital space transportation essentially would compete with 'classical' civil aviation, states would presumably wish to control and negotiate foreign service provision opportunities also regarding such a new mode of international transport and somehow 'integrate' those transport services into any existing international legal regime for air transportation.[254]

Needless to say, however, such a development would still be something for – at the earliest – the medium term. As long as the sub-orbital space tourism industry has not really established itself and technologies, operations, markets and regulation have not yet proven their maturity it is consequently unlikely that application or applicability of such GATS principles to sub-orbital spaceflight would come to be extensively discussed.

15.6 CONCLUDING REMARKS

The context of international trade and competition offers excellent illustrations of space law *lato sensu* being a conglomerate of more specific legal regimes, some of which have never focused – at least originally – on space activities and/or their major applications, rather than a somehow monolithic (international) regime. It also represents the best illustration of how this is particularly true for the paradigm change taking place in the space arena over the past several decades, with private industries gradually and with different intensity in various space sectors but nevertheless substantially and seemingly unstoppably moving into the space realm.[255]

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[254] Obviously, in view of the basic negation in this respect of Art. 1(a), GATS, Annex on Air Transport Services, *supra* n. 253, considerable doubt exists as to whether the GATS through these clauses actually covers any traffic rights, and if so, what that would mean; *cf.* Tomas, *supra* n. 252, 244; Zhao, *supra* n. 252, 58–60; also Balasubramaniam, *supra* n. 252, 55–8; V.J. Vissepó, Legal Aspects of Reusable Launch Vehicles, 31 *Journal of Space Law* (2005), 173, 189–91.

[255] See for further analyses of this phenomenon F.G. von der Dunk, As Space Law Comes to Nebraska, Space Comes Down To Earth, 87 *Nebraska Law Review* (2008), 500–12; *cf.* also V.S. Vereshchetin, Legal Regulation of Space Activities: Which Way Will It Advance Further?, 18 *Journal of Space Law* (1990), 11–8; B. Cheng, The Commercial Development of Space: The Need for New Treaties, 19 *Journal of Space Law* (1991), 17–21.

As liberalization and privatization make headway into the various space sectors, certain groups of space products and services are no longer by definition carved out from the normal politico-economic forces of the market – and as soon as that happens, the international trade regime as represented most prominently by GATT, GATS and the WTO becomes relevant.

This occurred earliest and most forcefully in the context of satellite communications, as by far the most commercialized and privatized of the space arenas in which a basic legal regime has now arisen under the GATS. In the context of launch services and remote sensing, where privatization is haphazard, far from complete and fraught with sovereignty-related issues, yet commercialization of one type or another is at issue, at best the GATT may be applied. For launching, however, a meanwhile aborted effort at essentially unilateral, US-led regulation of the world market place in services resulted, whereas for remote sensing the principled carve-out of governmental services under the GATS, the security aspects of the sector and the likely characterization of the core of remote sensing as providing services rather than products make application of the GATS/WTO regime quite unlikely for the near future. For satellite navigation and private commercial spaceflight, the one on the brink of some level of privatization by dint of the European Galileo system, the other by all accounts taking off in 2015, there are similar arguments why application of the GATS/WTO regime might, perhaps, be desirable, but not likely to happen in the short run. Nevertheless, if the long march of commercialization and privatization of specific sectors of space activities and their major applications is going to continue, inevitably these and similar issues will be brought to the table, and require appropriate solutions.

16. Financing space ventures

Mark Sundahl

16.1 INTRODUCTION

The construction, launch and operation of satellites and other space objects require tremendous financial resources. The construction and launch of a single telecommunications satellite, for example, can easily run into the hundreds of millions of dollars. The value of a single transponder on a satellite can range from five to 20 million dollars.[1] Given the capital-intensive nature of the space industry, financing is invariably a critical component of a successful venture.

The types of transactions involved in financing space ventures vary. Equity finance, secured and unsecured lending, and project finance structures have all been utilized to raise capital. Equity finance refers to the raising of funds by the sale of a company's shares of stock. This stock can be sold through public offerings in a stock exchange or through private offerings to individuals or companies. Funds can also be raised by borrowing money from a bank or a syndicate of banks. Such loans can be unsecured so that banks have no right to the borrower's assets if the borrower fails to repay or, more typically, the loans can be secured on the assets of the borrower in order to provide the banks with some protection in the event of default.

Project finance is a more complicated method of financing capital-intensive ventures in which the lenders financing the project rely on the revenue generated by the project for repayment of the debt obligations without recourse to the company sponsoring the project. This structure appeals to companies because it limits the company's potential losses to the value of the assets involved in the project. In the case of satellite finance, lenders would look to the income generated from transponder leases and other revenue streams flowing to the satellite operator. Because the lender does not have recourse to other assets of the operator if the operator defaults on the loan obligation, the lender will demand a first-priority security interest in the satellite since this collateral is the

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[1] See P.D. Nesgos, Satellites and Transponders, in *Equipment Leasing* (Ed. B.A. Dubin) (2012), § 30.02.1.

lender's only protection in the event that the expected revenue streams do not materialize.[2] Although satellite operators typically have their satellites built to their specifications, satellites have also been sold or leased to a new operator while on orbit.[3] Individual transponders on a satellite are also commonly sold and leased.[4] In some cases, a company will simply purchase or lease a transponder from the satellite operator, while in other cases a company may utilize a sale/leaseback structure to acquire the long-term use of a transponder.[5]

The legal environment in which these transactions take place is a major factor in ensuring that the transactions can be structured in a manner that reduces costs and risks to a level that is acceptable to the parties involved. In particular, the laws applicable to the enforcement of security interests are critical in a financing involving secured debt and the laws governing leasing and sales will affect the success of these types of transactions. This chapter explores the complexities of financing space ventures and describes the current legal landscape as well as recent legal reform efforts.

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[2] For a thorough treatment of the complexities of project finance see E.R. Yescombe, *Principles of Project Finance* (2002).

[3] A representative example of a satellite leasing took place in 2002 when the company SES S.A., a Luxembourg company, leased the Astra-1B satellite to the Swedish company Nordic Satellite AB. See M. Gerhard, Transfer of Operation and Control with Respect to Space Objects – Problems with Responsibility and Liability of States, 51 *Zeitschrift für Luft- und Weltraumrecht* (2002), 573. For additional examples of satellite leases see F.G. von der Dunk, The Illogical Link: Launching, Liability and Leasing, in *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (1994), 349.

[4] Transponders are more commonly subject to leases than satellites as a whole due, in part, to the fact that the operation of a transponder alone is not subject to licensing requirements. See Nesgos, *supra* n. 1, §§ 30.02.1, 30.06.1.

[5] Sale/leaseback financings involve the initial purchase of a transponder from the satellite operator by the company, which then resells the transponder to a bank. The bank then leases the transponder to the company. For an example of a Transponder Purchase Agreement, see J. Hermida, Transponder Purchase Agreement, in *International Business Transactions: Standard Forms and Documents* (Ed. D. Campbell) (2007); Suppl. 55 (May 2012).

16.2 THE NATURE AND CHALLENGES OF FINANCING SPACE VENTURES

At the outset of the space age, governments funded their own space activities.[6] When private industry entered the satellite telecommunications field, the companies were able to finance their operations with their own funds or by borrowing money from financial institutions that did not require that these loans be secured on the companies' space assets. These were blue-chip companies with triple-A ratings and significant assets on the ground, such as AmeriCom (a subsidiary of RCA), SES and DirecTV (a joint venture of RCA and Hughes Electronics). Given their financial stability, these companies had little difficulty receiving loans on the basis of their creditworthiness.

Due in part to the deregulation of satellite communications and the opening of domestic markets to foreign satellite operators through the General Agreement on Trade in Services (GATS) in the 1990s,[7] new entrants into the satellite telecommunications industries began to emerge.[8] More recently, a new cadre of space entrepreneurs have launched companies in the field of both manned and unmanned space flight. For example, companies such as SpaceX, SpaceHab, Rocketplane Kistler, PlanetSpace, and SpaceDev are participating in NASA's Commercial Orbital Transportation Services (COTS) programme, which was

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[6] For an overview of the government funding of space activities see I.H.P. Diederiks-Verschoor, The Development of Financing of Spacecraft, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 212.

[7] General Agreement on Trade in Services, Marrakesh, done 15 April 1994, entered into force 1 January 1995; UKTS 1996 No. 58; Cm. 3276; ATS 1995 No. 8; *cf.* also the Agreement on Telecommunications Services, Geneva, done 15 February 1997, entered into force 5 February 1998; ATS 1998 No. 9; 36 ILM 354 (1997).

[8] See F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 443; S.A. Davis, Unifying the Final Frontier: Space Industry Financing Reform, 106 *Commercial Law Journal* (2001), 457. In 1996 the conclusion of the Fourth Protocol to the GATS opened the domestic telecommunications industry of participating member states to foreign market entrants on a 'Most-Favoured Nation' basis; Fourth Protocol to the General Agreement on Trade and Services of 15 April 1994, Geneva, done 15 April 1997, entered into force 5 February 1998; ATS 1998 No. 9; 33 ILM 1167 (1994); 36 ILM 354 (1997). See, generally, S.M. Meisner, Global Telecommunications Competition a Reality: United States Complies with WTO Pact, 13 *American University International Law Review* (1998), 1345.

created to enable NASA to utilize private companies for cargo and crew delivery services in low earth orbit.[9]

Unlike the established behemoths of the space industry, these new companies do not have a long history of creditworthiness or the vast assemblage of assets on the ground. These start-up companies bring a new level of risk for financiers that extend loans to finance their operations – and the assets available as collateral are limited to the company's space assets. These smaller companies will therefore have no choice but to use their space assets as collateral. As a result, the ability of financial institutions to acquire an enforceable security interest in these space assets will be essential to attract financing.[10]

In addition, developing countries seeking the benefits of space may not have access to the capital required to build and launch satellites and these countries may therefore benefit from the ability to leverage their space assets as collateral to attract private funding.[11] Governmental need for external financing also exists to some extent in the industrialized world when public funds are scarce or a government sees a benefit in seeking external financing.[12]

While secured debt has been used to finance space ventures, loan obligations have been generally secured on more easily accessible, immobile and marketable terrestrial collateral.[13] In order to comprehend

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[9] Regarding the COTS programme, see NASA Commercial Crew & Cargo Program Office Homepage, www.nasa.gov/offices/c3po/home/index.html, last accessed 9 February 2014. Sub-orbital space tourism companies, including Virgin Galactic and XCOR Aerospace, have also entered the field of spaceflight.

[10] See e.g. N. Hazan, The UNIDROIT Preliminary Draft Protocol on Matters Specific to Space Assets, 28 *Annals of Air & Space Law* (2003), 222; M.J. Stanford & A. de Fontmichel, Overview of the Current Situation Regarding the Preliminary Draft Space Property Protocol and Its Examination by COPUOS, 6 *Uniform Law Review* (2001), 62; P.B. Larsen & J.A. Heilbock, UNIDROIT Project on Security Interests: How the Project Affects Space Objects, 64 *Journal of Air Law & Commerce* (1999), 707.

[11] See A.F. dos Santos, Financing of Space Assets, 19 *Space Policy* (2003), 127; R. Lochan, Cape Town Convention & Space Protocol: A Critical Analysis, in *Conference Proceedings of the ISRO/IISL Space Law Conference 2005: Bringing Space Benefits to the Asian Region*, (Eds. V. Gopalakrishnan & R. Lochan) (2006), 6-39, 6-40; O.M. Ribbelink, The Protocol on Matters Specific to Space Assets, 12 *European Review of Private Law* (2004), 38.

[12] See e.g. Larsen & Heilbock, *supra* n. 10, 737; Comments by the Cosmic Space Agency of the Russian Federation, UNIDROIT 1996, Study LXXII – Doc. 26, 1.

[13] One example of a satellite finance structure utilizing a security interest in the satellite involved the APSTAR satellite. See D.A. Panahy & R. Mittal, The

why this is the case, the basic theory of an efficient system of secured credit must be understood. A predictable and efficient law of secured transactions reduces the cost of borrowing money because banks will charge a lower interest rate when they face a lower risk of financial loss. Without a predictable law of secured transactions, a creditor will not have this confidence and will be reluctant to release funds or, if the loan is issued, the bank will charge a higher interest rate. At the most basic level, an efficient law of secured transactions will contain the following four features:

1. the ability of the creditor to easily acquire a non-possessory security interest without burdensome formalities;
2. clear priority rules coupled with a publicly searchable registration system to clarify the priority positions of competing claimants;
3. the ability of the creditor to unilaterally exercise remedies in the event of the debtor's default without the need to seek a court order; and
4. the ability of a secured creditor to exercise remedies against the debtor's assets even in the context of the debtor's insolvency.

In addition to having the protections of the proper legal environment, banks also need to have confidence that the collateral securing their loans will be easily marketable so that the bank can quickly dispose of the collateral and realize the proceeds needed to cover its losses.[14]

A security interest in immobile terrestrial assets that are held in a state with an efficient and creditor-friendly law of secured transactions, such as the United States, provides lenders with a highly reliable security package. In contrast, lenders may lack confidence in security interests in space assets for a number of reasons.

First, the patchwork of domestic laws that may be implicated in the course of creating and enforcing a security interest in space assets can

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Prospective UNIDROIT Convention on International Interests in Mobile Equipment as Applied to Space Property, 4 *Uniform Law Review* (1999), 305. ProtoStar Ltd. also granted security interests in its satellites to an affiliate of Credit Suisse Group AG in connection with the financing of its venture. See M. Bathon, ProtoStar Wins Court Approval of Liquidation Plan, www.bloomberg.com/news/2010-10-06/protostar-wins-court-approval-of-sale-plan-resolving-creditors-disputes.html, last accessed 9 February 2014.

[14] For more detailed explanation of the benefits of security interests see G. McCormack, *Secured Credit Under English and American Law* (2004), 1–38.

result in legal uncertainty and can increase transactional costs.[15] Although some states, such as the United States, Australia and New Zealand, have adopted progressive, creditor-friendly secured transactions statutes, many jurisdictions around the world retain an approach to secured transactions that fails to incorporate the above-mentioned fundamental principles of asset-backed finance.

For example, German law does not generally provide for the public registration of security interests for purposes of establishing priority and giving notice to prospective creditors of existing security interests.[16] Instead, priority in Germany is given to competing secured parties in order of the time of the creation of their security interests.[17] This can result in hidden liens if the debtor does not disclose existing security interests to a prospective lender since there is no public record of existing security interests.

In India, although judge-made law gives creditors the nominal right to enforce a non-possessory security interest without a court order, the reality is that a court order is still generally required and the ensuing litigation can cause sufficient delay so as to destroy the practical value of a security interest.[18] This difficulty in creating and enforcing security interests in personal property is a problematic area of commercial law not only in India, but in many other developing countries as well.[19]

In addition, although there is a general movement towards allowing parties to choose the law that governs their transaction (and thereby avoid

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[15] See H.L. Buxbaum, Unification of the Law Governing Secured Transactions: Progress and Prospects for Reform, 8 *Uniform Law Review* (2003), 323–4; P.B. Larsen, Creditors' Secured Interests in Satellites, in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (1992), 236. Regarding the complexities of cross-border secured transactions see also R.C.C. Cuming, Study of International Regulation of Aspects of Security Interests in Mobile Equipment, 1 *Uniform Law Review* (1990), 63.

[16] See R. Hesdahl & A. Lange, Germany, in *International Secured Transactions* (Ed. D. Campbell) (2012), § 15:23.

[17] See *ibid.*, § 15:25.

[18] *Cf.* H. Jayesh *et al.*, Bank Finance and Regulation Multi-Jurisdictional Survey: India, Enforcement of Security Interests in Banking Transactions, IBA (2010), 12–3, www.ibanet.org/LPD/Financial_Services_Section/Banking_Law/BankinglawSurveyApril2010.aspx, last accessed 19 April 2014.

[19] See, generally, N. de la Peña, Reforming the Legal Framework for Security Interests in Mobile Property, 4 *Uniform Law Review* (1999), 347. See also Panahy & Mittal, *supra* n. 13, 305 (citing, as an example, the uncertainty of Indonesian law regarding the use by Asia Cellular Satellite of its Garuda satellite as security for debt which was effected by the transfer of the satellite to a security agent by means of a fiduciary transfer agreement).

inimical laws), parties that are competing for the priority of their security interests in a space asset will not have entered into any agreement in which they would have chosen applicable law. In this case, the conflicts of law rules of the forum where the competing claimants appear in court will determine the applicable law.

The conflicts of law rule that generally applies to issues regarding the priority of security interests will, in many jurisdictions, call for the application of the law of the place where the collateral is located (*lex rei sitae*).[20] This rule is particularly problematic in the case of satellites and other space assets since assets in space are not located within the territory of any state.[21] The law applied by the court in this situation may result in a secured party unexpectedly losing priority.

Moreover, even if the parties to a dispute have chosen the governing law or the choice of law rules of the forum generally call for the application of the law of a jurisdiction other than that of the forum, certain mandatory rules of the forum (for example rules regarding the procedure for enforcing security interests) may still be applied by the court.[22] In addition to creating legal uncertainty that could harm a secured party's interests, this uncertainty increases transactional costs due to the expense of engaging local counsel in multiple jurisdictions to ensure that the requirements for a valid security interest, and the perfection of that security interest, are met.[23]

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[20] In the United States, Sec. 301 of the 2001 version of Art. 1, Uniform Commercial Code (hereafter UCC), provides for parties to choose the applicable law in general, but requires that the law of the location of the collateral governs issues of priority; see *infra*, § 16.3. The UCC was drafted by the American Law Institute and the National Conference of Commissioners on Uniform State Laws and is available in various hard copy statutory supplements as well as online at the Cornell University Legal Information Institute, www.law.cornell.edu/ucc, last accessed 19 April 2014. Each of the 50 US states has adopted the UCC, with only minor variations across the states.

Another example of the application of the *lex rei sitae* is found in Italian law which requires that *in rem* rights in movable assets be governed by the law of the jurisdiction in which the assets are located; see U. Nunziante, Italy, in *International Secured Transactions* (Ed. D. Campbell) (2012), § 20:42 (referencing Art. 51, Law No. 218/1995).

[21] See *infra* § 16.3.

[22] See e.g. Nunziante, *supra* n. 20, § 20:42 (referencing Art. 9, Regulation of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations, No. 593/2008/EC (Rome I); OJ L 177/6 (2008), which permits EU member states to enforce 'mandatory rules' that safeguard critical public interests).

[23] See Hazan, *supra* n. 10, 223.

Second, the lack of a centralized international registry of security interests to establish clear priority of competing claimants creates uncertainty for creditors regarding the priority of their security interests.[24] Some states even have separate registries for each of their territorial units (as is true in the United States).[25] Given the multiple registries around the world, compounded by the different priority rules for each jurisdiction, creditors cannot easily determine their priority position with respect to competing creditors and claimants.[26]

Third, repossession of a satellite in orbit is virtually impossible and therefore specialized approaches to the enforcement of security interests are required in order to allow the creditor to gain control of the asset in the event of default (such as the cooperation of states where ground stations that control satellites are located).[27]

Finally, a satellite is of limited value to a creditor due to (1) the restrictions on the transfer of satellites under domestic laws;[28] (2) the difficulty of transferring licences required for the operation of a satellite to a new owner (such as licences to use the needed orbital positions and radio frequencies for communication satellites);[29] and (3) the difficulty of repositioning and repurposing a satellite for the use of another owner (since the technical requirements of a satellite may differ for the new owner/operator and the use of on-board fuel for repositioning will reduce the lifespan of the satellite).

Even in this challenging legal environment, practitioners can structure a transaction to minimize the risks posed by existing law. Since the priority of a security interest will likely be governed by the law of the

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[24] See Larsen, *supra* n. 15, 236.

[25] Regarding the registration of security interests in the United States, see *infra* § 16.3.

[26] See S. Ospina, The Concepts of Assets and Property: Similarities and Differences, and Their Applicability to Undertakings in Outer Space, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 21 and n. 17.

[27] See Davis, *supra* n. 8, 459; Hazan, *supra* n. 10, 223.

[28] As discussed below, restrictions on the transfer of space assets may arise in the context of export controls; see *infra* § 16.4.3.

[29] As an example of domestic legal restrictions placed on the transfer of licences for the operation of satellites, US federal law prohibits the transfer or assignment (including the grant of a security interest) of any licence granted by the Federal Communications Commission (FCC) to a satellite operator without the permission of the FCC; 47 U.S.C. § 310(d). However, some courts have upheld the creation of security interests in the *proceeds* of an FCC licence; see Nesgos, *supra* n. 1, § 30.06.1.

state in which the asset is located and the enforcement of a security interest may depend on the cooperation of the courts where a satellite is located (or where the stations controlling a satellite are located), it is critical that the transaction be structured so that states with inhospitable laws are avoided.

The practitioner must also examine the laws of those jurisdictions where the space asset may be located (or from where it will be controlled) to ensure that any legal requirements for the recognition and enforcement of the security interest have been met under the laws of each jurisdiction. This may require certain contractual elements and the filing of certain documents with state agencies (such as the filing of a financing statement with the appropriate state office under state law in the United States). Any control codes or other information needed to gain control of a satellite when enforcing a security interest should also be placed in escrow in a state that will allow for the easy enforcement of an agreement calling for the release of this information to the creditor upon the default of the debtor. In order to facilitate the transfer of any licences required for the operation of a satellite to a new owner when enforcing a security interest, the creditor should obtain the consent of the debtor for such transfer in the transactional documents and an assurance that the debtor will take all necessary actions to effect such transfer. Agreements ancillary to the operation of a satellite should also be assigned to the creditor, such as transponder leases, transponder service agreements, or tracking, telemetry and control agreements.

16.3 SECURED TRANSACTIONS UNDER ARTICLE 9 OF THE UNIFORM COMMERCIAL CODE

The following section describes the operation of Article 9 of the Uniform Commercial Code (UCC),[30] which has been implemented in all 50 of the US states and is frequently chosen as the applicable law for those satellite finance transactions involving a US party. Article 9 is a creditor-friendly law of secured transactions which facilitates secured lending by allowing for the easy creation of a security interest, clear priority rules, and low-cost enforcement of the security interest. However, as discussed in greater detail below, Article 9 is only one of a multiplicity of domestic laws that a court may decide to apply to a dispute arising out of the financing of a space asset that may cross borders prior to being launched

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30 *Supra*, n. 20.

or have connections to multiple jurisdictions due to the location and activities of the parties. Even if Article 9 is chosen in the transaction documents, parties cannot be certain that their choice of law will be respected by a court with jurisdiction over the matter.

A security interest can be created under Article 9 of the UCC against any type of space asset including satellites, space stations, launch vehicles and space planes. This interest can be created in favour of a lender upon the mere execution of a security agreement that grants a security interest in the asset.[31] The security interest can encompass the asset in its entirety or be restricted to particular components of the asset, such as the individual transponders of a communications satellite. Security interests can also be created in intangible property, such as launch licences or licences to use a particular radio frequency in orbit, as well as other property related to the space asset, such as transponder leases that the debtor has entered into with third parties.[32]

In order to ensure the priority of its security interest, the secured party will perfect the security interest by filing a financing statement with the Secretary of State's office in that state where the debtor is located. The secured party that is first to file a financing statement (or otherwise perfect a security interest) has priority over competing secured parties.[33] A perfected secured party will also have priority over other competing claimants, such as parties holding a judgment against the debtor and who have converted that judgment into a lien against the debtor's assets (known as a 'lien creditor' in the parlance of Article 9).[34]

If the debtor is a corporation, the debtor is located (and a financing statement must be filed) in the state of incorporation.[35] If a debtor is a foreign corporation and its headquarters are located in a jurisdiction 'whose law generally requires information concerning the existence of a non-possessory security interest to be made generally available in a filing, recording, or registration system as a condition or result of the

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[31] The creation of a security interest under Art. 9 requires that (1) value be given by the secured party to the debtor (typically in the form of a loan), (2) the debtor has rights in the collateral, and (3) a security agreement describing the collateral be signed by the debtor; Sec. 9-203(b), UCC, *supra* n. 20.

[32] A licence falls into the catch-all category of 'general intangibles' under Art. 9; Sec. 9-201(a)(42), UCC, *supra* n. 20. A transponder lease would be characterized as an 'account'; Sec. 9-201(a)(2), UCC, *supra* n. 20. However, see *supra*, n. 29, regarding restrictions on the transfer of certain licences.

[33] See Sec. 9-322(a), UCC, *supra* n. 20.

[34] See Sec. 9-317(a), UCC, *supra* n. 20.

[35] See Sec. 9-307(e), UCC, *supra* n. 20.

security interest's obtaining priority over the rights of a lien creditor', the secured party must file in that foreign jurisdiction.[36]

If the law of the corporation's jurisdiction does not provide for such a filing system, the debtor will be deemed located in the District of Columbia.[37] In order to avoid any risk arising from the uncertainty as to whether a foreign corporation will be deemed located where it has its headquarters or in the District of Columbia a secured party would be well advised to both perfect its security interest under the law of the foreign jurisdiction and file a financing statement in the District of Columbia. The state registries containing financing statements are indexed by the name of the debtor and can be searched, frequently online, by the general public. Prospective lenders can therefore quickly discover whether there may be other competing secured parties with priority by searching the UCC registry in that state where the debtor is located.

Potential problems could arise for a secured lender under the UCC if the collateral is located outside of the United States when the time comes to enforce the security interest. The UCC provides that the law of the *jurisdiction in which the collateral is located* governs priority issues.[38] When an asset is located in one of the 50 US states, the secured party will benefit from the clear priority rules of Article 9. However, when an asset is located in a foreign jurisdiction, the priority rules of that foreign jurisdiction will apply. This could result in the secured party's loss of priority depending on the nature of the foreign priority rules.

For example, as discussed above, German law grants priority to the security interest that was created first.[39] Although the secured party may have had priority under Article 9's 'first-to-file-or-perfect' rule, the

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[36] See Sec. 9-307(c), UCC, *supra* n. 20. To restate this rule, perfection will be governed by the law of a foreign jurisdiction if the headquarters of a foreign corporation is located in a jurisdiction that requires the filing of a document (similar to the filing of a financing statement in the United States) in order for the secured party to gain priority over a competing lien creditor – which would include, e.g., a party who won a court judgment against the debtor and converted it to a lien against the debtor's assets. Whether or not a foreign jurisdiction qualifies under Art. 9, UCC, can be a difficult question. A helpful analysis of this question can be found in A.S. Rosenberg, Classification of Foreign Filing Systems, in *Practice Under Revised Article 9* (Ed. S. Sepinuck) (2008), 105.

[37] See Sec. 9-307(c), UCC, *supra* n. 20.

[38] See Sec. 9-301(3) (C), UCC, *supra* n. 20.

[39] See *supra*, § 16.2.

secured party may have nevertheless created its security interest subsequent to the creation of another security interest in favour of another secured party – and would therefore lose priority under German law.[40]

This issue becomes more complicated when an asset is in orbit since an object in space is located outside the jurisdiction of any of the 50 US states and, as a result, the Article 9 rule applying the law of location of the collateral to priority issues creates uncertainty about the applicable law governing priority.[41] When faced with this situation, a court would have to fall back on a general choice-of-law analysis. The general UCC choice-of-law rule states that if 'a transaction bears a reasonable relation to [the state where the court sits] and also to another state or nation', the parties can choose the law of any of those jurisdictions.[42]

If the court finds that the chosen law does not 'bear a reasonable relation' to the transaction, the court will apply the UCC in force in the state where the court sits if the transaction 'bears an appropriate relation' to that state.[43] Either of these standards will likely be satisfied if one of the parties to the transaction has a connection to the state or if any of the transactional activity occurs within the state at issue. A number of states, such as New York, will apply their law if chosen in the transactional documents even if the transaction has no connection to that state.[44]

In practice, the result of this choice of law analysis will not matter provided that the law of one of the 50 US states is determined to apply since Article 9 has been adopted in all states and, as a result, the priority rules in all states are uniform. However, if a court determines that the

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[40] Under the UCC (*supra*, n. 20) 'first-to-file-or-perfect' priority rule, Bank A can have priority over Bank B even if Bank B created its security interest first if Bank A filed a financing statement first (a practice known as 'prospective filing').

[41] Art. II, Outer Space Treaty (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967)) establishes outer space as an international commons, similar to the high seas, by providing that '[o]uter space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty'. See further *supra*, § 2.3.1.2.

[42] See e.g. the applicable provisions under the laws of California and New York; Cal. Com. Code §1301 & N.Y. U.C.C. Law §1105 respectively.

[43] See again e.g. for California and New York; Cal. Com. Code §1301 & N.Y. U.C.C. Law §1105 respectively.

[44] *Cf.* N.Y. Gen. Obl. Law § 5-1401.

applicable law regarding priority is the law of a jurisdiction outside the United States, the outcome of a priority question between competing claimants would be settled under that law. To the extent to which there is uncertainty under the UCC regarding the applicable law governing priority, this flaw would be remedied by the Cape Town Convention,[45] which, if broadly ratified, would provide a single set of rules to govern the financing of space ventures.

In addition to providing clear priority rules, Article 9 allows the secured party to enforce its security interest quickly and at low cost. Upon the default of the debtor, a secured party has the right to repossess the asset and dispose of the asset (by way of sale, lease, licence or other manner).[46] The secured party may pursue these remedies without a court order, which reduces the expenditure of time and money in connection with enforcing these remedies. The only restriction on the debtor's disposition of the collateral is that the debtor must proceed in a 'commercially reasonable' manner.[47]

When the assets are located in the United States or are controlled by parties based in the United States, enforcement will generally proceed without significant obstacles. However, the enforcement of a security interest may prove problematic if the cooperation of foreign courts or officials is required. For example, if a US bank needs to enforce a security interest in a satellite while the satellite is awaiting launch beside a launch pad at the Baikonur Cosmodrome in Kazakhstan, the bank may need a local court in Kazakhstan to issue an order allowing for an agent of the bank to take possession of the satellite.

Whether the Kazakh court will issue such an order is unpredictable. The bank could seek an order from a US court requiring the satellite operator to relinquish possession, but the ability of the court to compel the operator to do so would require the court's personal jurisdiction over the operator and would also depend on the effectiveness of the court's threat of sanctions in compelling the operator to comply with the court order. Personal jurisdiction will likely be found if the operator has been engaging in financial transactions with the US bank. But the operator may nevertheless choose to go ahead with the launch of the satellite in violation of the order of the US court. In that case, the cooperation of the Kazakh courts and local officials would be needed to stop the launch and

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45 Convention on International Interests in Mobile Equipment (hereafter Cape Town Convention), Cape Town, done 16 November 2001, entered into force 1 April 2004; ICAO Doc. 9793; see further *infra*, § 16.4.

46 See Secs. 9-609(a), 9-610(a), UCC, *supra* n. 20.

47 See Sec. 9-610(b), UCC, *supra* n. 20.

deliver the satellite to the bank since a US court has no authority to enforce its orders abroad.[48]

An additional feature of Article 9 that serves to protect the interests of the secured party is the ability of the secured party to enforce its security interest even after the debtor has entered insolvency. Article 9 achieves this by giving a secured party priority over the trustee in bankruptcy provided that the secured party is perfected before the debtor enters insolvency.[49] This protection of the secured party's interests is also recognized under US federal bankruptcy law, which allows the secured party relief from the automatic stay that is placed on all actions against a bankrupt party's assets so that the secured party may enforce its security interest against the relevant collateral.[50]

16.4 THE UNIDROIT CONVENTION ON INTERNATIONAL INTERESTS IN MOBILE EQUIPMENT AND THE SPACE ASSETS PROTOCOL

The harmonization and modernization of the law governing secured debt and lease transactions would improve the ability of new market entrants and other parties engaged in asset-backed finance to attract capital under beneficial terms for space ventures. The Convention on International Interests in Mobile Equipment, which was drafted under the auspices of UNIDROIT, promises such improvement by establishing an international legal regime governing the asset-backed financing of space assets (in addition to aircraft and rolling stock).[51] This Convention was concluded

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[48] The enforcement of US court orders abroad can indeed be problematic. For example, Russian law does not provide for the enforcement of a foreign court order unless a treaty is in place between the Russian Federation and the state where the order was issued; see W.D. Morriss *et al.*, Russian Federation, in *International Secured Transactions* (Ed. D. Campbell) (2012), § 27:94.

[49] See Sec. 9-317(a), UCC, *supra* n. 20. A trustee in bankruptcy is characterized as a type of 'lien creditor' under Art. 9 which allows for the application of the general priority rule governing contests between secured parties and lien creditors upon the insolvency of the debtor.

[50] Sec. 362(d), Bankruptcy Act, 11 U.S.C., allows for the automatic stay to be lifted upon motion by a perfected secured creditor.

[51] Cape Town Convention, *supra* n. 45; www.unidroit.org/instruments/security-interests/cape-town-convention, last accessed 19 April 2014.

in 2001 at a diplomatic conference held in Cape Town, South Africa, and is therefore commonly referred to as the Cape Town Convention.

The Space Assets Protocol to the Cape Town Convention was concluded and opened for signature in Berlin on 9 March 2012.[52] Provided that the Protocol enters into force and is broadly ratified, space companies and their creditors will no longer have to navigate a host of domestic laws of questionable efficacy, but will be able to rely on a single set of rules that govern their transaction.[53] This uniformity will eliminate the uncertainty of the existing patchwork of domestic laws and the increased transactional costs that result therefrom.

The Convention and Protocol provide for a transparent method for ensuring a creditor's priority over competing claimants and allow creditors to easily enforce remedies that are tailored to the special nature of space assets. As a result, financial institutions will be able to more easily rely on gaining recourse to a debtor's space assets in the event of the debtor's default. This will enable space companies with limited terrestrial assets to seek the benefits of asset-backed finance which will, in turn, reduce the cost of borrowing money – and will even make debt financing available where it would not have been possible prior to the Convention and Protocol.

This effect of reducing the cost of money was concretely illustrated when the Aircraft Protocol to the Cape Town Convention[54] entered into force and the Export-Import Bank of the United States reduced by

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[52] Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (hereafter Space Assets Protocol), Berlin, done 9 March 2012, not yet entered into force; UNIDROIT Doc., DCME-SP–Doc. 43; also www.unidroit.org/english/workprogramme/study072/spaceprotocol/conference/documents/dcme-sp-43-e.pdf, last accessed 10 February 2014. For a more detailed analysis of the Cape Town Convention and the Space Assets Protocol see R. Goode, *Convention on International Interests in Mobile Equipment and Protocol Thereto on Matters Specific to Space Assets: Official Commentary* (2013); M.J. Sundahl, *The Cape Town Convention: Its Application to Space Assets and Relation to the Law of Outer Space* (2013).

[53] The provisions of the Cape Town Convention, *supra* n. 45, and the Space Assets Protocol, *supra* n. 52, will apply to a transaction if (1) the debtor/lessee is located in a state that is a party to the Convention and Protocol when the international interest is created and (2) the state in which the international interest is being enforced is a party to the Convention and Protocol (or the courts of the state agree to apply the provisions of the Convention and Protocol under their choice of law rules); see Art. 3, Cape Town Convention.

[54] Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Aircraft Equipment (Aircraft Protocol), Cape Town, done 16 November 2001, entered into force 1 April 2004; ICAO Doc. 9794.

one-third its exposure fee on the export financing of certain commercial aircraft for buyers in states party to the Convention.[55] The improvements to the law of secured transactions will also be beneficial to project finance structures which rely on a strong security package. Two commentators have also predicted that the Space Assets Protocol will have a positive impact on leveraged buyouts in the space industry which involve the acquisition of satellite operators with borrowed funds.[56] The Convention also applies to the leasing and sale of space assets and promises to provide greater clarity and uniformity in these areas of the law as well.[57]

As described in the following paragraphs, the Cape Town Convention contains all of the features needed to facilitate asset-backed transactions and, in fact, echoes many of the provisions of Article 9 of the UCC. In addition, the Convention is particularly well suited to transactions involving space assets because the Space Assets Protocol contains rules that are tailored to the idiosyncratic needs of the space industry. The special issues that arise in the context of the space industry include the various licensing requirements involved in the operation and transfer of satellites and launch vehicles (such as licences for the use of orbital slots and radio frequencies and the licences for the transfer of space technology under export control laws) and the need to implement safeguards to protect against the interruption of public services that rely on satellite services (such as air traffic control systems).

16.4.1 The Scope of the Cape Town Convention and the Nature of an 'International Interest'

The Cape Town Convention governs 'international interests' in 'space assets'.[58] Although the term 'international interest' is of new coinage, it is

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55 For studies regarding the economic impact of the Cape Town Convention with respect to the aviation industry, see A. Saunders & I. Walter, Proposed UNIDROIT Convention on International Interests in Mobile Equipment as Applicable to Aircraft Equipment Through the Aircraft Equipment Protocol: Economic Impact Assessment, 23 *Air & Space Law* (1998), 339; A. Saunders *et al.*, The Economic Implications of International Secured Transactions Law Reform: A Case Study, 20 *University of Pennsylvania Journal of International Economic Law* (1999), 309.

56 See S. Kozuka & F. Taniguchi, The Economic Assessment of the Space Assets Protocol to the Cape Town Convention, in *Proceedings of the International Institute of Space Law 2011* (2012), 409.

57 See Art. 2(2)(c), Cape Town Convention, *supra* n. 45; Art. IV(1), Space Assets Protocol, *supra* n. 52.

58 See Arts. 1(o), 2(2), Cape Town Convention, *supra* n. 45.

a composite of three familiar types of interests: a security interest, the interest held by the conditional seller under a title reservation agreement, and the interest of a lessor.[59] The natures of these interests are distinct, but they share features that justify their treatment in the same legal regime as 'international interests'. In addition to their common purpose of financing the acquisition of space assets (either through a true sale with a security interest, a conditional sale or a lease), each of these transactions requires remedies that will enable the seller, chargee or lessor to retrieve or resell the equipment in the event of default. In other words, each of these transactions provides for recourse to the underlying asset – thus allowing all of these transactions to be characterized as 'asset-backed' transactions.

Briefly stated, a security interest arises when a debtor (the 'chargor') takes a loan from a creditor (the 'chargee') – or otherwise incurs a monetary obligation to the creditor by, for example, purchasing an item on credit – and then grants the creditor recourse to the debtor's property in the event that the debtor defaults on the repayment of the obligation. The debtor's property serves as collateral for the obligation, thus providing assurance to the creditor that even in the event of default the obligation will be repaid (since the creditor will have the right to sell the collateral or otherwise realize upon its value).[60]

A conditional sale is closely related to a security interest that arises in the context of a credit sale. However, whereas a seller that takes a security interest in collateral does not have title to the collateral, a conditional seller retains title in the sold item until final payment is made (and other conditions of the sale are fulfilled).[61] In the event of default, the conditional seller takes back the item that was sold and is thus protected from financial loss. A conditional sale is documented by a title reservation agreement.

Leases were also included in the Cape Town Convention because the lease is a common method employed by airlines to acquire the use of aircraft – as well as being a common way for companies to acquire the use of satellite transponders. The basic nature of a lease is familiar to most. The lessor provides the use of its equipment for a certain period of time (the 'term' of the lease) in exchange for periodic payments. Title remains with the lessor during the term of the lease, and when the term

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59 See Art. 2(2), Cape Town Convention, *supra* n. 45.
60 See Art. 1(ii), Cape Town Convention, *supra* n. 45.
61 See Art. 1(ll), Cape Town Convention, *supra* n. 45.

expires the lessee has no further right to use the equipment and must return it to the control of the lessor.

The definition of 'space asset' must also be considered to determine whether a transaction comes within the ambit of the Cape Town Convention. Although the term 'space asset' is mentioned in the Convention, it is defined only in the Space Assets Protocol.[62] Pursuant to the rather complicated definition of space asset, not every object in space can treated as a space asset that is subject to the Convention. Instead there are a number of requirements that must be met before a transaction involving the object will be governed by the Convention.

First, the object must be 'man-made'.[63] An asteroid or minerals mined from the moon or another celestial body will not qualify as a space asset. Second, the object must be 'uniquely identifiable'.[64] This ability to identify the specific asset is essential to the registration of the space asset in the International Registry (since the registry will be indexed by the specific asset that is subject to an international interest). Third, the object must either be 'in space or designed to be launched into space'.[65] This allows for the creation of an international interest not only in an object that is already in space, but also for a space object that has not yet been launched. Fourth, in order to come within the scope of the Convention the asset must be a 'spacecraft', a 'payload', or a part of a spacecraft or payload. Fifth, the asset must be separately registrable pursuant to the regulations governing the registration of international interests in space assets.[66] If these five requirements are met, an international interest can attach to the asset in question and the Convention and Protocol will extend to all parts or equipment 'installed, incorporated or attached' to the space asset as well as to 'all data, manuals and records relating thereto'.[67]

16.4.2 Formation of an International Interest

With regard to the formation of an international interest in a space asset, the Cape Town Convention takes a minimalist approach that greatly benefits the parties to the transaction. The formalities for the creation of

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62 See Art. I(2)(k), Space Assets Protocol, *supra* n. 52.

63 See *ibid.*

64 See Art. 2(2), Cape Town Convention, *supra* n. 45; Art. I(2)(k), Space Assets Protocol, *supra* n. 52.

65 Art. I(2)(k), Space Assets Protocol, *supra* n. 52.

66 See Art. I(2)(k)(ii) & (iii), Space Assets Protocol, *supra* n. 52.

67 Art. I(2)(k), Space Assets Protocol, *supra* n. 52.

an international interest are few and these few formalities are themselves rather flexible. This allows parties to easily grant an international interest while minimizing the risk to the creditor that the international interest will be invalidated due to the failure to adhere to transactional formalities.

There are three basic requirements for the creation of an international interest: (1) an agreement in writing;[68] (2) the power of the debtor to dispose of the asset;[69] and (3) proper identification of the asset in the agreement.[70] In the case of a security interest, the Cape Town Convention imposes the additional requirement that the security agreement 'enables the secured obligations to be determined, but without the need to state a sum or maximum sum secured'.[71]

16.4.3 Remedies

The Cape Town Convention also provides for the efficient exercise of remedies by generally allowing the creditor recourse to the asset without a court order.[72] Different remedies are provided under the Convention for chargees as opposed to lessors and conditional sellers. This is due to the fact that lessors and conditional sellers retain title to the asset involved in the transaction. Therefore, while the core remedy of the lessor and conditional seller is to regain possession of the asset, the chargee's remedies provide a mechanism for the chargee to generate money through the disposition of the asset – although under some circumstances

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[68] See Arts. 1(a) & 7(a) with chapeau, Cape Town Convention, *supra* n. 45.

[69] See Art. 7(b), Cape Town Convention, *supra* n. 45.

[70] See Art. 7(c), Cape Town Convention, *supra* n. 45; see also Art. VII(1), Space Assets Protocol, *supra* n. 52.

[71] Art. 7(d), Cape Town Convention, *supra* n. 45.

[72] It should be noted that a state has the option of making a declaration requiring a court order for any of the remedies contained in the Cape Town Convention, *supra* n. 45, or Space Assets Protocol, *supra* n. 52; see Art. 54(2), Cape Town Convention. Practitioners and parties should be aware of any such declarations limiting the ability of the creditor to exercise remedies in relevant states prior to entering into a transaction under the Convention. In the event that the creditor would like the assistance of the courts in the exercise of a remedy, the creditor is permitted to seek a court order under the Convention; see Arts. 8(2), 10(b), Cape Town Convention. A creditor may want such assistance if the debtor is uncooperative and threatens to create obstacles to the efficient exercise of a remedy.

the chargee may itself take title to the asset to satisfy the debtor's obligation.

When pursuing a remedy under the Cape Town Convention, the creditor must comply with only a few technical requirements set out in the text of the Convention. However, there is also a general requirement that all remedies must be carried out in a 'commercially reasonable manner'.[73] The meaning of this standard will be left to the court which will likely look at customary industry practices when making its determination. The Space Assets Protocol creates a 'safe harbour' for satisfying the requirement of commercial reasonableness by stating that the standard is met if the remedies are carried out in accordance with a provision of the parties' agreement, unless the provision is 'manifestly unreasonable'.[74] In the event that the enforcement of a remedy has been delayed due to litigation, a creditor may apply to a court for interim relief pending the resolution of the issue before the court.[75] The type of interim relief granted may be of any type that the court sees fit, including preservation of the asset and its value, possession or control of the asset, or lease of the asset.[76]

Upon default, the chargee has a right to take possession of the collateral, sell or lease the collateral, and collect income from the continued use of the collateral.[77] The chargee can only pursue these remedies if the chargor has agreed in advance.[78] This requirement would appear to create a significant obstacle to the efficient enforcement of a security interest – and render the security interest of little, if any, value. However, this apparent obstacle can be easily removed by requiring the chargor to agree in the security agreement that upon default the chargor will have the right to pursue all remedies provided by the Cape Town Convention and Space Assets Protocol.

The chargee's right to collect 'any income or profits arising from the management or use of' the asset does not provide the chargee with the right to take control of the asset and operate it for profit.[79] Instead, the chargee only has the right to any income stream that flows from the operation of the asset. For a telecommunications satellite, this income might take the form of payments on transponder leases. Income related to

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73 Art. XVII(1), Space Assets Protocol, *supra* n. 52.
74 See Art. XVII(1), Space Assets Protocol, *supra* n. 52.
75 See Art. 13(1), Cape Town Convention, *supra* n. 45.
76 See Art. 13(1), (4), Cape Town Convention, *supra* n. 45.
77 See Art. 8(1), Cape Town Convention, *supra* n. 45.
78 See *ibid.*
79 See Art. 8(1)(c), Cape Town Convention, *supra* n. 45.

remote sensing satellites might include payments made by third parties for photographs or other sensed data. This remedy provides a valuable option to a chargee in the event that the sale or lease of the asset is not possible or must be postponed due to market conditions or other reasons. A further remedy that is available to the chargee upon the debtor's default is for the chargee to take title to the collateral in satisfaction of all, or part, of the underlying obligation.[80] However, the debtor's interest in the collateral may vest in the chargee only if other parties holding a security interest and other 'interested persons', as defined in the Convention, agree to the vesting.[81]

The remedy for a lessor or for a conditional seller upon default is a simple one: terminate the agreement and either (1) retake possession of the asset or (2) take control of the asset.[82] Restoring title to the lessor or conditional seller is not necessary because title was never lost. If the debtor resists repossession, the lessor or conditional seller can choose to seek a court order to allow for the lessor or conditional seller to take possession or control of the asset.[83]

The Space Assets Protocol provides for special remedies upon the insolvency of the debtor, but only if the state with 'primary insolvency jurisdiction' has made a declaration to provide for such remedies.[84] In its declaration, the state can choose to apply one of the two optional sets of insolvency remedies. If the state of 'primary insolvency jurisdiction' chooses not to make a declaration, its existing domestic law will govern the insolvency proceedings.

The first set of remedies that a state may choose to adopt, referred to as 'Alternative A' in the Protocol, is the more creditor-friendly of the two options. The core obligation under this option is that the debtor (or insolvency administrator) must give possession or control of the collateral to the holder of an international interest no later than the earlier of (1) the end of the 'waiting period' which has been established by the state with primary insolvency jurisdiction in its declaration or (2) the date on which the creditor would have received possession or control under other applicable law if no declaration regarding the waiting period had been made.[85]

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[80] See Art. 9(1), Cape Town Convention, *supra* n. 45.

[81] See *ibid.*

[82] See Art. 10, Cape Town Convention, *supra* n. 45.

[83] See *ibid.*

[84] See Art. XXI(1), Space Assets Protocol, *supra* n. 52.

[85] See Arts. XXI Alternative A(2), XXI Alternative A(4), Space Assets Protocol, *supra* n. 52.

Under the second option, Alternative B, a state may choose a significantly less creditor-friendly set of remedies. The core remedy under this alternative only requires the debtor or insolvency administrator, upon the occurrence of an 'insolvency-related event' (and following the request of the creditor), to notify the creditor within the time period established by the state in its declaration that either (1) all defaults, other than the initiation of an insolvency proceeding, will be cured and that all obligations will be performed or (2) the creditor will be permitted to take possession of or control over the space asset in accordance with other applicable law.[86]

The difference between Alternative A and Alternative B is stark. Although there is still a time limit by which the debtor or insolvency administrator must act under Alternative B, control over the asset need not be transferred by the expiration of the time limit. Instead, the debtor or insolvency administrator need only give notice by the end of the time period. When possession and control are actually transferred is a matter of other applicable law.

The Space Assets Protocol places certain limitations on the enforcement of remedies in order to protect against the improper transfer of technology that may have military applications. The potential military value of space technology has resulted in the close supervision of the transfer of such technology by many states – and particularly by those states that participate in the Wassenaar Arrangement.[87] The laws of a particular state may require a licence prior to the export of a space asset or the transfer of a space asset to a foreign national. The drafters of the Protocol ultimately decided to allow states to retain the control over the transfer of such technology regardless of a creditor's right to effect a transfer under the Convention by allowing a state's courts to refuse to enforce an international interest if such enforcement would conflict with

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[86] See Art. XXI Alternative B(2), Space Assets Protocol, *supra* n. 52.

[87] Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (Wassenaar Arrangement), Wassenaar, done 19 December 1995, effective 12 July 1996; www.wassenaar.org/, last accessed 10 February 2014; see further *supra*, § 6.6.2, also §§ 7.5.1.2, 7.5.2.1. States participating in the Wassenaar Arrangement impose controls on the transfer of military and dual-use to foreign nationals. For example, the transfer of most space technology is controlled in the United States under the International Traffic in Arms Regulations (ITAR) which require a licence from the Department of State prior to the export of such technology. See, generally, M.J. Sundahl, Space Tourism and Export Controls: A Prayer for Relief, 75 *Journal of Air Law & Commerce* (2010), 581 ff.

its export controls or national security laws.[88] Even when a court is not involved with the enforcement of a remedy that results in, for example, the sale of a controlled space asset to a foreign purchaser, the Convention should not be interpreted to permit this transfer without the procurement of the required licences. Such an interpretation would eviscerate export control laws and would allow controlled military technology to fall into dangerous hands.

The Space Assets Protocol also explicitly preserves a state's right to regulate (1) the 'launch or operation of space assets', (2) the provision of services that rely on the use of space assets, such as telecommunications services, (3) the use of orbital positions and frequencies, and (4) the placement of command codes.[89] As a result, if a creditor sells a debtor's communications satellite to a new operator following the debtor's default, the purchaser's use of that satellite could be contingent on the granting of a licence by the state that has the right to regulate the operation of the satellite. Moreover, the Protocol preserves a state's right to place limitations on the transfer of any 'licences, approvals, permits or authorisations' that may be held by the debtor relating to the use of the space asset as well as the use of an orbital position or radio frequency.[90]

Another feature unique to the Space Assets Protocol concerns the limitations placed on the enforcement of remedies that might have a deleterious effect on public services, such as communications, navigation, air traffic control, tele-medicine, tele-education, natural disaster monitoring, and disaster management. For example, consider a scenario in which a debtor owned and operated a satellite subject to a security interest that played an integral role in a state's air traffic control system and the debtor defaulted. The creditor might sell the satellite to another operator who could decide to move the satellite to another orbit and thus disrupt the operation of the air traffic control system. This concern was so significant among the drafters that a provision was drafted to prevent creditors, under certain conditions, from enforcing remedies against space assets used in the provision of public services.[91] This stay of the enforcement of remedies will only take effect if a 'public service notice'

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[88] *Cf.* Art. XXVI(3), Space Assets Protocol, *supra* n. 52.

[89] Art. XXVI(1), (2)(b) & (2)(c), Space Assets Protocol, *supra* n. 52.

[90] Arts. I(2)(e), XXVI(2)(a), Space Assets Protocol, *supra* n. 52.

[91] For a discussion regarding limiting remedies with respect to assets that impact public services see Lochan, *supra* n. 11, 6–49; Y. Zhao, Revisiting Selected Issues in the Draft Protocol to the Cape Town Convention on Matters Specific to Space Assets, 76 *Journal of Air Law & Commerce* (2011), 805.

is registered in connection with the registration of the international interest concerning the relevant space asset.[92]

The public service notice describes the nature of the services that have been contracted for between the public services provider and the debtor (in addition to any other requirements imposed by the registration regulations).[93] If a public service notice is registered, a creditor cannot enforce any remedy against a space asset if the enforcement of that remedy would render the space asset 'unavailable for the provision of the relevant public service' until (1) the creditor registers a notice with the Registry stating that the creditor may take action to enforce remedies if the debtor fails to cure the default before the expiration of a stated cure period and (2) the cure period elapses without the default being cured.[94] The cure period will be a period of time (between three and six months in length) that has been established in a declaration by the state utilizing the public service.[95] If the default is not cured within that applicable period, the creditor is free to pursue the remedies under the Cape Town Convention and Space Assets Protocol. In the meantime, the creditor, the debtor and the public services provider are required to cooperate in good faith to find a commercially reasonable way to enable the continuation of the public service (whether such solution involves the use of the space asset or not).[96]

16.4.4 Registration and Priority

As stated above, the extent to which a law of secured transactions provides the assurance needed by financiers to bring down the cost of financing also depends largely on the clarity of its priority rules. If a bank cannot be assured a first-priority security interest in the debtor's collateral, that bank will either be unwilling to lend money or will do so at a high rate of interest in order to protect itself against losses following a default.

The Cape Town Convention excels in this respect by adopting a simple 'first-to-file' priority rule that utilizes an online centralized international

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[92] See Art. XXVII(1), Space Assets Protocol, *supra* n. 52.

[93] See Art. XXVII(2)(a), Space Assets Protocol, *supra* n. 52.

[94] Art. XXVII(3) & (4), Space Assets Protocol, *supra* n. 52.

[95] The length of the cure period must by declared by all states upon ratification, acceptance, approval of, or accession to the Protocol; see Art. XXVII(4), Space Assets Protocol, *supra* n. 52.

[96] See Art. XXVII(7)(a), Space Assets Protocol, *supra* n. 52.

registry.[97] Under this rule, priority is determined simply by the date of registration, which results in a priority system that is predictable and not easily challenged. This centralized online registry, together with the clear priority rules contained in the Convention, will give banks the needed confidence in the priority of their security interests because a bank can easily search online to determine whether any other creditor has registered an international interest relating to a specific asset. If no such registration is found, the bank can register its international interest through the online system and thus establish its first-priority right to foreclose on the asset in the event of default.

In addition to being a single, centralized registry that will eliminate the need for parties to search multiple domestic registries, the registry is accessible online at all times so that parties can receive instantaneous information about existing registrations 24 hours a day.[98] This allows transactions to move forward with greater efficiency than would be possible if multiple domestic registries had to be searched and search results were only available by less efficient means (for example, by mail).

The Convention and Protocol call for the appointment of a Supervisory Authority to create an International Registry that will contain the registrations and recordings of the covered interests and then appoint (and supervise) a Registrar to manage the registry.[99] During the Diplomatic Conference for the adoption of the Protocol, the International Telecommunication Union (ITU) was invited to serve as the Supervisory Authority.[100] At the time of writing, the ITU has not yet decided whether to accept the invitation, discussing the question at its October 2014 Plenipotentiary Conference.[101] The Supervisory Authority also

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[97] The ‘first-to-file’ priority rule is also a feature of certain domestic secured transactions laws, such as the Civil Code of Japan; see H. Kojima *et al.*, Japan, in *International Secured Transactions* (Ed. D. Campbell) (2012), § 21:27. Alternative methods of determining priority include granting priority to the security interest that was created first, as is true under German law; see *supra*, § 16.2. A hybrid approach is found in the UCC, which gives priority to the party that is either the ‘first-to-file-or-perfect’ its security interest; see *supra*, § 16.3.

[98] See Art. XXXII(5), Space Assets Protocol, *supra* n. 52.

[99] See Arts. 16 & 17, Cape Town Convention, *supra* n. 45; Art. XXVIII, Space Assets Protocol, *supra* n. 52.

[100] For a general discussion of the ITU and its functions see *supra*, § 8.2.

[101] See P. de Selding, ‘Space Protocol’ Widely Opposed by Industry Is on Agenda for ITU Meeting in Korea, *Space News*, 14 October 2014; http://www.spacenews.com/article/satellite-telecom/42185%E2%80%98space-protocol%E2%80%99-widely-opposed-by-industry-is-on-agenda-for-itu, last accessed 27 October 2014.

promulgates the regulations that govern the operations of the registry, including the processes for registering interests and searching the registry.[102]

The successful creation of an international interest gives the secured party, the conditional seller and the lessor the right to avail themselves of the remedies set forth in the Convention and Protocol in the event of default. It is not necessary to register the international interest in order to take advantage of these remedies. However, it is necessary to register the international interest in order to ensure the priority of the secured party, conditional seller or lessor over other competing claimants to the space asset.

16.4.5 Assignment of 'Debtor's Rights'

The Space Assets Protocol expands its scope of application in a way that is not found in either the Aircraft Protocol or the Rolling Stock Protocol[103] by providing for the assignment of so-called 'debtor's rights'.[104] Debtor's rights are defined as 'rights to payment or other performance due or to become due to a debtor by any person with respect to a space asset'.[105] In other words, the Protocol provides for the assignment by a debtor of any income stream payable to the debtor that is related to a space asset.

For example, the owner of a telecommunications satellite who has granted a security interest in the satellite to a bank can also assign to the bank the owner's right to collect lease payments from a television broadcaster. However, the definition of 'debtor's rights' is worded broadly so as to include not only payment rights, but the rights to any other obligation owed to the satellite owner in connection with the satellite. The concept of a 'rights assignment' is also broadly drawn to include not only the assignment of such debtor's rights for purposes of security, but to also include the assignment of an ownership interest in the debtor's rights.[106]

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102 See Art. 17(2)(d), Cape Town Convention, *supra* n. 45.

103 Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Railway Rolling Stock (Rolling Stock Protocol), Luxembourg, done 23 February 2007, not yet entered into force, www.unidroit.org/english/conventions/mobile-equipment/railprotocol.pdf, last accessed 10 February 2014.

104 See Art. II(1), Space Assets Protocol, *supra* n. 52.

105 Art. I(2)(a), Space Assets Protocol, *supra* n. 52.

106 See Art. I(2)(h), Space Assets Protocol, *supra* n. 52.

This expansion of the Protocol into the assignment of debtor's rights brings within the ambit of the Protocol classes of property that are not contemplated by the Cape Town Convention. Instead of being narrowly applicable to transactions involving space assets, the Protocol applies to transactions involving accounts receivable, payment instruments, and any number of other forms of performance obligations that could be owed to the owner of a space asset.

However, there are some criteria that must be met in order for these transactions to be governed by the Protocol. For a rights assignment to come within the scope of the Protocol, the debtor's rights related to a particular space asset must be assigned in order to secure, reduce or discharge an obligation that is already secured on (or otherwise associated with) the same space asset.[107] For example, a debtor's assignment of satellite lease payments to a creditor will be governed by the Protocol if the debtor has already granted a security interest in the same satellite to the creditor. In contrast, if the debtor assigns as security this income stream by itself (without a separate international interest existing in the satellite), the Protocol will not apply.

The formal requirements for the documentation of an assignment of debtor's rights are kept to a minimum, as is true for the creation of an international interest.[108] First, there must be a written agreement that enables (1) the debtor's rights to be identified and (2) the space asset related to the debtor's rights to be identified.[109] An additional requirement for a rights assignment is imposed when debtor's rights are assigned to secure an obligation.[110] When making an assignment by way of security, the writing documenting the assignment must also provide information that enables the secured obligation to be determined. The Protocol also provides for a creditor who has been assigned debtor's rights to reassign those rights (or a portion thereof), which is referred to as a 'rights reassignment'.[111] Subsequent assignments of the same rights can also take place.[112] Such reassignments are subject to the same provisions of the Protocol that apply to original assignments of debtor's rights.[113]

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[107] See *ibid.*
[108] See Art. IX, Space Assets Protocol, *supra* n. 52.
[109] See Art. IX(a), (b), Space Assets Protocol, *supra* n. 52.
[110] See Art. IX(c), Space Assets Protocol, *supra* n. 52.
[111] See Arts. I.2(i), XV, Space Assets Protocol, *supra* n. 52.
[112] See Art. I.2(i), Space Assets Protocol, *supra* n. 52.
[113] See Art. XV(1), Space Assets Protocol, *supra* n. 52.

In order to ensure an assignee's priority, the assignee must 'record' the assignment by adding a record of the assignment to the registration of the related international interest.[114] The assignee can add this record of the assignment at the time of registration or anytime afterwards by amending the registration.[115] This record of the rights assignment need not specifically describe the nature of the debtor's rights. A mere statement that the debtor has assigned all or some of the debtor's rights (or that the holder of the related international interest has acquired such rights) is sufficient since it places the public on notice that the holder of the international interest has an interest in the debtor's rights – leaving it to the third party to inquire further of the debtor regarding the particular rights that have been assigned or otherwise acquired.[116] This recording of a rights assignment is otherwise treated in the same manner as the registration of an international interest. A search for the recording of a rights assignment can be carried out by searching for the particular space asset related to the assigned rights.

16.4.6 Sales

The Space Assets Protocol extends the operation of the Convention to the sale of space assets.[117] The Convention operates to clarify which party has better title to a space asset in the event that multiple parties make competing claims and, as a result, can ensure a buyer that its title is secure. For example, a buyer of an on-orbit satellite can ensure, by registering its sale first, that it has superior title to the satellite in the event that the prior owner subsequently sells the satellite to another buyer – just as a creditor with a security interest in a satellite can ensure that it has priority over a competing claimant that later acquires a security interest in the same satellite by registering first.

The mechanics of registering the sale of a space asset are the same as when registering an international interest. For example, the asset must be described in the same way that the asset would be described when registering an international interest. Prospective registrations are also permitted so that a buyer can ensure its priority before releasing funds.

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[114] See Art. XII(1), Space Assets Protocol, *supra* n. 52. The reassignment of debtor's rights by the creditor (the original assignee) can only be recorded on the registration of the assignment of the international interest to that subsequent assignee; see Art. XV(2).

[115] See Art. XII(1), Space Assets Protocol, *supra* n. 52.

[116] See *ibid.*

[117] See Art. IV, Space Assets Protocol, *supra* n. 52.

16.4.7 The Cape Town Convention's Relation to the UN Space Treaties and ITU Instruments

The Cape Town Convention's application to satellites and other space assets through the Space Assets Protocol raises a number of issues that spring from the intersections between these instruments and the existing body of the law of outer space. International space law is primarily embodied in five treaties that were created in the 1960s and 1970s under the auspices of the United Nations. These treaties address a multiplicity of issues from national sovereignty, liability, and jurisdiction to the militarization of space, the duty to return errant spacecraft to the launching state, and the requirement to register space objects. They are the Outer Space Treaty,[118] the Rescue Agreement,[119] the Liability Convention,[120] the Registration Convention,[121] and the Moon Agreement.[122]

In addition to these treaties, the Constitution and Convention of the International Telecommunication Union comprise a body of international law that governs the use of orbital positions and radio frequencies – a regulatory system that is central to the orderly operation of the global telecommunications industry.[123]

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118 *Supra*, n. 41. See in general on the Outer Space Treaty *supra*, § 2.3.1.

119 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968). See in general on the Rescue Agreement *supra*, § 2.3.2.

120 Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971). See in general on the Liability Convention *supra*, § 2.3.3.

121 Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975). See in general on the Registration Convention *supra*, § 2.3.4.

122 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979). See in general on the Moon Agreement *supra*, § 2.3.5, also § 14.4.2.2.

123 Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July

The Cape Town Convention differs from the earlier space treaties in that it is concerned with private international law and, as a result, governs private transactions rather than governmental activity.[124] This stark difference in the subject matter of the Convention in contrast to the existing space treaties results for the most part in an absence of conflicts between the treaties.[125] Nevertheless, some intersections do arise and must be kept in mind by practitioners and courts that are involved in the application of the Convention. In some cases, these intersections of the Cape Town Convention with existing space law create potential conflicts that may be problematic to the practitioner. Where there are true conflicts between the Cape Town Convention and existing UN space treaties (including the ITU instruments), Article XXXV of the Protocol explicitly establishes the primacy of the existing treaties. In other cases, the interaction between these different systems of law creates new synergies that may result in the more effective operation of the law.

Some of the issues that arise are not new. For example, the fact that liability for damage caused by a satellite remains with the 'launching State' even if the satellite has been sold to a company incorporated in another state has been a controversial issue ever since satellites were first bought and sold among private parties.[126] The liability imposed by the treaties on a 'launching State' is perpetual, with only a few narrow

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1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1; regularly amended since; *cf.* www.itu.int/pub/S-CONF-PLEN-2011/en, last accessed 19 February 2014; and the Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71; regularly amended since; *cf.* www.itu.int/pub/S-CONF-PLEN-2011/en, last accessed 19 February 2014. See in general on the role of the ITU *supra*, § 8.2.

[124] See P.B. Larsen, Critical Issues in the UNIDROIT Draft Space Protocol, in *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 4 ff.

[125] See H.P. van Fenema, The UNIDROIT Space Protocol, the Concept of 'Launching State', Space Traffic Management and the Delimitation of Outer Space (Report of the 41st Session of the UN COPUOS Legal Subcommittee), 27 *Air & Space Law* (2002), 275; Larsen, *supra* n. 124, 3. For the views of the UN COPUOS Legal Subcommittee see Report of the Legal Subcommittee on its Forty-first session, U.N. Doc A/AC.105/787 (2002).

[126] See e.g. von der Dunk, *supra* n. 3, 351; M. Chatzipanagiotis, Registration of Space Objects and Transfer of Ownership in Orbit, 56 *Zeitschrift für Luft- und Weltraumrecht* (2007), 230; R.J. Lee, Effects of Satellite Ownership Transfers on

exceptions. For example, if State X launches a satellite, sells the satellite five years later to State Y, and, due to State Y's negligence, the satellite reenters the atmosphere and causes extensive damage on the surface of the Earth, State X will bear absolute liability for the damage under the Liability Convention.[127]

Although this issue is not new, the Cape Town Convention places greater stress on those areas of space law that do not accommodate the realities of private transactions because the Convention will only serve to increase the number of the commercial transactions that create these stress points in the law. In other cases, the Cape Town Convention has created new points of tension in the fabric of existing space law. For example, certain provisions in the Convention regarding jurisdiction have the potential to create new conflicts with the jurisdictional rules under the Outer Space Treaty and the Registration Convention. More specifically, the Outer Space Treaty may affect the jurisdictional provisions of the Convention and the Protocol since Article VIII of the Treaty provides that the country 'on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object'.[128]

The answer to this question depends on how 'jurisdiction' is interpreted in the Outer Space Treaty – a question that has been the subject of considerable academic debate. One interpretation of Article VIII is that only the state of registry has jurisdiction of any kind over a space object, including both prescriptive and adjudicative jurisdiction. In other words, the state of registry has exclusive jurisdiction to regulate the space object and exclusive jurisdiction to hear a case involving the object.[129] If this

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the Liability of the Launching States, in *Proceedings of the Forty-Third Colloquium on the Law of Outer Space* (2001), 151.

[127] State X may not be liable in this scenario if the damage occurred within the territory of State Y due to the negligence of State Y pursuant to Art. VI(1), Liability Convention, *supra* n. 120, which exonerates a state from liability if the damage to the claimant state was due 'wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of [the] claimant State'.

[128] Art. VIII, Outer Space Treaty, *supra* n. 41.

[129] See e.g. S. Aoki, In Search of the Current Legal Status of the Registration of Space Objects, in *Proceedings of the International Institute of Space Law 2010* (2011), 248 (stating that '[j]urisdiction arising from the registration shall be comprehensive, and a State of registry is supposed to hold legislative, judicial and, above all, enforcement jurisdiction'). Also M. Chatzipanagiotis, *The Legal Status of Space Tourists in the Framework of Commercial Suborbital Flights* (2011), 48; Lee, *supra* n. 126, 150–1; P.B. Larsen, The Draft Space Protocol and Jurisdiction over Commercial Space Assets, in *Proceedings of the International*

approach is adopted, then Article VIII would trump all jurisdictional provisions of the Cape Town Convention and Space Assets Protocol and would permit only the state of registry to issue orders regarding the enforcement of remedies and other matters arising under the Convention.

There are commentators who argue for a narrower interpretation of Article VIII of the Outer Space Treaty. The concept of 'jurisdiction' in Article VIII can be more narrowly read in at least two respects. First, even if Article VIII is read as granting jurisdiction of every form to the state of registry, it can be interpreted as a non-exclusive grant of jurisdiction – thus enabling other states to assert jurisdiction when appropriate under other sources of domestic and international law.[130] Second, Article VIII can be narrowly interpreted as only granting *prescriptive* jurisdiction to the state of registry over a space object (as well as any activity taking place on board the object) and not adjudicative jurisdiction.[131] Under this interpretation, Article VIII of the Outer Space Treaty would not affect the application of the Cape Town Convention provisions regarding jurisdiction.

When considered in the broader context of Article VIII of the Outer Space Treaty, this interpretation limiting the grant of jurisdiction to prescriptive jurisdiction is likely the proper interpretation. The Vienna Convention on the Law of Treaties requires that the terms of a treaty be interpreted in accordance with their 'ordinary meaning in their context

Institute of Space Law 2011 (2012), 487–8. In the end, Larsen concludes that there is uncertainty as to whether the grant of jurisdiction under Art. VIII, Outer Space Treaty, *supra* n 41, is exclusive. *Ibid*., at 499.

[130] See Chatzipanagiotis, *supra* n. 129, 50 (stating that '[i]t has been accepted that the State of registry does not have exclusive jurisdiction'). Bin Cheng's writings on jurisdiction also support the reading of Art. VIII, Outer Space Treaty, *supra* n 41, as a grant of non-exclusive jurisdiction; see B. Cheng, The Extra-Terrestrial Application of International Law, 18 *Current Legal Problems* (1965), 132.

[131] See B. Schmidt-Tedd & S. Mick, Article VIII, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. I (2009), 159 (stating that '[t]he legal consequence of jurisdiction and control is the applicability of the national law of the State of registry for the object launched into outer space'). See also M. Gerhard & K. Gungaphul-Brocard, The Impact of National Space Legislation on Space Industry Contracts, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 64 (explaining that the grant of jurisdiction to the state of registry 'defines the law applicable to space objects').

and in the light of [the treaty's] object and purpose'.[132] When determining the meaning of the term 'jurisdiction' in Article VIII, consideration should be given to its context in the phrase granting the state of registry 'jurisdiction and control' over the space object. This combination of the words 'jurisdiction and control' suggests that the type of jurisdiction intended was the prescriptive jurisdiction that would give the state the right to regulate the space object which, in turn, would enable the state to control the object.

One instance in which existing space law could work in tandem with the Cape Town Convention to the benefit of a creditor arises in connection with the operation of the Rescue Agreement. The Rescue Agreement could help financiers recover, for example, a space plane that has landed under distress in a state that is not a party to the Cape Town Convention. This would occur by virtue of one of the core duties imposed on states by the Rescue Agreement, namely the duty of a state to return a space object to the state that has launched the object, termed the 'launching authority'.[133] The benefit of this duty to return errant space objects is not as significant if both the finding state and the launching authority are parties to the Cape Town Convention and the Space Assets Protocol. In this case, even if the finding state did not return the asset to the launching authority, the creditor could proceed to enforce its international interest against the asset in the courts of the finding state under the Cape Town Convention – and should be able to enforce a security interest by gaining possession and shipping the asset back to where the auction of the asset will be held.

However, in a situation where, for example, a space plane takes off from State X, which is a party to the Cape Town Convention, and is forced down in State Y, which is not a party to the Cape Town Convention (but is a party to the Rescue Agreement), the creditor could benefit from the duty of State Y to return the space plane. The creditor with an international interest in the space plane would not be able to proceed against the space plane under the Cape Town Convention in State Y. However, State Y would be required under the Rescue Agreement to return the space plane to State X, which would then allow the creditor to proceed under the Cape Town Convention in State X to repossess the space plane and pursue other remedies.

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[132] Art. 31(1), Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969).

[133] See Art. 5(3), Rescue Agreement, *supra* n. 119.

While the preceding scenario envisions the Rescue Agreement aiding the creditor, some scenarios may arise in which a state's obligation under the Rescue Agreement could lead to a result that is contrary to the interests of a creditor. For example, a spacecraft might be returned to a state that is not friendly to the financier and not a party to the Cape Town Convention – which may, in turn, impede the exercise of the creditor's remedies under the Convention.

16.4.8 Entry into Force

The Cape Town Convention will only enter into force with respect to space assets when the Space Assets Protocol has entered into force.[134] There would be no benefit in having the Convention enter into force without the Protocol also entering into force since the Convention cannot operate on its own and, by its terms, only applies to those assets covered by a protocol. Thus, the Convention will enter into force with respect to space assets when the Space Assets Protocol enters into force, which will occur after the tenth state ratifies the Protocol and the Supervisory Authority deposits a certificate confirming that the International Registry is operational.[135] Transactions involving space assets will only be subject to the Convention with respect to a particular state if that state is party to both the Convention and the Protocol.

16.4.9 Criticism of the Cape Town Convention

Although representatives of a number of leading companies in the space industry were actively involved from the beginning in the drafting of the Space Assets Protocol, industry organizations later expressed vigorous opposition to the adoption of the Protocol.[136] The general concern of industry is that the existing models of space finance are sufficient and

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[134] See Art. 49(1), Cape Town Convention, *supra* n. 45.

[135] See Art. XXXVIII(1), Space Assets Protocol, *supra* n. 52.

[136] Representatives from the following companies were present at the meetings of the UNIDROIT Space Working Group: Alcatel, Alenia Spazio, Arianespace, Astrium, the Boeing Company, DirecTV, EADS, FiatAvio, GE American Communications, Hughes Electronics Corporation, Lockheed Martin Global Telecommunications, Motorola Satellite Communications Group, PanAmSat Corporation, Space Systems/Loral, SpaceVest, Telecom Italia, and Telespazio. See Report of the UNIDROIT Committee of Governmental Experts for the Preparation of a Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets, UNIDROIT 2004, C.G.E. Space Pr./1/Report rev, App. III.

that the Protocol 'adds an unnecessary supra-national layer of law' to the financing of space assets.[137] Other concerns raised by some segments of the space industry included the vagueness of the definition of 'space assets', the priority rights of parties having an interest in components of space assets, the public service exemption from remedies, the treatment of insurers' salvage rights, and the need for existing owners of satellites to register their interest.[138]

These concerns were taken into account in the course of finalizing the text of the Protocol and many of the issues raised by members of the satellite industry were resolved in the final text of the Protocol. For example, insurers' salvage rights were protected in the final version by a clear statement in the Protocol that such interests would not be affected by the Convention.[139] The concern about the need for existing owners to register in order to protect their interests was also resolved by the drafters' decision to exempt pre-existing interests from the operation of the Convention.[140]

This debate about whether the Space Assets Protocol will ultimately benefit the space industry cannot be settled here. However, the weight of experience and economic theory indicate that a harmonized, transparent and creditor-friendly law of secured transactions will facilitate the financing of space ventures. The fact that the drafters resolved certain concerns raised by the space industry also suggests that the industry's fears should dissipate. Although change to the practice of documenting the covered transactions always entails some initial costs as the industry accustoms itself to the new system, the new system in this case promises

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137 Statement of the Satellite Industry Association on the Revised Preliminary Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (hereafter SIA 2010 Statement), of 18 October 2010, www.esoa.net/upload/files/news/unidroit/20101018sia.pdf, last accessed 10 February 2014.

138 See Global Satellite Industry Denounces Unidroit Protocol, Brussels, 9 March 2012, www.esoa.net/upload/files/news/20120309_PR_UNIDROIT.pdf, last accessed 10 February 2014; SIA 2010 Statement, *supra* n. 137, 2–4; Continuing Issues of Concern Regarding the Unidroit Draft Space Protocol to the Cape Town Convention on International Interests in Mobile Equipment, 16 April 2010, www.esoa.net/upload/files/news/unidroit/20100416industry.pdf, last accessed 10 February 2014; S. Mosteshar, Financing Space Assets: The Unidroit Solution Examined, www.esoa.net/upload/files/news/unidroit/analysisoflegal issues.pdf, last accessed 10 February 2014.

139 See Art. IV(3), Space Assets Protocol, *supra* n. 52.

140 See Art. XL, Space Assets Protocol, *supra* n. 52.

to be an improved system that will bring new certainty and efficiency to space transactions.

16.4.10 The Future of the Space Assets Protocol

Since the Space Assets Protocol was opened for signature in 2012, four states have signed the Protocol[141] (indicating an intention to become a party to the Protocol or, at a minimum, to not take any actions which would 'defeat the object and purpose' of the Protocol[142]). However, no states have yet ratified the Protocol.

At this point in time, it appears that ratification will proceed slowly and, given the high threshold of ten ratifications before the Protocol will enter into force, the Protocol is unlikely to enter into force in the near future. However, as the space industry evolves to include new business models and new market entrants that will rely on their space assets to secure funding, support for the Protocol may grow. The existing industry opposition may also soften upon reconsideration of the final version of the Protocol, which addresses a number of previous industry concerns.

If the Protocol does enter into force, momentum for broad ratification is likely to grow in order to ensure harmonization of law and avoid uncertainty regarding the application of the Protocol to a given transaction. In the meantime, space companies and their financiers will have to rely on existing methods of finance and take precautions to avoid inimical domestic laws and minimize the complexities of financing space ventures under a patchwork of local laws.

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[141] These states are Burkina Faso, Germany, Saudi Arabia and Zimbabwe; see Status of the Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets, www.unidroit.org/status-2012-space, last accessed 19 April 2014.

[142] Art. 18, Vienna Convention on the Law of Treaties, *supra* n. 132, explains that by signing a treaty, a state 'is obliged to refrain from acts which would defeat the object and purpose of a treaty'.

17. Insurance in the context of space activities

Cécile Gaubert

17.1 INTRODUCTION

There is a multiplicity of actors and associated risks for space activities. For the different phases of risks, manufacturing, storing, transportation, launching, satellite operations and suchlike, identified and specific liabilities exist for these actors, with which insurance solutions are associated – and in some cases have been specifically set up to take care of.

Space insurance developed while the commercial use of launchers and satellites was growing. This development concerned not only the insurance covering damages to the satellite or launcher on the ground and in outer space but also insurance covering the liability of the space operator. Broadly speaking, there are two types of space insurance: one covering first-party property insurance and the other dealing with third-party liability insurance. The first one is a 'launch and in-orbit' insurance that protects the owner or operator of the impacted satellite in the event of loss or damage to the satellite during launch or in-orbit operation. The second is designed to address third-party liability of a launching agency or satellite operator/owner whose launcher, satellite or part thereof is considered accountable for damages caused to third parties during the space operation.

Originally, satellite insurance only covered risks of damage to third parties or to the satellite itself only before launch, while the satellite was on the ground. The insurance market, at that time, did not intend to insure such a commensurate risk as space activities. The first insured satellite, Early Bird (Comsat), benefited from a very limited insurance cover in 1965. This satellite was only covered for risks occurring on the ground, specifically excluding space activities.[1] It was in 1972 that full space property damage insurance (from launch up to the end of in-orbit

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[1] See Tracking Take-off of Space Insurance, interview with B. Pagnanelli, Insurance Day, 28 November 2007.

commissioning) was subscribed to for the first time, for the Westar-1 and -2 satellites of the Western Union Company.[2]

The purpose of property damages insurance is to enable the satellite operators among others to obtain the financial capacity to re-launch a satellite if it is lost or if it could not nominally fulfil its mission due to a loss of operational capacity. With respect to development of space third-party liability insurance, this is mainly linked to the evolution of national space legislation (the first one being the US Commercial Space Launch Act[3]) that set up a liability regime applicable to space operators (read the launch agency) and imposed an insurance obligation or financial guarantee on said operator. Nowadays, there are several pieces of national space legislation setting up a liability regime and imposing similar insurance obligations on space operators.[4]

Today, the topic of space insurance is mastered rather well, in terms of damage to space objects as well as in terms of third-party liability of space operators. There is an insurance market dedicated and adapted to space activities. There are 'space insurers' that offer insurance cover in case of damage occurring to space objects and 'aviation insurers' that are offering specific insurance cover for space third-party liability. Space insurers are those having a specific portfolio and capacity for coverage of space objects in case of damage occurring to them,[5] whilst aviation insurers have a specific aviation risks portfolio and capacity but will also undertake to cover space third-party liability.[6]

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[2] See C. Gaubert & S. Moysan, L'assurance spatial, 57 *Revue Française de Droit Aérien et Spatial* (2003), 249.

[3] Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law – Basic Legal Documents*, E.III.3; now codified as Subtitle VII, 51. U.S.C. See further *supra*, § 3.3.1.1.

[4] See also further *supra*, § 3.2.3 as well as the various national laws discussed in § 3.3.

[5] *Cf. The Satellite Insurance Market and Underwriting Cycles* – presentation at American Risk and Insurance Association Annual Meeting, Quebec City, 5–8 August 2007.

[6] See Gaubert & Moysan, *supra* n. 2, 252; A.S. Branger & C. Derache, L'application de la garantie d'assurance dans le temps en matière spatial, 66 *Revue Française de Droit Aérien et Spatial* (2012), 369; G. Catalano Sgrosso, Insurance for Commercial and Industrial Activities in Outer Space, in *International Space Law* (2011), 471–503; F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 114–6; A. Soucek, International Law, in *Outer Space in Society, Politics and Law* (Eds. C. Brünner & A. Soucek) (2011), 344–6.

This chapter will address in some detail the existing space insurances to cover third-party liability[7] and property damage to space objects.[8] Specific attention will also be paid to the space debris issue.[9] Dedicated insurances applicable to astronauts will be briefly addressed.[10] Finally, a few words will be spent on the insurance broker's mission.[11]

17.2 THIRD-PARTY LIABILITY INSURANCE

Basically, there are two main types of liability for participants in space operations: third-party liability for space operations including launch activities and satellite operation in orbit, and space products' liability further to the manufacturing of a satellite or launch vehicle or any part thereof. These two main liabilities can today be covered by specific insurance policies under certain conditions. Before detailing these insurance policies and their associated insurance market, the space liability regime will be briefly reviewed once more,[12] which will help understand the basis of liability insurance.

17.2.1 The Legal Environment

As a matter of fact, international law, national space laws, common law and contractual practices together comprise the liability regime applicable to space industries.

17.2.1.1 International law

At the international level, the Outer Space Treaty[13] and the Liability Convention[14] have first established a liability regime applicable to spacefaring states to the extent qualifying as 'launching States' (states

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[7] See further *infra*, § 17.2.

[8] See further *infra*, § 17.3.

[9] See further *infra*, § 17.4.

[10] See further *infra*, § 17.5.

[11] See further *infra*, § 17.6.

[12] See in more detail, however, *supra*, § 2.3.1.1, and § 2.3.3.

[13] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[14] Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29

which launch or procure the launch of a space object or from whose territory or installation a space object is launched[15]). States parties to the Treaty and Convention are thus internationally liable for damage caused by such space objects (whether operated by governmental agencies or not) on the earth, in air space or in outer space.[16]

The Liability Convention has set up a regime of joint and several liability resting upon the states parties to other states for damage caused by a space object for which they each qualify as 'launching State'.[17] This is a key issue for multinational programmes, as the respective liability of participating countries can be difficult to determine. The liability in respect of damages caused to third parties as per the Liability Convention is divided into two parts: a fault-based liability for damage to other spacecraft occurring in space and non-fault-based liability and an absolute liability for damage to third parties occurring on earth or in air space.[18] In either case, the 'launching State' is liable to other states for all such damage caused by its space object, though in the former case only to the extent of its fault. The Liability Convention has not foreseen any liability time bar; therefore, the liability of the 'launching State' will survive for ever, even for derelict objects.

The remedies provided by the Liability Convention are available solely between states and stipulate procedures within a diplomatic context.[19] It does not apply to damage caused in the 'launching State(s)' and does not preclude injured parties from pursuing other judicial remedies.[20] This liability regime is coupled for the states with a responsibility regime, under which the states whose national activities in outer space are at

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March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).

15 See Art. I(c), Liability Convention, *supra* n. 14.

16 *Cf.* Arts. III resp. II, Liability Convention, *supra* n. 14.

17 Art. VII, Outer Space Treaty, *supra* n. 13, provides: 'Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the Moon and other celestial bodies.' See further Arts. I(c), II, III, Liability Convention, *supra* n. 14.

18 See respectively Art. II & Art. III, Liability Convention, *supra* n. 14.

19 *Cf.* Art. IX, Liability Convention, *supra* n. 14.

20 *Cf.* respectively Art. VII(a) & Art. XI(2), Liability Convention, *supra* n. 14.

issue bear a responsibility of surveillance and control of the space activities carried by entities falling under their responsibility.[21]

At this stage, there is no insurance obligation imposed by either the Outer Space Treaty or the Liability Convention. Still, many states have developed a regime under which it is illegal to conduct space operations without a licence. The required licence may be issued subject to the imposition of a 'hold-harmless' provision in favour of the state. The state may also require satisfactory evidence of adequate insurance or financial guarantee, but it is important to bear in mind that the amount of insurance required should not be seen as automatically limiting liability.

17.2.1.2 National laws

As far as relevant here all national laws relating to space activities provide the legal and regulatory framework relevant to individuals and entities carrying out space-related activities.[22] The scope of individual national liability varies from one country's legal regime to another and does not always follow the approach set out by the Liability Convention. For example, an operator's liability may be limited in time or to a minimum amount of insurance; this minimum amount being in some cases a protection above which the state will step in and guarantee on an unlimited basis or up to a specified amount.[23]

17.2.1.3 From third-party liability to third-party liability insurance

The national space liability regimes are not identical, and the liability imposed will consequently differ on various grounds. For some laws, the liability may be imposed on the launch operator only and not on the in-space operator (such as the US Commercial Space Launch Act[24]) whilst for some others, the liability will lay with all space operators (such as is the case with the Dutch,[25] UK[26] and

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[21] See Art. VI, Outer Space Treaty, *supra* n. 13, referring to 'authorization and continuing supervision'.

[22] See again further *supra*, Chapter 3.

[23] Note that Art. XII, Liability Convention, *supra* n. 14, basically provides for unlimited liability.

[24] *Cf.* Sec. 50904, Commercial Space Launch Act, *supra* n. 3; further *supra*, § 3.3.1.1, also *supra*, § 12.3.4.2.

[25] See Sec. 1(b), Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (hereafter Dutch Space Law), 24 January 2007; 80 *Staatsblad* (2007), at 1; *Nationales Weltraumrecht/National Space Law* (2008), at 201; further *supra*, § 3.3.3.3.

[26] See Sec.1, Outer Space Act (hereafter UK Outer Space Act), 18 July 1986, 1986 Chapter 38; *National Space Legislation of the World*, Vol. I (2001), at

French[27] laws). The type of liability may differ as well, following the fault or no-fault basis regime set up by the 1972 Liability Convention or not. Some laws have implemented a limit to liability, in terms of time (liability ends after launch[28] or after a certain period of time[29]) or in terms of amount.[30] Finally, national laws may have implemented a state's guarantee for its space operator (for example the US Commercial Space Launch Act and the French Law[31]), applicable in particular to national third-party liability claims (as the unlimited liability at the international level makes the state liable for any damage caused by the operator above any limit in any event).

All legal regimes effectively exclude claims from third parties for direct and indirect damage arising out of signal defect. For instance, the Dutch Space Law provides that the licence holder is liable for damages caused by its *space activities*,[32] such space activities being defined as 'the launch, the flight operation or guidance of space objects in outer space'[33] – so not including any damages caused by signal defect. The same intent has been expressed by the French Law on Space Operations, which even explicitly excludes from its scope any damage that is the consequence of the signal use of a space object.[34]

293; *Space Law – Basic Legal Documents*, E.I; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 12; further *supra*, § 3.3.2.3.

27 See Art. 1(3), Law on Space Operations (*Loi relative aux opérations spatialise*; hereafter French Law on Space Operations); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453: further *supra*, § 3.3.3.1.

28 Further to Sec. 50901(a), Commercial Space Launch Act, *supra* n. 3, at a lower level the mandatory insurance coverage is limited to the launch phase as defined by Sec. 440.11, 14 C.F.R.; see also A. Kerrest de Rozavel & F.G. von der Dunk, Liability and Insurance in the Context of National Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 146–7.

29 See Art. 13, French Law on Space Operations, *supra* n. 27; *cf.* also Kerrest de Rozavel & von der Dunk, 160.

30 *Cf.* Sec. 50914, Commercial Space Launch Act, *supra* n. 3; Arts. 14, 15, French Law on Space Operations, *supra* n. 27.

31 *Cf.* Sec. 50915, Commercial Space Launch Act, *supra* n. 3; Art. 15, French Law on Space Operations, *supra* n. 27. See further e.g. on France P. Achilleas, Regulation of Space Activities, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 112.

32 *Cf.* Sec. 12, Dutch Space Law, *supra* n. 25.

33 Sec 1(b), Dutch Space Law, *supra* n. 25.

34 See Art. 1(1), French Law on Space Operations, *supra* n. 27.

17.2.1.4 The US launch licensing regime and third-party liability insurance

The very first national space law to be enacted to specifically and substantially address launching and the liabilities associated therewith following the Liability Convention is the aforementioned US Commercial Space Launch Act.[35] This Act has established several principles to be applied when an entity undertakes launch operations. Some other national laws have followed these principles.

Under this Act, as said, only launching activities are subject to the liability regime.[36] The liability is attributed to the launch operator and complemented by a waiver of recourse and hold-harmless clauses.[37] To this liability is attached an insurance obligation or financial guarantee,[38] fixed at a certain amount that will vary from one launch to another, but cannot exceed the amount of US$ 500 million for claims from third parties (or US$ 100 million for governmental claims, essentially of an inter-party liability character since applicable in a context where the launch operator uses government launch facilities).[39] Above that fixed amount of insurance or financial guarantee, the United States promises indemnification up to a determined maximum, being US$ 1.5 billion (which, however, only refers to national liability claims, as the United States remains internationally liable without any limit under the Liability Convention).[40]

Under the Commercial Space Launch Act the launch licensee is required to provide third-party liability insurance for launch plus 30 days.[41] Under this Act, the Department Of Transportation (DOT) can require extended in-orbit third-party liability insurance if a problem has

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35 *Supra*, n. 3; more generally P.A. Vorwig, Regulation of Private Launch Services in the United States, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 405–15; V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001) 90–134.

36 See *supra*, text at n. 3.

37 See discussion *infra*, § 17.2.1.9.

38 See Sec. 50914, Commercial Space Launch Act, *supra* n. 3.

39 See Sec. 70112(3), Commercial Space Launch Act, *supra* n. 3.

40 *Cf.* Sec. 50915(a)(1), Commercial Space Launch Act, *supra* n. 3. Note that this is in 1988 US$; at the time of writing this actually amounts to some 3.0 billion US$.

41 Further to Sec. 50901(a), Commercial Space Launch Act, *supra* n. 3, in conjunction with Sec. 440.11, 14 C.F.R.; see also Kerrest de Rozavel & von der Dunk, 146–7, *supra* n. 28.

occurred during the launch.[42] For licensed launches that include de-orbiting and return to earth of the launch vehicle, the in-orbit third-party liability insurance can also be extended, although this is not satellite-specific.[43]

There is a distinction between low earth orbit satellites that are de-orbited to meet their controlled destruction in the atmosphere and low earth orbit spacecraft intended for re-entry to safely return to earth. Thus, on the one hand there is no requirement under Federal Communications Commission (FCC) licensing for third-party liability insurance for low earth orbit satellites in operation or while being de-orbited to destruction in the atmosphere. On the other hand, however, the Federal Aviation Administration (FAA) does license intentional re-entry to return to earth for commercial spacecraft. Future regulation of low earth orbit spacecraft is under discussion as a possible inclusion in revisions to the US Commercial Space Launch Act, as announced at a 2013 FAA COMSTAC meeting.[44]

This being said, there are exceptions for certain objects in low earth orbit. If the satellite is subject to US Department of Defense government contract/indemnity provisions, those indemnity provisions will require underlying third-party liability insurance that could apply to a de-orbit activity. If the launch is a failure and leaves the satellite in an unintended low earth orbit and the launch is still within the FAA licence period (usually 30 days after launch) the FAA can require that third-party liability insurance will be maintained for on-orbit and re-entry under the original launch licence.[45] This is usually done through extension of the launch liability insurance policy but purchased separately by the satellite owner if the launch liability insurance has lapsed. If the space vehicle is returning to earth and is operating under a US licence, the FAA re-entry licence requires underlying third-party liability insurance to be carried by the licensee for re-entry activities beginning at de-orbit burn.[46] It must be

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[42] Further to Sec. 50901(a), Commercial Space Launch Act, *supra* n. 3, see Sec. 440.11, 14 C.F.R.

[43] See *Ibid*.

[44] The meeting took place on 9 and 10 October, 2013. For further information, see www.spacepolicyonline.com/news/house-hearing-reveals-faa-comstac-rift-on-learning-period-for-commercial-human-spaceflight, last accessed 19 April 2014; www.spacenews.com/article/civil-space/37428industry-faa-look-to-stay-one-step-ahead-of-congress-with-draft-safety, last accessed 19 April 2014.

[45] See Sec. 440.11, 14 C.F.R.

[46] See Sec. 440.12, 14 C.F.R.

borne in mind that the US government requires owners of satellites to register and comply with, and file, de-orbit plans as part of their FCC licensing requirements.[47] Indeed, most satellite owners already comply with this requirement.

17.2.1.5 Other national launch licensing regimes and third-party liability insurance

Certain national laws have implemented a third-party insurance requirement as a condition precedent to obtaining a licence.[48] The scope of the insurance obligation varies from one regime to another in terms of the minimum amount of insurance required, which parties must be added as additional insured, and the limit of liability in respect of time. Regarding the amount of insurance, the national space law may not specify a precise amount, as is the case for the Dutch Space Law, which refers to 'maximum possible cover',[49] with a limitation that the insurance amount shall be in line with what is reasonably available. It is understood that the Dutch authorities will determine the amount of insurance needed taking into account the customary practice and the space activity to be licensed, in order to impose said maximum possible cover.

Some other national space laws state a specific insurance amount, such as the French Law on Space Operations as per a *Loi de finances*,[50] which stipulates an amount of insurance between €50 million and €70 million. As compared to the US Commercial Space Launch Act, French law also gives private operators the choice to purchase insurance or alternatively demonstrate they have the financial capacity to pay a potential victim.[51]

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[47] See Appendix A to Part 440, 14 C.F.R.

[48] See e.g. Sec. 3(4), Dutch Space Law, *supra* n. 25; Art. 6, French Law on Space Operations, *supra* n. 27; Sec. 5(f), UK Outer Space Act, *supra* n. 26.

[49] Sec. 3(4), Dutch Space Law, *supra* n. 25.

[50] See Art. 119, Loi n° 2008-1443 du 30 décembre 2008 de finances rectificative pour 2008; further e.g. C. Gaubert, Insurance in the Context of National Authorisation, in *National Space Legislation in Europe* (Ed. F.G. von der Dunk) (2011), 168; also Kerrest de Rozavel & von der Dunk, *supra* n. 28, 160.

[51] See Art. 6(I), French Law on Space Operations, *supra* n. 27: 'Any operator subject to authorization in accordance with this law must, for as long as it may be held liable therefore in the conditions provided for in Article 13 and up to the amount mentioned in Articles 6 and 17, be covered by an insurance policy or have another financial guarantee approved by the competent authority'.

17.2.1.6 Product liability in the context of space activities

The liability regime applicable to space manufacturers is rather different from the liability discussed above applicable to space operators (whether launching agencies or satellite operators). The participants in a space operation may have their liability called into question on both these different grounds. With respect to satellite manufacturers at any tier, including services providers, they can carry liability based on the space product or on service default. Hereunder, the product liability regimes of the United States and the European Union will be briefly addressed.

17.2.1.7 US product liability

In the United States, even as there is not one single federal product liability regime, but one for each individual state, the product liability grounds may be summarized as follows. The first is based on the concept of negligence, under which the manufacturer is liable for damages caused by its employee's negligence in not having used reasonable care in the manufacturing of the product.[52] Another concerns the breach of warranty (expressed or implied) of the manufacturer. This liability is usually applicable if there is a contractual link between the manufacturer and the injured person.[53]

The last ground of liability is 'strict liability',[54] that is a form of non-fault liability. The defendant will have to prove that there was a defect in the product, that said defect existed when the product was delivered, and that the defect has caused the damage. There are three types of defect:[55]

1. *The manufacturing defect*, meaning that the product has not been manufactured in accordance with applicable specifications and becomes dangerous.
2. *The design defect*. Most tribunals will generally conclude that if the advantages of the design are not higher than the risks or if the product is in practice more dangerous than what a consumer could expect, then there is a design defect.

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[52] See for the historic decision *Mac Pherson v. Buick Motor Co.* in conjunction with §1(a), Restatement of the Law (Third) Torts: Product Liability, American Law Institute, 1998.

[53] See Art. 2, Uniform Commercial Code, as adopted by each state; further on this topic, R.A. Mann & B.S. Roberts, *Business Law* (14th edn., 2008), 467.

[54] See Restatement of the Law (Third) Torts: Product Liability, *supra* n. 52.

[55] *Cf.* also Sec. 402A, Second restatement of Law of Torts, American Law Institute, 1964.

3. *The warning and instructions defect*. This will apply when the manual or instructions do not clearly indicate the risks.

17.2.1.8 EU product liability

At the European level, product liability was originally dealt with by Directive 85/374 of 25 July 1985,[56] now amended by Directive 1999/34 of 10 May 1999,[57] which has unified EU member states' regulations. The regime set up by this Directive is a non-fault liability regime of the producer (being the manufacturer of a finished product) by way of safety default of the product in service.[58] Therefore, the producer liability resides in the fact that its product has caused damage to a victim and the victim will only have to prove a link between the product and the damage.[59] The defect of the product is appreciated relative to the default safety of use which the user of the product can expect.

To this liability there are possible exculpation clauses for the producer. For example, he can prove that the defect did not exist in the product at the time of its delivery, or that the product was not delivered or the product was not designed to be distributed.[60] It is, however, important to note that this special EU regime of product defect liability is not exclusive and that the victims may also act on the ground of contractual or non-contractual liability or on the ground of 'hidden defect'.[61]

This regime was not fundamentally changed by Directive 1999/34, which essentially redefined the concept of 'products' as meaning 'all movables even if incorporated into another movable or into an immovable', and including electricity.[62]

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[56] Council Directive on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products (hereafter Product Liability Directive), 85/374/EEC, of 25 July 1985; OJ L 210/29 (1985).

[57] Directive of the European Parliament and of the Council amending Council Directive 85/374/EEC on the approximation of laws, regulations and administrative provisions of the member states concerning liability for defective products (hereafter Product Liability Directive as amended), 1999/34/EC, of 10 May 1999; OJ L 141/20 (1999).

[58] See Arts. 1, 6, Product Liability Directive, *supra* n. 56.

[59] See Art. 4, Product Liability Directive, *supra* n. 56.

[60] See Art. 7, Product Liability Directive, *supra* n. 56.

[61] See Art. 13, Product Liability Directive, *supra* n. 56.

[62] Art. 1(1), Product Liability Directive as amended, *supra* n. 57.

17.2.1.9 Contractual practices

In order to mitigate the liability of any participant to a space operation, the parties to a contract may negotiate limits of liability or exemptions of liability. A 'limitation of liability' or 'waiver of recourse' clause permits contracting parties to reduce or eliminate the potential recourse for direct, consequential, special, incidental and indirect damage should there be a breach of contract.[63] In some cases, a cap on damage type may be used. Another way to limit the liability is to use a 'hold-harmless' clause. This is a clause in an agreement by which one party agrees to hold the other free from the responsibility for any liability or damage that might arise out of the transaction involved.[64]

On the insurance side, the said limits to or exemptions from liability have an important consequence as they limit the insurer's exposure and its loss record as well, when the limit to or exemption from liability is in favour of its insured. On the other hand, the said limit to liability or exemption may increase the insurer's exposure if the insurer cannot exercise its right of subrogation against the entity responsible for a loss that it has indemnified, due to the fact that the insured had previously accepted contractually to limit or exempt the said entity's liability. Where a satellite is damaged due to a product fault, the property damage insurers covering the satellite will indemnify the value of the satellite. If the property damage insurance contains no waiver of subrogation rights on the insurer's part or in case of gross negligence of the manufacturer, the insurer, having indemnified the damaged satellite, would be entitled to recourse against the manufacturer of the product. But if in the contract between the insured and the manufacturer the insured has agreed not to have recourse against the manufacturer then the insurers will not be able to have recourse against the manufacturer. Therefore, the exposure of the insurer is increased because of the impossibility of recourse against the manufacturer.

The validity of such limitations of liability may vary from one legal regime to another. Under certain legal regimes, the waivers of recourse or 'hold-harmless' clauses are illegal and can be rescinded by a judge. For instance, in France, in the absence of applicability of the French Law on Space Operations, limitation to or exemption from liability clauses is not

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[63] See M. Fontaine & P. De Ly, *Drafting International Contracts – An Analysis of Contract Clauses* (2009), 369 ff.

[64] See Fontaine & De Ly, *supra* n. 63, 356; for more examples of 'hold-harmless' clauses, see L. Ravillon, *Les télécommunications par satellites, Aspects juridiques* (1997), 227–8.

valid for professionals that do not have the same business specialty.[65] The French courts have already ruled that limits to or exemptions from liability afforded by a party to a contract that does not have the same business specialty as the other party having the benefit of such limit to or exemption from liability are invalid.[66]

More generally, for states that have enacted specific space law, sometimes that law requires that this limit to/exemption from liability is included in the contracts.

17.2.1.10 The US case

The Commercial Space Launch Act is the first national space law to impose an obligation on the licensee or transferee to enter into a reciprocal waiver of claims with the participant in the launch or re-entry operation, including the customer. In this case, by way of this waiver, each party agrees not to have recourse against another involved party for any damage (property or bodily injury) it has sustained (including sustained by its employees).[67]

As a counterpart to this cross-waiver the Secretary of Transportation agrees to the reciprocal waiver of claims for any damage the US government or a US executive agency sustains (property or bodily injury) resulting from an activity carried out by the licensee.[68] This being said, the Secretary of Transportation may also decide not to claim against the licensee or transferee if the insurance is not available due to the application of an exclusion contained in the insurance contract.[69] This can be seen as a strong protection of the licensee or transferee in case there is an applicable exclusion.

17.2.1.11 The French case

The French Law on Space Operations has specifically validated the standard practice of launch services contracts containing waivers of recourse and 'hold-harmless' clauses as between the participants to a space operation. This validation is effected by way of two articles that have a direct impact on the manufacturer's liability and any participant to a space operation.

On the one hand, Article 19 states that further to the indemnification of a third party that has sustained damage due to a space operation, the

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65 See C. Cass ch. civile, 19 March 2013, 11-26566.
66 See *ibid*.
67 See Sec. 50914(b)(1), Commercial Space Launch Act, *supra* n. 3.
68 See Sec. 50914(b)(2), Commercial Space Launch Act, *supra* n. 3.
69 See Sec. 50914(b)(1), Commercial Space Launch Act, *supra* n. 3.

entity having participated in this operation or in the production of the space object cannot have its liability invoked by another entity having participated in the said operation.[70] This applies only in the case where the mandatory insurance or the financial guarantee has been exhausted, with the further exception of wilful misconduct of the liable entity. Therefore, the aim of this Article is to attribute the liability to the space operator (as defined by the law), at least for damages on the ground or in airspace, and as a consequence gives a certain protection to the suppliers and subcontractors.

On the other hand, Article 20 provides that waivers of recourse are mandatory between the participants in a space operation or in the manufacturing of a space object, for any damage caused between them, unless there is a specific provision to the contrary in the contract relating to the satellite manufacturing or unless the exception of wilful misconduct applies.[71] This provision generalizes the waiver of recourse between the contracting parties that already exists within the launch contractual chain. This waiver of recourse is a simple translation of the current practice of launch services contracts, a practice that has flowed down to subcontractors at any tier of this contractual chain.[72] However, with respect to the satellite contractual chain, the 'waiver of recourse' practice is not systematic and one may find liability provisions of the satellite manufacturer or the subcontractors in the procurement contracts and subcontracts respectively.

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[70] Art. 19, French Law on Space Operations, *supra* n. 27, provides: 'When the insurance or financial guarantee mentioned in Article 6 as well as, if necessary, the governmental guarantee have been laid out to indemnify a third party, one of the persons having taken part in the space operation or in the production of the space object which caused the damage cannot be held liable by another of these persons, except in case of a wilful misconduct.'

[71] Art. 20, French Law on Space Operations, *supra* n. 27, provides: 'In the case of a damage caused by a space operation or the production of a space object to a person taking part in this operation or in that production, any other person taking part in the space operation or in the production of the space object having caused the damage and bound to the previous one by a contract cannot be held liable because of that damage, unless otherwise expressly stipulated regarding the damage caused during the production phase of a space object which is to be commanded in outer space or during its commanding in orbit, or in case of a wilful misconduct.'

[72] For an example of such provision in Arianespace launch contracts, see L. Ravillon, *supra* n. 64, 225.

17.2.1.12 Contractual issues

These limits to/exemptions from liability can also be the consequence of manufacturing/launch service contract negotiations. In launch service contracts, on a standard basis 'reciprocal no-fault, no-subrogation, inter-party waivers of liability' are applied as between participants, by which each party agrees to waive its right of recourse against its contractor (respectively subcontractors at any tier) in case of damage caused to its property and bodily injury or property damage to its employees, including that sustained by its contractual partners in relation to the execution of the launch services agreement.[73] By way of these clauses the co-contractors avoid any recourse between them, and allocate in advance the liabilities for damage to third parties. These reciprocal waivers of recourse and 'hold-harmless' clauses are generally complemented with a 'flow down' obligation with respect to the subcontractors.

Usually, under the satellite chain of contracts, the rights of recourse are preserved between the participants to this contractual chain, during any phases (notably assembly, integration and tests phase; launch phase; and in-orbit phase), subject to application of relevant national law. The space insurance policies covering damage caused to satellites (during the launch or in-orbit phases) traditionally include a waiver of subrogation rights from the insurer in favour of the participants in the satellite contractual chain. It means that the insurers contractually agree not to use their right of recourse against the party responsible for the damage to the satellite, after having indemnified the insured for its loss, except in case of gross negligence of the responsible party.[74]

These different liability regimes and contractual practices obviously can have a substantial impact on the insurances to be underwritten. That is why it is important to understand the legal context of space activities and the various roles of relevant actors in order to draft the most appropriate insurance policy wording.

17.2.2 Available Insurance

The insurance policy must meet the demands of the international treaties (in particular, as discussed, the Outer Space Treaty and the Liability Convention) as well as respond to any national statutory or licensing

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[73] *Cf.* e.g. Art. 18.1, General Clauses and Conditions of the ESA contracts (as adopted in 2010).

[74] See Art. 18.1.3 & 18.1.6, General Clauses and Conditions of the ESA contracts (as adopted in 2010).

requirements, the applicable conventional liability regime at the location and relevant contractual obligations.

17.2.2.1 Insurance for space operators ('space third-party liability insurance')

Space third-party liability insurance covers the financial consequences of the liability of the insured in case of damage caused to third parties due to insured space operations. Such insurance is available, under the present insurance market conditions, up to a cover of US$ 750 million. This amount corresponds to the maximum available insurance market capacity for this type of risks. The amounts generally subscribed are between US$ 50 million and US$ 500 million, depending on the phase of risks (launch or in-orbit) and on the applicable legal regime which can prescribe a specified (minimum) amount of insurance.[75]

For example, as seen, the 'maximum maximum' amount of insurance required by the US Commercial Space Launch Act is US$ 500 million[76] – in theory, as in practice the amounts will vary between a few million US$ and US$ 261 million, so far the highest amount ever included.[77] The French Law on Space Operations stipulates an amount of insurance between €50 million and €70 million, which is usually translated into the insurance policy as coverage up to €60 million.[78] The insurance amount required by the UK Space Agency is now established at € 60 million.[79]

The period of insurance may vary from a few days to a maximum of one year after launch for the launch phase, and for the in-orbit phase from a few days (for specific activities, such as drift manoeuvres) to a maximum of one year after inception of the insurance policy. Multi-annual coverage was available a few years ago, but the market only offers single-year coverage today, with for some insured a possibility to renew

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75 See further *supra*, § 17.2.1.4, § 17.2.1.5.

76 See Sec. 50914(a)(3)(A)(i), Commercial Space Launch Act, *supra* n. 3; further *supra*, § 3.3.1.1 and § 12.3.4.2.

77 See also *supra*, § 12.3.4.2, esp. at n. 91.

78 *Cf.* Arts. 14–16, French Law on Space Operations, *supra* n. 27, in conjunction with the Loi de finances, *supra* n. 50, also *supra*, § 17.2.1.5, § 3.3.3.1.

79 A reduction of the compulsory insurance requirement from £100 million to €60 million was announced by the UK Minister for Universities and Science on 4 July 2011. See Reform of the Outer Space Act 1986, Consultation Document, UK Space Agency, of 31 May 2012, 4.

the policy on the same terms, conditions and rates, subject to no loss having occurred during the policy period.[80]

Basically, the insured are the launch operator for the launch phase and the satellite operator for the in-orbit phase. Traditionally, it is not only these operators that are insured under the third-party liability insurance, but also the launching states and any participants in the space operation at whatever level (including manufacturers and their subcontractors and other suppliers):[81] they will all be named as additional insured. This means that they will benefit from all provisions of the insurance and will have their liability covered by the policy as if they were the insured under the policy.

This additional insurance provision is sometimes the consequence of a legal obligation. The US Commercial Space Launch Act requires that the United States and the participants in the launch operation shall be named additional insured to the policy subscribed by the launch operator.[82] The French law also requires that the French state, the national space agency, the European Space Agency and all the participants in the space operation shall have the benefit of the third-party liability insurance subscribed to by the space operator.[83]

17.2.2.2 Triggering third-party liability insurance

On the international insurance market, the different triggers which can be used are ‘occurrence’ and ‘damageable facts’; both of them having their advantages and inconveniences. With respect to the ‘occurrence’ trigger,[84] it is necessary that such an occurrence takes place during the period of insurance, that is: between attachment of risks and termination of risks. The application of this notion to space activities leads to some problems: indeed there might be an important gap between the moment of the incident or accident and the effective damage to the third party. An example thereof is the case where a non-controlled satellite collides with

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[80] This option is included in insurance contracts, usually not uniformly worded; the precise terms moreover constitute proprietary information.

[81] See Gaubert, *supra* n. 50, 170.

[82] See Sec. 50914(a)(4), Commercial Space Launch Act, *supra* n. 3.

[83] See Art. 6, French Law on Space Operations, *supra* n. 27.

[84] Definition of ‘occurrence’ as per the international standard from Lloyd’s AVN 98: ‘Occurrence means an accident or incident (other than a Grounding) or a continuous or repeated exposure to conditions occurring during the Policy Period which arises out of the Products Hazard and causes Bodily Injury or Property Damage neither expected nor intended from the standpoint of the Insured. All damages arising out of exposure to substantially the same general conditions shall be deemed to arise out of one Occurrence.’

another satellite ten years after such loss of control.[85] In this case, the loss of control can be interpreted as the accident or incident at the origin of the collision (the damage to the third party). As the insurance is offered on an annual basis and as it is necessary that the occurrence takes place during the annual period of insurance, one might face a situation in our example where the insurance cannot cover the damage because ten years have elapsed between the moment of the incident/accident and the effective occurrence of damage to the third party.

For some insurance markets, 'occurrence' is understood as the moment when the damage to the third party occurs, whatever the date of the accident or incident at the origin of the damage.[86] The question with this interpretation is that if an incident occurs to a satellite leading to a partial loss of control of the said satellite, the insurers might require that any damage to a third party that is the consequence of the loss of control be excluded, or require a premium increase to cover specifically the consequences of the loss of control.[87]

Lastly, the notion of 'occurrence' can be interpreted in the light of French insurance law which offers the possibility to have the insurance triggered by the 'damageable fact', being the accident or incident at the origin of the third-party damage, whatever the date of the third-party damage and its claim (even if the damage or claim occurs ten, twenty or

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[85] It should be noted that the Liability Convention, *supra* n. 14, does take such considerations into account: whilst Art. X(1) provides that 'A claim for compensation for damage may be presented to a launching State not later than one year following the date of the occurrence of the damage *or the identification of the launching State which is liable*' (emphasis added); Art. X(2) adds: 'If, however, a State does not know of the occurrence of the damage or has not been able to identify the launching State which is liable, it may present a claim within one year following the date on which it learned of the aforementioned facts; however, this period shall in no event exceed one year following the date on which the State could reasonably be expected to have learned of the facts through the exercise of due diligence', whereas Art. X(3) further adds: 'The time limits specified in paragraphs 1 and 2 of this article shall apply even if the full extent of the damage may not be known. In this event, however, the claimant State shall be entitled to revise the claim and submit additional documentation after the expiration of such time limits until one year after the full extent of the damage is known.'

[86] This conclusion can be drawn from experience of the author with insurers; for proprietary reasons, more specific information can not be provided here.

[87] This conclusion can be drawn from experience of the author with insurers; whilst this has happened in the past, for proprietary reasons more specific information can not be provided here.

more years after the 'damageable fact'). For example if an incident (loss of control of a satellite) occurs in 2015 and that lost satellite causes damage to a third party (when returning to earth) in 2030, the applicable insurance will be the one in force in 2015. However, the unknown factor is the existence of the same insurance market in 2030 as in 2015 – and some insurers may also have disappeared – but at least there will be insurance in force, even if partial. One has to bear in mind that this trigger basis is specific to French insurance law and does not follow the standard international practice. Furthermore, using this trigger in an insurance policy may be subject to a higher premium than the 'occurrence' basis because of its long-term application. This is one of the reasons why this trigger is not commonly used by the space liability policies.

17.2.2.3 Insurance for manufacturers at any tier ('space product liability insurance')

As seen above, the space manufacturer may carry product defect liability based on general product liability, not specific to space activities. As such, in the event of damage caused to third parties or to a contractor, the space manufacturer, at any tier, may have its liability called into question. Therefore, the available insurances for such exposure will be detailed here.

Space product liability insurance covers the financial consequences of the liability of an insured, typically a manufacturer, subcontractor or supplier, in case of damage to third parties caused by an accident or incident due to a flawed space product after its delivery. Several conditions have to be met in order to trigger this coverage. There must be damage to a third party or contractual party; such damage must be the result of an accident or incident due to a product default; and the space product must have been delivered, meaning that it must not be in the care, custody or control of the insured. Today on the insurance market mainly two types of space product liability insurance can be found, the so-called 'space endorsement' and the European Space Products Liability Scheme (ESPLS).[88]

'Space endorsement' constitutes an extension of coverage of aviation product liability insurance by way of an endorsement that will extend the cover for aviation products to space products. The amount of insurance will be determined as an aggregate amount, meaning that the amount of

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[88] See T. Justice, Parole à un membre, 14 *Le Bulletin d'I-Space-Prospace* (January 2006).

insurance is a combined single limit for the period of cover (for both property damage and bodily injury).[89] This amount of insurance will be the one of the aviation product liability cover to which the endorsement is attached. To this aggregate amount, sub-limits are applicable, after arrival of the space product at the launch site, of US$ 250 million for damage to satellites in which the space product is incorporated and US$ 125 million per satellite in case of a multiple launch respectively.

These sub-limits are understood as per event and in the annual aggregate. As an example, if during the period of insurance, damage to a satellite in which the space product is incorporated leads to an insurance indemnification of US$ 250 million, the limit of insurance will thereby be exhausted. Consequently, there will be no cover available during the same period of insurance if another satellite (in which the product is incorporated) is damaged, unless the amount of insurance has been (fully or partially) reinstated subject to an additional premium. In case of damage to third-party satellites on the ground or in orbit (subject to the operational life of the third-party satellite not having expired) and to bodily injury, the full limit of insurance will apply.[90] Often space endorsements require that the insured must have waivers of recourse, limitations to liability or 'hold-harmless' clauses in its favour included in the contracts with its customers. However, as seen above, this is not often the case within the satellite contractual chain.

The ESPLS coverage offers an amount of insurance up to a maximum of US$ 300 million per event and in the annual aggregate, without distinguishing between ground products, launcher products or satellite products.[91] The particularity of this insurance is that it is specifically drafted for space risks, contrary to space endorsements which follow the terms and conditions of the aviation product liability insurance. For example, the aviation product liability insurance is triggered by the

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[89] See *infra*, Appendix 1, for an example of an aviation endorsement.

[90] See *ibid*.

[91] Example of space products definition: '*SPACE PRODUCT* means a completed *GROUND EQUIPMENT* and/or any article forming part of, or supplied and/or integrated and/or to be integrated for installation in, or for use in connection with, a *LAUNCH VEHICLE* or a *SATELLITE* or a *GROUND EQUIPMENT*.

The word "article" as used here above means not only any sub-system, equipment, component, software, spare part, tooling, ground handling or test or support equipment but also any service or labor associated with and/or related to a *SATELLITE* or *LAUNCH VEHICLE*, or *GROUND EQUIPMENT* such as training aids, the drafting of specifications or manual blueprints, drawings or other data, engineering, survey and advice.'

occurrence of an accident or an incident at the origin of the damage to the (third-party or other) satellite or bodily injury to persons. However, the main risk in space is that of failure of the satellite without an accident necessarily occurring (for example the loss of power or the loss of a solar array). The ESPLS will provide specific coverage in case of failure of the satellite to complete its mission without the occurrence of physical damage to the satellite – always subject to terms, conditions and exclusions of the policy. Lastly, this coverage does not require the existence of a waiver of recourse or 'hold-harmless clause' in favour of the insured in the procurement contract or subcontracts, which is often the case for space endorsements.

Both types of insurance policy are generally subscribed to for a maximum of one year.

17.3 PROPERTY DAMAGE INSURANCE

Further to the above analysis of the third-party liability regime and applicable insurance with regard to space actors, property damage insurance will now be discussed as underwritten in order to indemnify the insured in case of damage to its space object.

Contrary to third-party liability insurance, as far as is known, no insurance obligations resting upon the space operator or manufacturer exist under international or national law. The decision to insure space property, being elements of the launcher on the ground or the satellite or any part on the ground or in space, entirely rests with the manufacturer, the operator or their clients, or alternatively with the financial institutions wishing to have their loan guaranteed by the insurance proceeds.

When talking about space property damage insurance, three periods of risks,[92] being the pre-launch, launch and in-orbit period, should be identified. These will be discussed in further detail below.

17.3.1 Typology of Property Damage Insurances

17.3.1.1 Pre-launch insurance

The pre-launch insurance phase starts at the signing of the satellite procurement contract and ends at the launch of the launcher, more

[92] See *Commercial Space and Launch Insurance: Current Market and Future Outlook*, Launch Report, Fourth Quarter 2002, FAA; see www.faa.gov/about/office_org/headquarters_offices/ast/media/q42002.pdf, last accessed 19 April 2014.

precisely when the launch becomes irreversible.[93] During this period, one may further sub-divide the risks into three phases.

The first period within the pre-launch phase concerns assembly, integration, test and potential storage of the satellite at the manufacturer or test centre's premises. During this period, payload and platform, including solar arrays, which are generally manufactured by different manufacturers, are assembled, integrated and tested in order to actually construct the satellite. Following such assembly, integration and test, the second period starts when the satellite has to be transported to the launch site. The end of this second period is heralded by the launch campaign, understood as the third period of risks, which is when the satellite is being integrated with the launcher and all the pre-launch tests are being performed, with checks, amongst other things, regarding whether the satellite has not been damaged during its transport to the launch site or that it will not itself damage the launcher.

The amount of insurance for the pre-launch phase is generally between €50 million and €80 million, but depending upon the type of satellite, this amount may be even higher.

The insurance policy covers damage to the insured assets that are due to different causes. Damage due to causes external to the satellite or part of the launcher (like collision or fall) will be covered, as well as damage due to causes internal to the satellite or part of the launcher (like fire or electrical short-circuit) and damage due to human error, noting that in the latter case wilful misconduct of the employees acting within the scope of their missions is always covered, this not being the case for wilful misconduct of directors or officers of the insured.[94] The cover will, of course, be subject to the specific terms, conditions and exclusions of the insurance policy. Generally, such pre-launch insurance coverage is offered by maritime cargo insurers, in contrast with launch and in-orbit insurance, which are normally offered by dedicated space insurers.[95]

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[93] Each launch contract states its own definition of an 'irreversible launch'. For instance, Ariane-5 launch contracts define it as 'the ignition of first stage engines'.

[94] The standard exclusion refers to 'wilful or intentional acts of the directors and officers of the named insured acting within the scope of their duties designed to cause loss or failure of the insured property. This exclusion does not apply to the employees of the Named Insured.'

[95] See e.g. P. Daouphars, L'assurance des risques spatiaux, in *Exploitation commerciale de l'espace, droit positif, droit prospectif* (Ed. P. Kahn) Vol. 15 (1992), 262; O. Schöffski & A.G. Wegener, Risk Management and Insurance

17.3.1.2 Launch insurance

To avoid any lack or overlapping of guarantees, it is important that pre-launch insurance ceases to have effect when the launch insurance starts. The inception of the launch insurance coverage phase is when the launch is deemed irreversible, that is when it cannot be stopped as per the definition provided by the applicable launch services agreement. Such definition differs from one launcher to another one and will depend on its technical context: it can be at intentional ignition or when the clamps open to release the launcher.[96]

During the launch phase, only the satellites at issue are covered by the insurance policy. The launchers are not directly insured in case of loss or damage because, on the one hand, the launcher is destroyed once it has performed its launch service and its value is included in the launch services costs and, on the other hand, launch services agreements generally provide that the launch service is deemed performed upon ignition of the launcher.[97]

Generally, the launch insurance policy ends one year after launch, meaning that the launched satellite can be covered during its first year in orbit via the launch insurance. In actual fact, the duration of the launch insurance policy thus varies from ‘launch plus few days’ to ‘launch plus one year’. Today the majority of space insurers offers launch insurance policies for a period of one year after launch, policies which have to be renewed at the end of the year under in-orbit insurance.[98] Some insurers today propose multi-annual policies with adapted premiums.

The satellite property damage insurance policy is systematically offered on the basis of ‘all risks’ coverage. This means that the insurance covers any loss or damage to the satellite, whatever the cause, except for the causes specifically excluded in the policy.[99] This notion is opposed to

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Solutions for Space and Satellite Projects, 24-2 *Geneva Papers on Risk and Insurance* (April 1999), 204–5.

[96] See *supra*, n. 93.

[97] For more details, see e.g. C.A. du Parquet, Specific Clauses of Launch Services Agreements, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 386–7.

[98] An example of such a ‘Policy Period’ wording would read: ‘The Policy Period is the period commencing on TBD 2013 and terminating on TBD 2014 (one year later) both dates at 00.01 hrs local time at the Named Insured’s Address (the “Period”).’

[99] An example of such an ‘All Risks’ cover would read: ‘Subject to all the terms, conditions, limitations and exclusions of the Policy, the Insurer shall indemnify the Named Insured up to the Sum Insured for all risks of loss occurring during the Policy period.’

the notion of a policy based on 'named perils', by which the insurers will only cover loss or damage specifically enumerated in the policy.[100]

The importance of the distinction between these two concepts lies in knowing upon which party (insured or insurer) the burden of proof rests. Under an 'all risks' policy the insurer will have to prove that an exclusion is applicable to deny its cover. The insured will only have to demonstrate that a loss or damage has occurred to its satellite. By contrast, under a 'named perils' policy the insured will have to prove that a peril covered by its insurance policy has occurred. Furthermore, the scope of cover of an 'all risks' policy is wider (covering essentially all causes) than a 'named perils' policy (covering only specific enumerated causes). So, it is clearly to the benefit of the insured that its satellite property damage insurance be subscribed on the basis of an 'all risks' wording.

In general, the insured determines the amount of insurance representing the maximum amount of coverage, to be included in the insurance policy. This amount corresponds either to the manufacturing costs of the satellite (including development costs) or to the remanufacturing costs of an identical satellite. It may include the launch services costs – except if a 'launch risk guarantee' (LRG) has been included in the launch services agreement – as well as the insurance premium or the in-orbit positioning costs.[101]

Launch service providers sometimes offer an LRG to their clients by which they propose, in case of launch failure, either a re-launch or a financial indemnification for the loss of the launched satellite. This LRG will provide for the full (or partial) cost of another launch if the satellite fails to reach its intended orbit or is destroyed, or if its functions are impaired as a result of a launch vehicle malfunction.[102] In this case, the insurance needs of the insured are lowered because of this existing guarantee. Specific insurances can be subscribed to cover this LRG.

The insured amount is commonly referenced in the insurance policy as being at an 'agreed value'.[103] By using this 'agreed value' notion,

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[100] An example of such a 'Named Perils Cover' would read: 'Subject to all the terms, conditions, limitations and exclusions of the Policy, the Insurer shall indemnify the Named Insured up to the Sum Insured for the following listed losses occurring to the insured asset during the Policy period.'

[101] For more details on launch insurance coverage and underwriting process, see B.R. Elbert, *Introduction to Satellite Communication* (3rd edn., 2008), 363.

[102] See Insurance Market for Space Activities, in *The Space Economy at a Glance 2011*, OECD (2011).

[103] Further on the concept of 'agreed value', see P. Montpert, Space Insurance, in *Contracting for Space* (Eds. L.J. Smith & I. Baumann) (2011), 287.

contestation of the value of the satellite at the time of a loss can generally be avoided. The insured and the insurer have determined the insured value on an *a priori* basis before inception of the policy, without the possibility to effectively change this value. The covered risks are essentially threefold.

Firstly, there is the 'total loss' of the satellite, being generally defined as the destruction of the satellite, the loss of the satellite (meaning the satellite cannot be controlled by ground stations), or the inability of the satellite to reach its orbital position within a pre-defined delay in the policy.[104] In case of total loss of a satellite, the insurers will indemnify the insured with the full value of the insurance amount.

Secondly, there is the 'constructive total loss', corresponding to a reduction of the lifetime or operational capacity of the insured satellite below a threshold, being traditionally between 70 per cent and 90 per cent.[105] This threshold is called 'loss quantum' and is defined as being the actual capacity compared to the nominal (contractual) capacity of the satellite. This capacity is evaluated as per the technical specifications of the satellite. If the actual capacity is below the nominal capacity, then the percentage of the capacity that the satellite has lost will be calculated. If the percentage of this loss quantum is between 70 per cent and 90 per cent, meaning that the operational capacity remaining for this satellite is between 10 per cent and 30 per cent, it will be declared a 'constructive total loss'. The satellite is deemed a constructive total loss when the loss quantum is higher than the threshold indicated in the policy, in which case the satellite will be totally indemnified by the insurers, as if the satellite indeed had been totally lost.

As a counterpart to such full indemnification of a constructive total loss a salvage provision has been introduced in the insurance policies. By application of this provision, upon receipt of the full indemnification of its loss, the insured undertakes to use its best efforts to save the satellite. The insurers will then be entitled to have the sole right to the maximum benefit of salvage.[106] Of course, the salvage amount that can be received by the insurers is limited to the indemnification amount paid to the

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[104] A common example of a 'Total Loss' definition would read: 'the satellite is totally lost or destroyed or cannot reach its intended orbital position within xxx months'.

[105] A common example of a 'Constructive Total Loss' definition would read: 'a satellite shall be declared Constructive Total Loss if the loss quantum relating to the operational capability of the satellite is of more than 75%'.

[106] A common example of a salvage clause would read: 'After a Claim Payment has been made for a Constructive Total Loss or a Total Loss, the

insured. In no event may the insurers gain a profit from the application of salvage. Furthermore, under the hypothesis that the insurers have indemnified the insured against a total loss or a constructive total loss, they can request the right to take title to the satellite.[107] On the practical side, this transfer of property is difficult to put in place, as there is not only the transfer of the satellite to be dealt with, but also the transfer of licences, authorizations, orbital positions, frequencies and suchlike.

Thirdly, 'partial loss' of the satellite corresponds to a partial reduction of the lifetime or operational capacity of the satellite below the threshold used for the determination of the constructive total loss. In this case, the amount of indemnification will correspond to the actual loss of capacity or lifetime sustained by the satellite. To calculate the indemnification of a partial loss, the same 'loss quantum' notion as for the 'constructive total loss' will be used. If the percentage of the loss quantum is less than the threshold defined in the policy, then the satellite will be declared a 'partial loss', and the insurers will indemnify only the amount of insurance corresponding to the percentage of loss. It is possible to add a salvage clause in the insurance policy by which after a claim payment, the insured agrees to do all things reasonably practicable to maximize salvage opportunities for the affected part of the satellite.[108] In such a case, in the same way as for 'total loss' and 'constructive total loss', the amount of salvage received by the insurers shall be limited to the indemnification paid by the insurers.

17.3.1.3 In-orbit insurance

In-orbit insurance will start at the expiry of the launch insurance and end, at the latest, at the end of the in-orbit life of the satellite.[109] Today, as for launch insurance, the market offers an insurance policy on an annual basis (except for a few markets that can offer up to two, three or even five years of coverage, with associated premiums) to be renewed at each anniversary date of the policy. Each year, at renewal, the insured has to provide the insurers with a health status report of the insured satellite. On the basis of this health status report, the insurers will decide to renew the

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Insurers have the sole right to the maximum benefit of salvage including the right to take title to the Satellite.'

[107] See *supra*, n. 106.

[108] For an example of salvage, see A.J. Gould & O.M. Linden, *Estimating Satellite Insurance Liabilities*, CAS Forum, Fall 2000, 57.

[109] See M. Spagnulo, R. Fleeter & M. Balduccini, *Space Program Management – Methods and Tools* (2013), 167; also B.R. Elbert, *The Satellite Communication Applications Handbook* (2nd edn., 2004), 107.

policy on the same terms and conditions, to exclude specific risks or not to renew the policy, for example if the satellite is not in good enough shape.

The amount of insurance corresponds, at the choice of the insured, to the value of the satellite, the cost of a replacement satellite or the amount of loans. Some satellite projects are financed by financial institutions, in which case the amount of insurance will correspond to the amount of the loan in order to secure the financing.[110] Generally, the amount of insurance decreases linearly to end at zero at the end of life of the satellite or at the end of the corresponding financing agreement.

The covered damages are total loss, constructive total loss or partial loss of the satellite, for the same causes and on the same bases as discussed above for the launch insurance policy.

17.3.1.4 Exclusions

The main standard exclusions of such insurances relate to damage caused by war risks and other perils, damage caused by radiation or nuclear effects, and damage caused by wilful misconduct of the insured, with the exception of employees acting within the scope of their duties.[111] Specific exclusions may also be added in the policy, for example excluding damages caused by specific components (known as defective or unimproved new components).[112]

17.3.2 Property Damage Insurance Market

The space insurance market is an international market with a handful of actors. These insurers are considered 'space' insurers in contrast to the third-party liability insurers, which are essentially aviation insurers as seen above. Because of the high amount of insurance for space risks it is necessary to approach the insurers on an international basis and not only on a national one. Today, around 20 insurers in the world offer such type of coverage for a total capacity of around US$ 668 million per launch for

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[110] Further on space projects financing, see F. Martin, Le financement des projets de télécommunications spatiales, in *Exploitation commerciale de l'espace, droit positif, droit prospectif* (Ed. P. Kahn) Vol. 15 (1992), 245–51; also *supra*, Chapter 16.

[111] See *infra*, Appendix 2, for an example of an exclusion.

[112] Here, specific provisions are inserted depending on technical specificities; unfortunately the precise terms constitute proprietary information.

the launch phase risk (depending on the type of launcher) and a total capacity of around US$ 549 million per satellite for in-orbit risks.[113]

As of today, this capacity is sufficient and meets the insured's needs. For the last several years in a row this type of insurance is beneficial and new actors have emerged to add to the overall coverage available. This has led to an increase of the total capacity per launch alternatively per satellite, and to more competition between these actors.

17.4 SPACE DEBRIS IN THE CONTEXT OF INSURANCE

Finally, the issue of space debris, already discussed more generally above,[114] will be assessed from the specific perspective of insurance. The number of particles constituting space debris has increased considerably in the past decade – and actually has almost doubled over the last 20 years. This continued growth of the amount of space debris also as of today raises the question of what the response from the insurance sector would be to damage caused by the said debris to other spacecraft or on earth.

Historically, the insurers, especially with respect to the geostationary orbit, have considered space debris risks to be very low.[115] However, taking into account that the duration of exposure can be very long for space debris, insurers generally refuse to cover space debris under third-party liability insurance, as they do not want to be exposed to very long-term risks. Therefore, only a small minority of insurers offer cover for space debris and that, in addition, only on a short-term basis (usually one year).

Such third-party space debris liability must be distinguished from the issue of first-party property insurance; that is where owners of spacecraft would wish to insure their property in space against damage caused by space debris, in particular if no state or other entity can be held liable for such damage.

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113 These figures come from Marsh, see *2013 Space Market Capacity*.

114 See *supra*, § 13.2.1.

115 See M.W Taylor, *Orbital Debris: Technical and Legal Issues and Solutions* (2006), 33; also *Orbital Debris – A Call to Action*, International Space University SSP 2012, 13.

17.4.1 Space Debris Liability

Liability for space debris is an important issue in that space debris may cause damage in orbit, but also on earth (whether on the ground, at sea or in airspace) for a long time after the launch of the original space object. In case of damage caused by space debris, would there be insurance coverage available to the owner/operator of the spacecraft at the origin of the debris?

With respect to space debris regulation, the related issue of application of the Outer Space Treaty and the following space conventions is not within the scope of this chapter. At this stage it may simply be noted that after several years of coordination, at national and international level, a consensus has been reached on space debris mitigation measures.[116] All these measures have in common that they constitute guidelines for space operators, not binding regulation. This is an important element to be considered when referring to insurance in case of damage caused by space debris. How can the liability of the space operator be assessed in order to be able to apply adequate insurance cover?

The main issue is that space third-party liability insurance will cover the financial consequences of the liability of the insured in the event of damage caused to third parties and caused by the space activity of the insured.[117] Therefore, in the absence of liability, no insurance will offer its guarantee. That is the reason why it is important, when damage occurs, to know whether the space operator bears liability or not. Even though 'launching States' may bear liability in case of damage caused by their space debris under international regulation,[118] this does not automatically lead to availability of third-party liability insurance coverage for such liability.

Third-party liability insurance is underwritten on the basis of a fixed duration up to a maximum of 12 months, and must be renewed each year. If a space object becomes space debris and causes damage to third parties

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[116] This concerns such key work as undertaken by the Inter-Agency Space Debris Coordination Committee (IADC), UN COPUOS, and the European Code of Conduct; see *supra*, §§ 13.3.2.1, 13.3.2.2, 13.4.

[117] Further on this issue, see P. Manikowski, Examples of Space Damages in the Light of International Space Law, 6 *Poznan University of Economics Review* (2006), 54–68.

[118] *Cf.* also the discussion of 'space object' as relevant for the determination of applicability of the Liability Convention (*supra* n. 14), *supra*, § 2.3.3.3, also 2.3.3.9; and § 13.3.1.2.

while the third-party liability insurance is in force (for example, following a launch failure, debris falls down on earth and causes damage to facilities or following loss of control of a satellite, that satellite collides with another satellite), then such insurance should cover the financial consequences of the liability of the space operator, unless some exclusions apply.

At the end of the launch or in-orbit third-party liability insurance, the space operator will either decide to renew its insurance, following a legal requirement or of its own will (the latter being quite rare), or decide not to renew its insurance. In the first case, if there is some space debris to be insured, there is a small and specific insurance market that can offer a dedicated cover for space debris at a specific premium rate. In the second case, if there is no insurance cover in force to cover space debris after expiry of the previous insurance policy, in most cases there will be no compensation available on the part of the insurance provider if space debris causes damage. However, it must be borne in mind that depending on the insurance trigger, some insurance policies can afford coverage for damage caused by space debris. Indeed, using the 'damageable fact' trigger[119] permits coverage of damage caused by space debris after expiry of the third-party liability insurance policy if the damageable fact has occurred during the period when the insurance policy was in force.[120]

As of today, there are a few examples of collision on orbit with space debris or of space debris falling back to earth. With regard to space debris falling back to earth, there is the well-known Cosmos-954, which crashed in the Canadian Arctic in 1978 following its loss of control, leading to a transaction between Canada and the USSR.[121] In this case, insurance was not subscribed at the time of re-entry of the satellite; therefore, there has been no insurance indemnification.

Another notable event occurred on 23 December 2011 when the launch of the Meridian-5 satellite terminated a few seconds after launch. Debris fell over the Novosibirsk Oblast in Siberia and one piece of debris even fell through the roof of a house in Cosmonaut Street in the village of Vagaitsevo. Fortunately, no injuries were reported. In this case, even though Soyuz launches are always insured under third-party liability insurance as this is a legal requirement, there has been no indemnification under any third-party liability insurance.

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119 See *supra*, § 17.2.2.2.

120 See *ibid.*, also for limits of application of such trigger.

121 See e.g. L.H. Legault & A. Farand, *Canada's Claim for Damage Caused by the Soviet COSMOS 954 Satellite*, Paper at the ABA Forum Committee on Air and Space Law, Orlando, 24 February 1984; also further *supra*, § 2.3.3.9.

Recently, there have been collisions on orbit that may question the application of third-party liability insurance cover, if any was underwritten. In 2009 there was a collision between an operational satellite of the Iridium constellation Iridium-33 and a Russian Cosmos-2251 defunct satellite. Another recent event occurred in January 2013 when a small Russian satellite, BLITS, was hit by a piece of space debris generated by the destruction by means of an anti-satellite missile of the Fengyun-1C Chinese satellite back in 2007. For both cases, the question of liability of the Russian Federation in the first example and of the People's Republic of China in the second one may be discussed at length.[122] On the third-party liability insurance side, the debris of the Fengyun-1C satellite and Cosmos-2251 defunct satellite were not insured for damage caused to third parties at the time of respective collision, so third-party insurance has not been involved in these cases.

Therefore, a dedicated regulation on space debris mitigation leading to allocation of liability for damage caused by space debris such as has been enacted by way of some national space laws,[123] may have the consequence of providing comfort to space insurers by setting up specific liability allocation rules and may influence the development of dedicated third-party liability insurance for space debris. It would also lead to adaptation of current insurance policies to such regulation. In this case, the insurance policy would refer to applicable liability and may offer specific space debris liability insurance adapted to the liability and conditions set up by said regulation.

17.4.2 Space Debris and Property Damage Insurances

In case of damage caused to a spacecraft by space debris, the basic question is whether there would be insurance coverage available to the owner/operator of the damaged spacecraft. In this case, one is not referring to liability of the (former) operator of the space debris but to damage caused to an operating satellite by a piece of space debris and how space property damage insurance would apply to that.

As discussed earlier, the standard property damage coverage is drafted as an 'all risks' insurance, which means that this insurance will compensate any damage sustained by a satellite unless a specific exclusion in the policy applies. To date, as far as is known, space property damage

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[122] *Cf.* also further *supra*, § 13.2.1.
[123] *Cf.* e.g. Art. 5, French Law on Space Operations, *supra* n. 27.

insurance policies do not exclude damage caused by space debris.[124] Therefore, such policies will cover the total loss, constructive total loss or partial loss of an insured spacecraft including if caused by space debris. This assumes that the launching state(s) actually liable for such damage could not be identified, somehow, as otherwise those states would have to compensate – and both identifying the 'launching State' and proving fault can be difficult in an in-orbit environment.

Alternatively, the owner of the insured satellite may seek indemnification from its property insurers, which would be easier to do than to establish a 'launching State's' liability and go through the diplomatic process of arranging for compensation therefrom.[125] Then, the property insurers may have their state try to take recourse against the 'launching State' (to the extent, of course, such rights of recourse exist under the Liability Convention[126]).

Of course, this is the situation in respect of coverage of space debris as of today. The insurance market perception of this risk may evolve in the future, for example in the event of increase of damage caused by space debris, and as a consequence the conditions of coverage may evolve as well.

17.5 ASTRONAUTS' INSURANCE

With respect to astronaut activities, two alternative situations should be taken into consideration from a liability and insurance perspective: either the astronaut is the origin of damage caused to someone else, or the astronaut has sustained such damage him/herself (to his/her property or by way of bodily injury). For both situations, the insurances actually in place will be briefly addressed.

17.5.1 Damage Caused by Astronauts

Regarding the case where astronauts cause damage to space objects, either the launch vehicle or, for instance, any module of the International

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[124] Further on this topic, see the discussion in Daouphars, *supra* n. 95, 289–93; also Space Debris, Postnote no. 355, UK Parliamentary Office of Science and Technology, March 2010, 4.

[125] *Cf.* further *supra*, § 2.3.3.7 on the procedural provisions of the Liability Convention, *supra* n. 14.

[126] *Cf.* further *supra*, § 2.3.3.6 on the provisions of the Liability Convention, *supra* n. 14, regarding the right to claim.

Space Station, the liability and the repairs process are generally determined and ruled through agreements between the launch agencies and agencies providing the astronauts. As an example, the Intergovernmental Agreement relating to the International Space Station[127] states that there will be no recourse between the partners when a partner causes damage to the assets of another partner, except when otherwise stated in the Intergovernmental Agreement.[128] Due to the cross-waivers between the partners and the astronauts contained in the applicable clause, no third-party liability insurance needs to be underwritten.

17.5.2 Bodily Injury or Property Damage Sustained by Astronauts

By contrast, there is some insurance in place for damage sustained by astronauts while in mission. Such accidents suffered by astronauts during their professional mission, that is before, during and after the space mission, can be covered via a specific insurance programme named 'personal accident' (PA) programme.

This PA insurance may be subscribed to by the employer of the astronaut and will indemnify him/her or his/her legal successors in case of death or permanent invalidity following an accident. This insurance will provide its cover without seeking any liability of any potentially accountable person.[129] The major interest of this insurance is to permit rapid indemnification of the victim or its legal successors. The astronaut is covered for injury that he/she may sustain, but there are obviously applicable exclusions, such as (damage caused by) suicide, alcohol, drugs or war and terrorism.[130]

In the space sector, there is no legal obligation for the employer to subscribe to PA insurance on behalf of its employees; such a decision remains entirely with the employer. In some cases, the employer may want to have the benefit of the indemnification and be indemnified himself for the training or investment costs in the project, and thereby be

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[127] Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4; see further *infra*, § 11.3.2 ff.

[128] See Art. 16(3)(d), Intergovernmental Agreement, *supra* n. 127.

[129] As per the PA insurance policy itself.

[130] Note, that the war and terrorism exclusion may be covered under certain conditions and with application of an additional premium.

able to replace the injured astronaut. In this case, the PA insurance may be replaced by an insurance named 'key man', the purpose of which is to cover a company in the event of unavailability of one of its employees.[131] Certain conditions are applicable to this type of insurance. For example, in France the said insurance is valid only if the employee has agreed to it. If the employee has not given its agreement, the indemnification will not be paid to the company but to him or its legal successors.

17.6 THE ROLE OF THE INSURANCE BROKER

Finally, a few words on the mission and status of the insurance broker, as he plays a major role in the space insurance for several reasons – the size of the coverage and capacity of the individual insurers, the technical expertise available, and the international character of space activities.

To place its space insurance risks, the space operator (launch agency or satellite operator) or space products manufacturer will usually call upon the services of specialized space insurance brokers. The insurance broker is the intermediary between the insured (the entity wishing to subscribe an insurance coverage) and the insurers. The broker is mandated by the client and represents the latter's interests. From the moment the client wishes to insure its risks up to the expiry of the insurance contract or claims settlement, if any, the broker will accompany the insured, by determining with him the risks to be insured and the best insurance solutions, by drafting the policy and, as said, by negotiating and settling claims. This being said, in no case may the broker act as an insurance provider, as he does not have the approval to act as an insurance company, therefore he cannot be liable in lieu of any insurance provider, for instance in case of bankruptcy. In such a situation, the insured will be indemnified for the aggregate insured sum minus the part which was the responsibility of the failed insurance provider.[132]

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[131] As per the PA insurance policy itself.

[132] Further on the role of the insurance broker in the space activities industry, see Elbert, *supra* n. 101, 363; also *Commercial Space and Launch Insurance: Current Market and Future Outlook*, *supra* n. 92, 9. For a more general perspective on the broker's role, see J.W. Stempel, *Stempel on Insurance Contracts* (3rd edn., 2006) Vol. 1, ch. 6.

17.7 CONCLUSION

To conclude, traditional space activities are today well known and handled in terms of risk management and insurance, but some new activities may impact the standard insurances, such as sub-orbital flights activities. These sub-orbital flights are different from space tourism as their goal is to organize a short flight in weightless conditions and not a more or less long stay in outer space; such flights will ask a few questions with respect to the legal liability regime that can be applicable (air, space, common law, or specific regulation?)[133] and the insurance obligations that may stream down.

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133 *Cf.* further *supra*, e.g. § 12.3.

APPENDIX 1: SPACECRAFT COVERAGE ENDORSEMENT

Notwithstanding Exclusion TBD of this policy it is hereby agreed that Product liability coverage of this policy shall apply in respect of Property Damage to:

(1) any spacecraft, satellite or spaceship and any article or Aircraft Product furnished for, used in connection with, relating to, or installed in any spacecraft, satellite or spaceship whether partially or wholly completed, and
(2) any spacecraft, satellite or spaceship belonging to a third party whether partially or wholly completed,

until the Operational Life of such spacecraft or satellite or spaceship has expired
provided that:

(A) in the event of Property Damage to two or more satellites on the same launch occurring after completed integration of the satellites on board the Launch Vehicle, until the actual physical separation from the Launch Vehicle, this policy shall pay such sums which the Insured shall be legally obligated to pay as damages in respect of Property Damage to a satellite subject to the applicable policy limit or USD 125,000,000, whichever the lesser, any one satellite, or
(B) in the event of Property Damage to a satellite occurring other than as stipulated in (A) above, this policy shall pay such sums which the Insured shall be legally obligated to pay as damages in respect of Property Damage to such a satellite subject to the applicable policy limit or USD 250,000,000, whichever the lesser. However, if Property Damage is caused to another satellite the Operational Life of which has not expired, this policy shall provide coverage up to the applicable policy limit.

For the purpose of the coverage afforded by this endorsement the term Operational Life shall be defined as follows:

OPERATIONAL LIFE

Operational Life of a complete spacecraft, satellite or spaceship is deemed to be the period of time such spacecraft, satellite or spaceship is designated to perform by the manufacturer as stated in the original sales contract.

LIMITATION OF LIABILITY

It is further understood and agreed that the inclusion of this endorsement shall not operate to increase the total liability of the Insurers beyond the limits stated in Item 5 of the Declarations.

APPENDIX 2: EXAMPLE OF PRE-LAUNCH INSURANCE EXCLUSIONS

This insurance does not apply to loss, damage or failure caused by or resulting from:

1. War, invasion, hostile or warlike action in time of peace or war, including action in hindering, combating or defending against an actual, impending or expected attack by:
   (a) any government or sovereign power (de jure or de facto); or
   (b) any authority maintaining or using a military, naval or air force; or
   (c) a military, naval, or air force; or
   (d) any agent of any such government, power, authority or force.
2. Any anti-satellite device, or device employing atomic or nuclear fission and/or fusion, or device employing laser or directed energy beams.
3. Insurrection, strikes, labour disturbances, riots, civil commotion, rebellion, revolution, civil war, usurpation, or action taken by a government authority in hindering, combating or defending against such an occurrence, whether there be declaration of war or not.
4. Confiscation, nationalisation, seizure, restraint, detention, appropriation, requisition for title or use by or under the order of any government or governmental authority or agent (whether secret or otherwise and/or whether civil, military or de facto) or public or local authority or agency.
5. Nuclear reaction, nuclear radiation, or radioactive contamination of any nature, whether such loss or damage be direct or indirect, except for radiation naturally occurring in the space environment.
6. Electromagnetic or radio frequency interference, except for physical damage to the Satellite directly resulting from such interference and from interference coming directly from the Satellite.
7. Wilful or intentional acts of the Named Insured designed to cause loss or failure of the Satellite designed to cause loss or failure of the Satellite; however, this exclusion does not apply to actions of any employees, contractors or subcontractors of the Named Insured while acting outside their authorised responsibilities.
8. Any act of one or more persons, whether or not agents of a sovereign power, for political or terrorist purposes and whether the loss, damage or failure resulting therefrom is accidental or intentional.

9. Loss of revenue, incidental damages, consequential loss or extra expenses, other than expressly covered under this insurance.
10. Third Party Liability.

18. Intellectual property rights in the context of space activities

Catherine Doldirina

18.1 INTRODUCTION

Intellectual property (IP) has become ever more important in the information age of the societal development in various countries, and its protection often becomes a cornerstone in engagement and progress in various activities. This is true for many types of space activities that are at the edge of the technological development and produce results that require granting and enforcement of IP rights (IPR).

There is, however, one major challenge to effective application of IP protection to the results of space activities, and this analysis focuses precisely on this interesting issue. IP protection, in particular the procedures for granting and enforcing it, is per se territorially limited: it encompasses territory of single states, sometimes of groups of states, and existing international IP law instruments[1] recognize IPR legitimately existing in one jurisdiction in countries that are party to the same relevant treaties.

In a nutshell, an owner of IPR over eligible subject-matter in one jurisdiction may only protect it in other jurisdictions if the latter recognize them by virtue of the so-called national treatment provisions embodied in relevant international law instruments, or if the owner

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[1] This principle is fundamental to any IP protection regime, be it patent, copyright or trademark law. See Berne Convention for the Protection of Literary and Artistic Works (hereafter Berne Convention), Berne, done 9 September 1886, entered into force 5 December 1887; 828 UNTS 221; 331 UNTS 217; ATS 1901 No. 126; as last revised Paris, 24 July 1971, 1161 UNTS 30; the World Intellectual Property Organization (WIPO) Copyright Treaty (hereafter WIPO Copyright Treaty), Geneva, done 2 December 1996, entered into force 6 March 2002; UKTS 2011 No. 30; Cm. 8161; 36 ILM 65 (1997); and the Convention for the Protection of Industrial Property as Modified by Additional Act of 14 December 1900 and Final Protocol (hereafter Paris Convention), Paris, done 20 March 1883, entered into force 6 July 1884; 828 UNTS 305; USTS 379; UKTS 1907 No. 21; ATS 1907 No. 6.

decides to register his IPR in those jurisdictions where the protection and its enforcement may be sought.

What is, on the contrary, inherent in many space activities is their international nature: they are either conducted in an international environment, outer space, that is declared a province of mankind by the Outer Space Treaty,[2] or often are the result of cooperation between different countries, or actors incorporated in different jurisdictions,[3] hence the limitation of the IP protection to the territory of a single state or even a group of states may not be effective.[4] This fundamental feature of space activities constitutes a major challenge to the effective legal protection of IPR in space-related[5] or space-generated[6] subject-matter, and often will necessitate specific regulatory arrangements in order to secure its protection. One of the most cited and well-known examples in this regard is the legal regime regarding patentable inventions made on board the International Space Station, which needed to be clarified in the Intergovernmental Agreement concluded by the participating states.[7]

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[2] Hence they are not subject to claims of sovereignty or territoriality (see Arts. I, II, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967)): the exploration and use of outer space for the benefit of mankind and the non-appropriation of outer space by any nation are fundamental principles under international space law. See further R. Abeyratne, The Application of Intellectual Property Rights to Outer Space Activities, 29 *Journal of Space Law* (2003), 1.

[3] This is the consequence of the scope and financial dimensions of space activities.

[4] In general, see Intellectual Property and Space Activities, Issue paper prepared by the International Bureau of WIPO, April 2004; see www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf, last accessed 26 January 2014. The World Intellectual Property Organization (WIPO) was established by means of the Convention Establishing the World Intellectual Property Organisation (WIPO) (hereafter WIPO Convention), Stockholm, done 14 July 1967, entered into force 26 April 1970; 828 UNTS 3; TIAS 6932; 21 UST 1749; UKTS 1970 No. 52; Cmnd. 3422; ATS 1972 No. 15; 6 ILM 782 (1967).

[5] This concerns IP produced as a result of space activities.

[6] This concerns IP produced in outer space.

[7] Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter

Several main areas that require (regulatory) action in order to provide adequate IP protection of the subject-matter in question include principles regarding the creation of IP, in particular its location, registration (for example regarding appropriate jurisdiction for the patentable inventions made in outer space) and enforcement mechanisms, especially when protection is sought worldwide. These principles or mechanisms should effectively address IP produced on the earth (space hardware like rockets or satellites), in outer space for terrestrial needs (like remote sensing data), as well as in outer space for space needs, when utilization of IP subject-matter, for instance patents, is carried out in outer space itself. This snapshot of issues reveals the complexity of the potential solution and points out the need for a comprehensive international regime that would specifically address them,[8] for example by harmonizing relevant national approaches and regulations.

The principle of state jurisdiction over space activities under Article VIII of the Outer Space Treaty is used as a basis for securing quasi-territorial protection of space-generated IP subject-matter.[9] This requires the creation of an IP management regime suited to the particular project or programme.[10]

The following sections address the two most important fields of IP protection – copyright and patent – and lay down the main international mechanisms governing them, as well as reflecting on their incorporation in national law. They point out the issues that are seen as obstacles to achieving the necessary level of protection and the ability to effectively enforce it, in particular based on the international dimension of space activities and the territoriality of IP protection. In conclusion, they attempt to identify possible solutions for treating these interesting, challenging and potentially far-reaching issues.

Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4.

[8] This necessity was already indicated 20 years ago by the participants of the WIPO workshop on Intellectual Property Rights in Outer Space, Madrid, 26 May 1993.

[9] For a discussion on current approaches to the bases for exercising jurisdiction by states that go beyond the traditional interpretation of territoriality, see H.L. Buxbaum, Territory, Territoriality, and the Resolution of Jurisdictional Conflict, 57 *American Journal of Comparative Law* (2009), 631.

[10] This applies to the use of remote sensing data – the same data sets can be effectively utilized in different jurisdictions; data from several providers can also be combined to make one geographic information product.

18.2 COPYRIGHT

18.2.1 Characteristics of Protection

Copyright is one of the oldest forms of IP protection and has enjoyed substantial attention both at the international level and in the domestic legislation of states. The oldest and the most adhered-to international source of law that harmonizes principles of copyright protection and codifies rules to overcome the hurdles of its territoriality is the Berne Convention for the Protection of Literary and Artistic Works.[11] Other instruments, which do not conflict with the provisions laid down in the Berne Convention or even complement them, include the Universal Copyright Convention,[12] the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement)[13] and the WIPO Copyright Treaty.[14] This analysis concentrates on the provisions codified in the Berne Convention and the WIPO Copyright Treaty as the most widely accepted.

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[11] *Supra*, n. 1.

[12] Universal Copyright Convention of 6 September 1952, as revised (hereafter Universal Copyright Convention as revised), Paris, done 24 July 1971, entered into force 10 July 1974; 943 UNTS 178; TIAS 7868; 25 UST 1341; UKTS 1975 No. 9; Cmnd. 4905; ATS 1978 No. 2; including Protocols 1 and 2. The Convention is not applicable between the Contracting States of the Berne Convention, *supra* n. 1; see Art. XVII, Universal Copyright Convention as revised. For the original version, see Universal Copyright Convention, Geneva, done 6 September 1952, entered into force 16 September 1955; 216 UNTS 132; TIAS 3324; 6 UST 2731; UKTS 1957 No. 66; Cmd. 8912; ATS 1969 No. 9.

[13] Agreement on Trade-Related Aspects of Intellectual Property Rights (hereafter TRIPS Agreement), Annex 1C to the WTO Agreement (Agreement Establishing the World Trade Organization, Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1867 UNTS 154; UKTS 1996 No. 57; ATS 1995 No. 8; 33 ILM 1125, 1144 (1994)), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1869 UNTS 299; UKTS 1996 No. 10; Cm. 3046; ATS 1995 No. 38. An earlier version of TRIPS had been included in 1986 in the General Agreement on Tariffs and Trade (Geneva, done 30 October 1947, entered into force 1 January 1948; 55 UNTS 194; TIAS 1700; ATS 1948 No. 23), then concluded as a separate agreement. The instrument covers many areas of IP and requires World Trade Organization members to comply with the Berne Convention, *supra* n. 1.

[14] *Supra*, n. 1. Concluded in 1996 as a special agreement pursuant to Art. 20, Berne Convention, *supra* n. 1, it introduced specific provisions to regulate exploitation of works in on-line and digital environments.

The Berne Convention established the fundamental principles of copyright protection. The first one is laid down in its Article 2 as the so-called 'creator's doctrine', according to which only works that are *intellectual creations of their authors* are eligible for copyright protection. The traditional interpretation of this principle excludes protection of subject-matter, generation, collection or making of which required a lot of time, labour or financial resources,[15] but not the required creativity.[16] The second most important principle of copyright protection declares that only the 'mode or form of expression' of a work and not ideas on which it is based are protected.[17] In line with this principle, ideas, processes, methods of operation, mathematical concepts, as well as data and material are explicitly[18] excluded from the scope of copyright protection, because the protection they require would have to cover their content. The third principle, often omitted in today's practice, is that of fixation of the work on a certain medium.[19] This omission is particularly true for the digital environment, where the works never materialize as such, like books, CDs and other works tangibly fixated.

Copyright is the most 'liberal' of the types of IPR and does not require registration or any other formal recognition: its protection covers the eligible work as soon as it is created.[20] The lists of examples of protected works that a number of copyright protection legal instruments contain[21] are long and encompassing, but never exhaustive, to allow currently non-existent yet eligible future works to be protected by the regime.

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[15] This interpretation often results in the fact that remote sensing data fall short of qualifying for copyright protection because of methods and modes of generation and further processing. See e.g. the extended discussion in C. Doldirina, *The Common Good and Access to Remote Sensing Data* (2011), 39–52.

[16] Instead of 'creativity', often terms like 'originality' and 'sweat of the brow' are used, and interpreted differently in various jurisdictions.

[17] See e.g. (implied) Art. 2(1), Berne Convention, *supra* n. 1; (expressed) Art. 2, WIPO Copyright Treaty, *supra* n. 1.

[18] See Art. 5, WIPO Copyright Treaty, *supra* n. 1.

[19] See Art. 2(2), Berne Convention, *supra* n. 1.

[20] There are some minor exceptions that exist in some jurisdictions, usually of procedural character, such as registration of the work with a designated authority that may be used as the proof of authorship if contested, or in case of other infringements.

[21] The Berne Convention (*supra* n. 1), the US Copyright Act of 1976 as amended, 17 U.S.C., and the German Copyright Law ('*Urheberrechtsgesetz*'), 9 September 1965, BGBl. I S. 1273, as amended (hereafter German Copyright Law) serve as good illustrations.

The essence of copyright is that it grants the author of the work that is his personal creation exclusive economic rights to reproduce, disseminate and otherwise utilize it.[22] Along with these economic rights, in a number of jurisdictions, it also has a moral side – the right to be recognized as the author of the work. Copyright protection, like other forms of IPR, is granted for a limited period of time, and expires after 50 years,[23] when protected works enter the so-called public domain. Today many jurisdictions opt for longer periods of protection: for example in the United States and the European Union it comprises 75 years. Any or all rights[24] comprising a copyright protection regime can be transferred or waived while the work is still protected.

The mechanism that aids the implementation of the principle that only expression is protected is embodied in exceptions to the economic rights of authors.[25] They allow users of works to utilize them without permission or without remuneration.[26] Exceptions are an integral part of the copyright protection regime for a number of reasons. Most of the exceptions relate primarily to not-for-profit or socially beneficial acts: research, archiving of works by libraries, teaching and news reporting. National legislation across jurisdictions contains principles or scenarios regarding when such 'free' use of protected works is permitted.[27]

Copyright protection can be granted to databases[28] if they fulfil the same criteria as eligible individual works, meaning that a database has to

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[22] See Arts. 8, 9, 11, 12, Berne Convention, *supra* n. 1; Art. 8, WIPO Copyright Treaty, *supra* n. 1.

[23] See Art. 7, Berne Convention, *supra* n. 1. The term of protection usually starts from the year following the publication of the work.

[24] This depends on the will of the author or rights holder, or alternatively applicable legislation (e.g. with regard to moral rights).

[25] The concept is known as 'fair use' in the common law jurisdictions; *cf.* Sec. 107, US Copyright Act.

[26] As per Arts. 10, 10*bis*, Berne Convention, *supra* n. 1; *cf.* also e.g. Sec. 29, Canadian Copyright Act, R.S.C. 1985, c. C-42.

[27] E.g. in the European Union the choice was made in favour of a long but closed list of specific exceptions in Art. 5, Directive of the European Parliament and of the Council on the harmonisation of certain aspects of copyright and related rights in the information society (hereafter Information Society Directive), 2001/29/EC, of 22 May 2001; OJ L 167/10 (2001). In Canada and the United States the exceptions are dealt with through the concepts of 'fair dealing' (Canada) and 'fair use' (United States) respectively, which serve as guidelines enabling the assessment as to whether a particular act of using the work can be considered as an exception to author's rights.

[28] This is important especially for the protection of geospatial data, including remote sensing data.

be an intellectual creation, and be fixed in a material form.[29] According to both international and national legal norms, separate materials, data sets and works contained in a database do not have to be original works under the Berne Convention,[30] as the eligibility for protection of a database does not depend on whether its content as such is protected by copyright. Therefore, databases that contain factual information are not automatically precluded from copyright protection, and will be subject to it if the selection and arrangement of their content meets the creativity criterion. At the same time, protection granted to the author of a database does not cover any parts of its content,[31] as an interpretation that allows such a scenario would exceed the traditional scope of copyright protection.

The necessity for databases to be creatively arranged precludes application of copyright protection to a lot of databases that are arranged, for example, following the basic principles of alphabetic order, numbered list, or any other utilitarian or functional basis. This fact results in a situation where a lot of today's databases, particularly electronic databases, fall short of qualifying for copyright protection. They are often, however, a source of substantial revenues for the companies who develop and maintain them. Hence, the question as to how best protect them arises.

One of the few jurisdictions that opted for introducing a special type of protection for unoriginal databases is the European Union. In 1996 it introduced *sui generis* database protection for databases the making of which required substantial investment. The Database Directive[32] lays down the requirements regarding the substantial investment[33] and codifies the right of the database maker to prevent extraction or re-utilization of substantial parts of the contents of the protected database.[34] The protection is granted for 15 years and can be prolonged an unlimited

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[29] See Art. 2(5), Berne Convention, *supra* n. 1; Art. 5, WIPO Copyright Treaty, *supra* n. 1; Sec. 10, US Copyright Act, *supra* n. 21; Art. 4(1), German Copyright Law, *supra* n. 21.

[30] See Art. 2(5), Berne Convention, *supra* n. 1.

[31] I.e. they are protected separately, as separate intellectual creations; database protection is not suitable to protect the content or information databases contain.

[32] Directive of the European Parliament and of the Council on the legal protection of databases (hereafter Database Directive), 96/9/EC, of 11 March 1996; OJ L 77/20 (1996). See also e.g. *supra*, § 4.3.2.3.

[33] See Art. 7(1), Database Directive, *supra* n. 32.

[34] See Art. 7(1), (2), Database Directive, *supra* n. 32.

number of times provided that the contents of the database are substantially changed before the 15-year protection expires.[35]

The scope of protection, however, is unclear and even the authoritative interpretation of some provisions of the Database Directive by the European Court of Justice did not bring the desired necessary clarification.[36] The Database Directive was also reviewed by the European Commission.[37] However, the revision did not identify any substantial economic benefits of having the Directive in force.[38] Nevertheless, taking into account overall positive feedback regarding the new codified database right, the decision to keep the Directive in force was made.[39] Overall, it seems, the Database Directive represents 'lessons learned' rather than a 'best practice', primarily because it introduces a type of IP protection that is hardly recognized and codified by any other states, and is not clear enough both in terms of criteria for protection and of scope. This potentially creates more problems in the rights' enforcement phase as it distorts the internationally agreed principles of copyright and IP protection.

In addition to the substantive provisions regarding the conditions and scope of copyright protection, the Berne Convention establishes rules regarding protection of foreign works in the territory of its contracting states. The basic principle is the 'national treatment' approach: authors who are not nationals of a contracting state enjoy the same protection in the country of origin as authors who are nationals of that state.[40] In such cases protection is governed by the domestic law of the state where the

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[35] See Art. 10, Database Directive, *supra* n. 32.

[36] See ECJ, *British Horseracing Board Ltd and others v. William Hill Organisation Ltd*, C-203/02 [2004] OJ C 6 (08.01.2005); ECJ, *Fixtures Marketing Ltd v Organismos prognostikon agonon podosfairou AE*, C-444/02 [2004] OJ C 6 (08.01.2005).

[37] See First evaluation of Directive 96/9/EC on the legal protection of databases, of 12 December 2005, http://ec.europa.eu/internal_market/copyright/docs/databases/evaluation_report_en.pdf, last accessed 27 January 2014.

[38] See First evaluation of Directive 96/9/EC on the legal protection of databases, *supra* n. 37, 22–3, 24.

[39] Out of the four policy options for the future of the Database Directive, *supra* n. 32, proposed in First evaluation of Directive 96/9/EC on the legal protection of databases, *supra* n. 37, 25–7, the most preferred options were not to change the Directive at all, and to clarify its scope, http://ec.europa.eu/internal_market/copyright/prot-databases/index_en.htm#maincontentSec2, last accessed 27 January 2014.

[40] See Art. 5(3), Berne Convention, *supra* n. 1.

protection is sought or rights are exercised.[41] However, in order to minimize the differences, particularly in the scope of protection and the enforcement mechanisms available to the author or the owner of the protected work, the Berne Convention specifies that the minimum level of protection regarding the rights granted, and their duration, shall be ensured by the contracting states in line with the 'minimum standard' approach. Still, the Berne Convention allows states to adopt higher standards of copyright protection. These principles are important for the practical enforcement of copyright in protected works, particularly when they are placed on foreign markets, located in a state other than that of the first publication of the work.

In conclusion, it is appropriate to emphasize that copyright, like other forms of IPR, is an artificial construct that exists solely within the boundaries and the framework of the legal norms that create it. This means, most importantly, that the owner of copyrighted works cannot enjoy more rights than those granted by law. It is an important and equally fundamental aspect of IP protection across the world and should be applicable to the case of protecting results generated by space activities by virtue of this regime. Whether this is achieved in practice is addressed over the next paragraphs, which analyse applicability of copyright protection to the results of space activities. The most relevant example to illustrate in this respect is remote sensing data.

18.2.2 Case Study: Satellite Remote Sensing Data and Copyright

Satellite remote sensing activities are vital to the overall space sector and are becoming more widespread, with growing participation of the private sector, as well as an increasing range of uses of remote sensing data and information products. Copyright protection may be a suitable mechanism for remote sensing data and information for several reasons. They represent immaterial goods that copyright traditionally protects. Many remote sensing information products fulfil the criterion of creativity, in particular due to its flexibility,[42] and thereby fall under copyright protection.[43]

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41 See Art. 5(1), Berne Convention, *supra* n. 1.

42 The creativity principle is generic enough to have a quite broad interpretation, while for instance principles of patent protection have much more precise formulation and interpretation.

43 *Cf.* C. Doldirina, The Impact of Copyright Protection and Public Sector Information Regulations on the Availability of Remote Sensing Data, in *Evidence from Earth Observation Satellites: Emerging Legal Issues* (Ed. R. Purdy) (2012), 293–313.

Some technical aspects of generating satellite remote sensing data need to be briefly mentioned here as well. Primary remote sensing data[44] are generated by an automated process built into the satellite sensors and then sent to the receiving stations on the ground by means of telemetry. Remote sensing data reflect the geographic reality. Without some degree of processing, primary remote sensing data are not comprehensible for the human mind. All of these factors should be taken into account when application of copyright to remote sensing data is considered.

International law does not have a specific (binding) instrument that regulates satellite remote sensing activities, the only relevant document being the United Nations Principles Relating to Remote Sensing of the Earth from Outer Space.[45] It is a UN Resolution and does not have binding effect on states unless and to the extent it contains provisions that are considered norms of customary international law.[46] In addition, the UN Remote Sensing Principles do not contain any provisions regarding protection of remote sensing data. For this reason, the norms of copyright protection mechanisms such as the Berne Convention or the WIPO Copyright Treaty as described above[47] remain relevant and applicable provided the criteria they set forth are fulfilled. In the analysis of whether remote sensing data are works in the sense of copyright law, the distinction made within the UN Remote Sensing Principles of primary data, processed data and analysed information is useful and is followed.[48]

Probably the most problematic nexus between copyright protection and the results of remote sensing activities is fulfilment by remote sensing data and information of copyrightability criteria.[49] However, when a particular data(set) or remote sensing information product is eligible for

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[44] *Cf.* Princ. I(b), Principles Relating to Remote Sensing of the Earth from Outer Space (hereafter UN Remote Sensing Principles), UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986), using precisely this terminology.

[45] *Supra*, n. 44.

[46] *Cf.* also the analysis *supra*, § 9.4.1.2.

[47] See further *supra*, § 18.2.1, esp. (text at) nn. 14–19.

[48] See Princ. I(b), (c), & (d) respectively, UN Remote Sensing Principles, *supra* n. 44.

[49] A number of researchers agree that the lack of creativity or originality is indeed the biggest problem with regard to copyrightability of remote sensing data. See L.A.W. Lockridge, Comment: Intellectual Property in Outer Space: International Law, National Jurisdiction, and Exclusive Rights in Geospatial Data and Databases, 32 *Journal of Space Law* (2006), 337; J. Cromer, How on Earth Terrestrial Laws Can Protect Geospatial Data? 32 *Journal of Space Law* (2006), 275–81.

protection, their owners should face few or no enforcement problems while exercising their exclusive rights.[50] This is different from the situation with patent protection as discussed further below,[51] as both the 'minimum treatment' and the 'national treatment' approaches sufficiently streamline copyright protection and its enforcement in various jurisdictions, regardless of whether the protected subject-matter concerns a novel or a map. What causes problems with trans-boundary use of remote sensing data and information are different licensing conditions according to which data are made available by their providers from different countries for further use. Often they result in various data(sets) being legally non-interoperable, which prevents the user from combining data from different sources to produce own information products or disseminating them. This important issue is discussed further below.[52]

As was mentioned earlier, the WIPO Copyright Treaty[53] explicitly excludes data from the scope of the copyright protection. The definitional distinction that the UN Remote Sensing Principles make between primary and other types of remote sensing data may be interpreted as an implicit recognition of the obligation not to protect data under copyright rules.[54]

Primary remote sensing data that were subject to initial mandatory or auxiliary processing[55] should be considered as not fulfilling the creativity criterion of copyright protection. If the terminology of the UN Remote Sensing Principles is adopted, processed remote sensing data may be seen as a transition category between non-protectable primary remote sensing data and analysed information eligible for protection. It is

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[50] Such issues, however, may still persist if remote sensing data are used in the digital environment, especially on-line. See the analysis of general issues with jurisdiction on the internet in O. Bigos, Jurisdiction over Cross-Border Wrongs on the Internet, 54 *International & Comparative Law Quarterly* (2005), 592–619.

[51] See further *infra*, § 18.3.

[52] See further *infra*, § 18.2.3.

[53] *Supra*, n. 1. The WIPO Copyright Treaty is referred to here for the same reason as the Berne Convention, *supra*, n. 1: both the United States and the European Community/Union (in its own capacity) are parties to it.

[54] The same approach is adopted in the US Land Remote Sensing Policy Act (Land Remote Sensing Policy Act, Public Law 102-555, 102nd Congress, H.R. 6133, 28 October 1992; 15 U.S.C. 5601; 106 Stat. 4163). In other jurisdictions, e.g. in EU member states (such as Germany and France) this distinction is not explicitly articulated.

[55] This refers only to the processing that has been the primary purpose of enabling further processing and analysis of the data.

probably the most difficult category for the application of copyright protection, because its eligibility will be conditioned by the processing applied (and its creativity), as well as by the value of processed data as such and not as an element for producing analysed information.

The latter cannot be determined without reference to the specific use for which the remote sensing data in question are required. This is so because the same data sets can be used for totally different applications, and depending on the level of expertise of the users: for some, primary or processed remote sensing data could be the final product they need, while for others, the same data will be useless or just an element of producing another, more analysed, information product.

Analysed information most certainly falls under the copyright protection, as it is a result of human and computerized analysis of the primary data,[56] which also includes use of data and information from other sources. Application of knowledge from a number of different scientific and computing fields to the produced remote sensing information products may be sufficiently creative. In addition, the definition of a copyrightable work[57] includes maps and images, and thereby also analysed information generated through human creativity from primary remote sensing data.[58]

Another important issue is whether databases that contain satellite remote sensing data and information can be protected by copyright. Its significance is obvious, since nowadays most of the remote sensing data

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[56] For a reference as to what processed data and analysed information include, see Sec. 4204(4), Land-Remote Sensing Commercialization Act (Land Remote-Sensing Commercialization Act, Public Law 98-365, 98th Congress, H.R. 5155, 17 July 1984; 98 Stat. 451; *Space Law – Basic Legal Documents*, E.III.4; repealed by the Land Remote Sensing Policy Act): 'conclusions, manipulations, or calculations derived from [unenhanced remote sensing] signals or film products or combination of the signals or film products with other data or information'. *Cf.* Princ. I(c), (d), UN Remote Sensing Principles, *supra* n. 44, which establish the criterion of usability for processed data and the requirement of interpretation of remote sensing data with 'inputs of data and knowledge from other sources' to reach the status of analysed information.

[57] As per the Berne Convention, *supra* n. 1, and the WIPO Copyright Treaty, *supra* n. 1, as well as various national regulations.

[58] See J.R. West, Copyright Protection for Data Obtained by Remote Sensing: How the Data Enhancement Industry Will Ensure Access for Developing Countries, 11 *Northwestern Journal of International Law & Business* (1990), 403, referring to the US submission at the UN COPUOS stating that enhanced data being the product of the analyser should be considered his property. See Report of the Scientific and Technical Sub-Committee on the Work of its 15th Session (1978), U.N. Doc. A/AC.105/216, at 8.

received from the satellites in digital form are stored in electronic databases. Databases that contain remote sensing data and information will only be eligible for protection if they fulfil the creativity criterion.[59] However, many such databases are set up following more utilitarian than creative principles,[60] which should result in non-availability of copyright protection for them as such.[61] This means that a lot of database makers outside of the European Union are left with the traditional tools of licensing and trade secrets to protect their assets.

Some consider the inapplicability of copyright protection to primary remote sensing data as negative and an impediment to the development of this economic activity, because data-generating companies (satellite owners or operators) may be forced to engage in value-adding activities in order not to lose control over their own data.[62] Supporters of this viewpoint suggest that copyright is nevertheless applied to improve the position of companies that are mainly engaged in the generation of primary remote sensing data. However, economic position and strength of one group of market participants alone should not be seen as a reason sufficient to justify artificial stretching of the traditional scope of copyright protection, also because the market is comprised of other participants as well.[63]

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[59] *Cf.* for an opposite view P.A. Salin, Proprietary Aspects of Commercial Remote-Sensing Imagery, 13 *Northwestern Journal of International Law & Business* (1992), 349, n. 45, referring to L. Faugérolas, *L'accès international à des banques de données* (1989), and arguing that as soon as primary remote sensing data are archived the copyright protection should be automatically granted.

[60] Some of the key features of a geographic information database are expandability, comprehensibility and shareability. See S. Guo & Y. Guan, Data Standardisation for the Chinese Resources and Environment Remote Sensing Database, in *Proceedings of Geoscience and Remote Sensing Symposium* (IEEE International) (Vol. 7 (2004)), 4428–31.

[61] *Cf.* also *supra*, § 18.2.1, and the discussion on the Database Directive, *supra* n. 32, on how a database which complies with the creativity criterion differs from a database which does not.

[62] So e.g. Salin, *supra* n. 59, 372, referring to the practices set up by SpotImage, and to L. Keesey, Value-Added Firms Eye Geographic Sector Growth, *Space News* (3–9 December 1990), 8.

[63] See the discussion regarding the disparities in the development of the European and the US markets of remote sensing data, as well as the figures that reflect it, in B. van Loenen & J. Zevenbergen, Assessing Geographic Information Enhancement, 5 *International Journal of Spatial Data Infrastructures* (2010), 245.

Non-availability of copyright protection for primary satellite remote sensing data gives a chance to companies that have the capabilities and the knowledgeable personnel to produce value-added information products,[64] even if they would never be able to launch their own satellites. Taking into account the trend of vertical integration of the remote sensing market,[65] availability of data to such value-adding companies should be seen as positive and a factor contributing to further development of the market. In addition, the aim of treating any type of remote sensing data as copyrightable, which extends the traditional scope of copyright protection to the content of works, distorts the very foundational principle of copyright to protect original expression only. If, or rather since, the protection of the actual content[66] of remote sensing data is of the utmost importance for their generators – and usually this is the case – other forms of protection should be developed or adopted instead.

18.2.3 Licensing

In practice the use of exclusive rights granted by copyright protection occurs through licensing. It is the most common mechanism used by authors or other owners of copyrighted works to authorize third parties to use them. This situation is no different from the framework for the use of other IPR granted by patents or trademarks. The main issue with licensing practices is that licensing conditions can vary across jurisdictions and make trans-boundary use of satellite remote sensing data

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[64] As for example in the weather forecast services sphere.

[65] See e.g. the forecasts made by S. Galant, Can EO-based Businesses Expand Profitably in Europe?, paper presented at the European Association of Remote Sensing Companies workshop, April 2008, www.eomag.eu/file_download/1/Paper+EARSC+Galant+07+04+08.pdf, last accessed 28 January 2014; Business in Earth Observation, Report, May 2008, www.google.com/url?sa=t&source=web&cd=1&ved=0CBYQFjAA&url=http%3A%2F%2Fwww.earsc.eu%2Ffile_download%2F43%2FBusiness%2Bin%2BEarth%2BObservation%2BeoVOX080508.pdf&ei=2AVrTI_gFIL68AbGyPCKBQ&usg=AFQjCNFQPkgCV6Tt8e7D7Mr6GoYDjPlt7g, last accessed 1 February 2011; A. Keith & S. Bochinger, The New Earth Observation Market: Expansion & Private Sector Development, 111 *Satellite Finance* (13 March 2008), 31–4.

[66] The substance (content) of information and raw data is often much more valuable than their expression: this was recognized by the European Commission as early as 1988. See Green Paper on Copyright and the Challenge of Technology – Copyright Issues Requiring Immediate Action, COM(1988)172 final, of 7 June 1988, at 207, http://ec.europa.eu/green-papers/pdf/green_paper_copyright_and_chanllenge_of_thecnology_com_(88)_172_final.pdf, last accessed 20 April 2014.

problematic or unclear from the legal perspective. International law instruments like the Berne Convention or the WIPO Copyright Treaty leave the regulation of this field to the individual states that, in accordance with the principle of territorial protection, are responsible for enforcement of copyright.

However, it is imperative that these licences comply with the fundamental principles of copyright protection, as otherwise declaring it as a relevant basis for granting the licence becomes questionable. Not all clauses of the licences used today are compatible with the principles of copyright law. The inconsistencies are highlighted in the next few paragraphs. They result in the unfounded recourse to copyright as the basis for licences. It is important here to remember that copyright exists only within the legislative framework that created it,[67] which means that the licensor who introduces 'new' rights in his licence, may not state that they are backed up by the quasi-proprietary copyright.

The rules regarding licensing of remote sensing data and information products are also determined by national governments through regulations or policies, and sometimes even by private actors themselves. The patterns of licensing often used today illustrate the trend of trying to stretch copyright protection to include the content of licensed works that was briefly described earlier. All private companies that generate or distribute remote sensing data set up their relationships with the users through licensing agreements, which have to be accepted by the licensees in order to get a remote sensing data(set) or an information product. The most important licensing clauses include permitted uses of the licensed products, ownership, and categorization and status of the derivative products made by the licensee.

In practice the ownership over licensed satellite remote sensing data or information products is retained by the licensor. As a result, solely the non-transferable, non-exclusive limited rights to use the remote sensing data or information are granted to the licensee.[68] Granting limited rights

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[67] On this characteristic of IP protection and the issues of jurisdiction over IP issues see e.g. K. Lipstein, Intellectual Property: Jurisdiction or Choice of Law?, 61 *Cambridge Law Journal* (2002), 295 ff., esp. 296–7; see also *supra*, § 18.2.1, text at nn. 64–66.

[68] See e.g. § 2.1, SPOT General Supply Conditions of Satellite Imagery Products, January 2011, www2.astrium-geo.com/files/pmedia/public/r1931_9_spot_generalsupplyconditions_jan2011.pdf, last accessed 20 April 2014; § 2.1, eGEOS Standard Terms and Conditions of Licence, May 2010, www.e-geos.it/terms/e-GEOS%20Std%20Terms%20and%20Conditions%20of%20License_May_2010.pdf, last accessed 20 April 2014; Sec. 4, GeoEye Data Single or Multiple

resembles clauses of non-exclusive licences that retain certain rights of the owner over a copyrighted work, and in itself is compatible with the relevant provisions of the copyright protection regime.

However, retaining the ownership over licensed copies of remote sensing data or information products physically transferred to the licensee by the licensor[69] is incompatible with the rules of international law regarding copyright protection. Traditionally, copyright does not vest in the ownership of the actual physical copies of the work (with the exception for works of art), but in the rights regarding the original expression. The WIPO Copyright Treaty explicitly states that such use of copyrighted works only occurs 'through *sale or other* transfer of ownership'.[70] Some national laws, such as in the United States, expressly incorporate the distinction between rights in a work and rights in the copy of the work.[71] In other jurisdictions the distinction is implicit.[72] Transfer of data under a licence is therefore a form of exercising the distribution right that is one of the recognized rights of authors that must occur within the scope granted to it by law. As a result, if the licensor wishes to remain under the umbrella of copyright protection, he may not alter the essence and the pattern of use of the rights as laid down in the relevant legal rules.

The wording of most licences used for remote sensing data manifests the uncertainty as to whether the licensed subject-matter can be effectively protected by copyright, because attempts are made to safeguard the licensed data otherwise, by for instance declaring them trade secrets, and

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Organization Licence, www.americaview.org/sites/default/files/importedFiles/GeoEye_SingleOrganization_license.txt, last accessed 20 April 2014.

69 *Cf.* e.g. SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68: 'No CLIENT shall be able to claim an exclusive right of use on the PRODUCT.'

70 Art. 6(1), WIPO Copyright Treaty, *supra* n. 1. In the European Union the European Court of Justice had a chance to interpret the distribution right under the Information Society Directive, *supra* n. 27, and confirmed transfer of ownership as its constitutive element. See *Peek & Cloppenburg v Cassina* C-456/06 [2008] OJ C 142/7 (07.06.2008).

71 See Sec. 202, US Copyright Act, *supra* n. 21, Ownership of copyright as distinct from ownership of material object.

72 See § 17, German Copyright Law, *supra* n. 21, which allows further distribution of the copies of works that were legitimately authorised for distribution without additional consent of the rights holder.

obligating the licensee to protect their status as such.[73] In the European Union reference to the *sui generis* database protection is made.[74]

Whether and to what extent these regimes are applicable to the licensed data should ideally be assessed on a case-by-case basis by courts or other appropriate authorities. In addition, differentiation between primary satellite remote sensing data and analysed information is usually omitted in the licences despite the fact that some states[75] recognized it within their national regulations. In practice this allows the owners of remote sensing data to treat both primary remote sensing data and analysed information as protected by copyright. This claim, together with the stipulation that the licensee unconditionally agrees with the terms of the licence, leads to the recognition by the licensee of something that the statutory copyright law does not accept or even, quite to the contrary, prohibits. Therefore, enforceability of such licences becomes questionable, at least when copyright remedies are being invoked as the basis for such enforcement. As a result, the licensor no longer asserts or relies on quasi-proprietary copyright in data it licenses. The licence, like a regular contract, only binds its parties, while a fully fledged copyright owner has a right of redress/recovery vis-à-vis any third party.

'Permitted uses' that the licences refer to represent an exhaustive list of actions the licensee is allowed to perform with regard to the licensed subject-matter, and this constitutes another type of clause that is potentially incompatible with copyright law. Often use is limited to the licensee's internal purposes,[76] and include installation and copying of the

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73 *Cf.* § 2.2, SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68; § 2.4, eGEOS Standard Terms and Conditions of Licence, *supra* n. 68.

74 See also the discussion on the Database Directive (*supra* n. 32) *supra*, § 18.2.1. The situation mirrors the practice of the European Space Agency to mention all mechanisms that theoretically protect information as applicable to remote sensing data.

75 E.g. *i.a.* the United States.

76 *Cf.* § 4(b) (d), GeoEye Data Single or Multiple Organization Licence, *supra* n. 68; § 2.1(c), (e), SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68; § 2.1, eGEOS Standard Terms and Conditions of Licence, *supra* n. 68.

licensed products on different computers of the licensee,[77] as well as use of imagery contained in the licensed products.[78]

Licences permit production and distribution[79] of derivative works. Availability of the distribution right over products that the licensee makes depends on whether they contain imagery from the licensed data. If they do, the licensee is not allowed to freely distribute the derivative works produced.[80] If one goes back to the terminology used by the UN Remote Sensing Principles,[81] the derivative works should be regarded as either processed data or analysed information and therefore will in most cases fall under the copyright protection. However, variation in the terminology used in the licences makes it difficult to judge what products would be considered derivative and thus free for further distribution.

Prohibitions on distributing derivative works may go against current legislation regarding copyright protection if the licensee creates his own copyrightable works on the basis of the licensed data. According to the copyright rules,[82] derivative works are subject to copyright protection that is independent from the copyright in the original work provided that the authorization to make derivative works was granted,[83] and the author of the original work is acknowledged. A derivative work, being an author's own creation, is usually based on one or more pre-existing works, and may be created through different acts, such as translation, arrangement, reproduction or any other form in which a work may be transformed or adapted.

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[77] *Cf.* § 4(b), GeoEye Data Single or Multiple Organization Licence, *supra* n. 68; § 2.1 (a), (b), (c), SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68; § 1 (Definitions, Use), (a), (b), (d), eGEOS Standard Terms and Conditions of Licence, *supra* n. 68.

[78] *Cf.* § 4(d), GeoEye Data Single or Multiple Organization Licence, *supra* n. 68; § 2.1(g), (h), SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68; § 1 (Definitions, Use), (c), eGEOS Standard Terms and Conditions of Licence, *supra* n. 68.

[79] Limitations apply depending on how processed the licensed data in the derivative product is.

[80] *Cf.* § 2.1(e), SPOT General Supply Conditions of Satellite Imagery Products, *supra* n. 68; § 2.2, eGEOS Standard Terms and Conditions of Licence, *supra* n. 68; 4(e), GeoEye Data Single or Multiple Organization Licence, *supra* n. 68.

[81] See also discussion *supra*, § 18.2.2.

[82] E.g. according to Arts. 31–42, German Copyright Law, *supra* n. 21; Secs. 90–96, UK Copyright, Designs and Patents Act 1988 (c. 48).

[83] See e.g. the definition of 'adaptation', Sec. 20, UK Copyright, Designs and Patents Act, *supra* n. 82; '*Bearbeitungen*' in Art. 23, German Copyright Law, *supra* n. 21; 'derivative work' in Secs. 101, 103, US Copyright Act, *supra* n. 21.

Restrictive licensing clauses create an additional layer of problems for users working with remote sensing data and information products by often rendering combination (or other similar use) of data from various sources practically impossible. For example, if for a production of a new derivative work a user needs data or information from several providers, he will only be in a position to carry out planned activity if all data come with exactly the same restrictions on use. However, even when the production of derivative works is allowed, licences of different data providers interpret the notion of derivative work differently. This reduces or eliminates legal interoperability of data and as a result negatively affects possibilities of re-use of remote sensing data. Yet, the wide range of applications for which remote sensing data are essential necessitates use of such data from different sources to develop new useful products or services. In addition, this legal non-interoperability often unreasonably hinders development and success of international and regional remote sensing data open access and sharing initiatives that pursue important or even vital goals of societal well-being and growth.

18.2.4 Initiatives to Promote Sharing of Satellite Remote Sensing Data

A number of projects regarding free and open access to geographic data, including satellite remote sensing data, have been launched in recent years. Some of the most notable include free and unrestricted access to and use of US Landsat[84] data, the China-Brazil Earth Resources Satellites (CBERS),[85]

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[84] For the history and other information about the programme, see e.g. http://landsat.gsfc.nasa.gov/about/history.html, last accessed 28 January 2014. Further e.g. *supra*, §§ 9.3.2, 9.3.3, 9.4.2.3; also e.g. J.I. Gabrynowicz, The Perils of Landsat from Grassroots to Globalization: A Comprehensive Review of US Remote Sensing Law With a Few Thoughts for the Future, 6 *Chicago Journal of International Law* (2005), 65–6; F.G. von der Dunk, Non-discriminatory Data Dissemination in Practice, in *Earth Observation Data Policy and Europe* (Ed. R. Harris) (2002), 46–7; K. Mukhija & Y. Goyal, An Analysis of Issues Arising from the Commercialization of Remote Sensing Activities, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 237–52.

[85] This programme was initiated in 1998, by way of the Framework Agreement between the Government of the People's Republic of China and the Government of the Federative Republic of Brazil on Cooperation in the Peaceful Applications of Outer Space Science and Technology, Beijing, done 8 November 1994, entered into force 29 June 1998; 2036 UNTS 335. See for the data policy as of June 2004, www.obt.inpe.br/cbers/documentos/appl_07_2004.pdf, last accessed 28 January 2014. *Cf.* also e.g. J. Monserrat, Regulation of Space

the European INSPIRE Directive[86] and Copernicus,[87] as well as the Global Earth Observation System of Systems (GEOSS) led by the Group on Earth Observations (GEO).[88] All of them are aimed at maximizing access to geographic data and facilitating their re-use for various societal benefit areas. For example, GEOSS is designed to become a *global network of data*, information and other geographically referenced content from multiple providers, offering 'an extraordinary range of information'.[89] This system of systems aims at offering '*decision-support tools* to a wide variety of users'[90] by linking together national and

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Activities in Brazil, in *National Regulation of Space Activities* (Ed. R.S. Jakhu) (2010), 69; J. Monserrat & A. F. dos Santos, Chinese–Brazilian Protocol on the Distribution of CBERS Products, 31 *Journal of Space Law* (2005), 247–70; with regard to IPR clauses C. Doldirina, Are Intellectual Property Laws an Impediment to the Development of Collaborative Earth Observation Missions? Part 2, in *Proceedings 60th International Astronautical Congress 2009* (2010), 2175 ff.

[86] See Directive of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), 2007/2/EC, of 14 March 2007; OJ L 108/1 (2007). *Cf.* also e.g. C. Doldirina, INSPIRE: A Real Step Forward in Building an Interoperable and Unified Spatial Information Infrastructure for Europe?, ESPI Perspectives (March 2009), www.espi.or.at/images/stories/dokumente/Perspectives/espi%20perspectives%20 20%20doldirina.pdf, last accessed 20 April 2014.

[87] *Cf.* Regulation of the European Parliament and of the Council on the European Earth monitoring programme (GMES) and its initial operations (2011 to 2013), No. 911/2010/EU, of 22 September 2010; OJ L 276/1 (2010); see further on GMES/Copernicus *supra*, § 4.4.4.2. Regulation 1159/2013 (Commission Delegated Regulation supplementing Regulation (EU) No 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES) by establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information, (EU) No. 1159/2013, of 12 July 2013; OJ L 309/1 (2013)) has meanwhile supplemented the existing one; recently Regulation 911/2010 is repealed by Regulation of the European Parliament and of the Council establishing the Copernicus Programme and repealing Regulation (EU) No 911/2010, No. 377/2014/EU, of 3 April 2014; OJ L 122/44 (2014); see the European Commission's proposal, www.copernicus.eu/pages-principales/library/policy-documents/?no_cache=1&cHash=b537b7aba03c64288a16f9e66140d6f2, last accessed 20 April 2014.

[88] See www.earthobservations.org/about_geo.shtml, last accessed 28 January 2014.

[89] See *ibid*.

[90] See Description of GEOSS, www.earthobservations.org/geoss.shtml, last accessed 28 January 2014 (emphasis added).

international earth observation satellites and systems, as well as other sources of information about the earth.[91]

The 2007 GEO Cape Town Ministerial Summit agreed on the three overarching principles applicable to exchange and use of data provided through GEOSS.[92] Data, metadata and products should be shared on a 'full and open' basis,[93] they should be accessible with 'minimum time delay and at minimum cost', and data for research and education purposes should be provided 'free of charge or at no more than cost of reproduction'.[94] These principles are given authoritative interpretation in the Implementation Guidelines for the GEOSS Principles[95] and are recommended to be adhered to when GEO members contribute data to GEOSS. The current Work Plan 2012–2015[96] envisages the increased cooperation of the experts and users as a cornerstone of GEOSS success,[97] and the focus on making GEOSS more accessible should be a priority.[98]

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[91] For a more thorough analysis see C. Doldirina, Implementation of GEOSS Data Sharing Principles: Relationship with the Regional and National Data Access Initiatives, in *Proceedings 63rd International Astronautical Congress 2012* (2013), 2958 ff.

[92] See GEO, Report on Progress (Beijing Summit: Observe, Share, Inform, 5 November 2010), at 15, www.earthobservations.org/documents/geo_vii/geo7_report_on_progress.pdf, last accessed 28 January 2014.

[93] The implementation thereof is limited by restrictions imposed by 'relevant international instruments and national policies and legislation'.

[94] GEO, Implementation Guidelines for GEOSS Data Sharing Principles, at 3, www.earthobservations.org/documents/geo_vi/07_Implementation%20Guidelines%20for%20the%20GEOSS%20Data%20Sharing%20Principles%20Rev2.pdf, last accessed 28 January 2014.

[95] See GEO-VI, 17–18 November 2009, www.earthobservations.org/documents/geo_vi/07_Implementation%20Guidelines%20for%20the%20GEOSS%20Data%20Sharing%20Principles%20Rev2.pdf, last accessed 28 January 2014.

[96] See www.earthobservations.org/documents/work%20plan/GEO%202012-2015%20Work%20Plan_Rev1.pdf, last accessed 28 January 2014.

[97] See Work Plan 2012–2015, at 21: 'Foster GEOSS applications and societal benefits: Broker connections between experts and users. Identify best practices in applications, and enable GEO efforts to document societal benefits.'

[98] See Work Plan 2012–2015, at 22: 'Show the benefits of Earth observation and information through the identification and dissemination of success stories in language that can be understood by all, specifically decision- and policy-makers.'

Resources from national and regional initiatives mentioned above (in particular Landsat,[99] and certain data from CBERS[100] and Copernicus[101]) and others were declared to be shared through GEOSS according to its Data Sharing Principles.[102] However, the issue of legal interoperability regarding satellite remote sensing data and information products made available through GEOSS has been identified as one of the most serious problems that users may face and which may jeopardize full success of the initiative. A dedicated sub-group within the GEO Data Sharing Working Group is working on potential approaches to enhancing legal interoperability, in particular by suggesting adoption and use of licences that facilitate re-use of the data in question. These licences should not contain clauses described in the licensing section above.

The operational phase of the European Copernicus initiative came with the challenge of how to introduce the most favourable regime for unrestricted use of Sentinel data that will be available through the system, also taking into account the connection between Copernicus and GEOSS as officially declared by the European Commission. Regulation 1159/2013[103] lays down the basic principles regarding access to and use of Copernicus dedicated data and information services. These are made available under conditions of full and open access. However, subsequent rules on licensing need to be developed to establish a framework for handling data from contributing missions.

Success of full and open access to and use of satellite remote sensing data and information in part depends on the correct interpretation of the principles of copyright protection, particularly those that allow use of copyrighted works without permission. If copyright applies to remote sensing data and information products, or rather when it is applicable, the exceptions to exclusive rights of authors or owners over protected works should also be made use of. The copyright protection should be applied coherently, without twists and stretching licensing mechanisms often used for privately generated or distributed remote sensing data today.

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[99] See GEO announces free and unrestricted access to full Landsat archive, Press release, 20 November 2008, www.earthobservations.org/documents/pressreleases/pr_0811_bucharest_landsat.pdf, last accessed 28 January 2014.

[100] See www.earthobservations.org/geoss_ta_cb_ph.shtml, last accessed 28 January 2014.

[101] See Regulation 1159/2013, *supra* n. 87, recital 28.

[102] See Sec. 5.4, GEOSS 1-Year Implementation Plan, adopted 16 February 2005, www.earthobservations.org/documents/10-Year%20Implementation%20Plan.pdf, last accessed 20 April 2014.

[103] *Supra*, n. 87.

18.2.5 Suggestions Regarding Use of Copyright to Protect Satellite Remote Sensing Data

Copyright protection is flexible and provides interpretation open enough to encompass eligible subject-matter generated as a result of space activities. Absence of any formalities for the recognition of copyright, as well as overall sufficient approximation of principles and main rules governing the regime at the international level, and their acceptance by the majority of countries that are involved in space activities or at least govern them are positive developments. Even enforcement of rights in a state different from the one where the author is based or where the work was first published as a rule is enabled through the adherence of the vast majority of the jurisdictions to the national treatment principle of the Berne Convention.[104] This translates into the availability of the same remedies that the authors from the state where the infringement occurs can make use of according to the domestic laws and regulations. However, some problems exist.

One of the major issues regarding protection of remote sensing data is that often it is not the expression that is intended to be protected, but the actual content. Copyright, however, conceptually is ill-suited for such demands (even if they are a necessity) as it explicitly protects only the original expression of the author. Copyright even acquired its name because historically the primary right granted to authors or other rights holders was to prohibit literal copying of their works, hence precisely the way in which their ideas were written down or otherwise fixed. Efforts to the contrary result, for example, in the restrictive licences that are used to tailor statutory protection to the needs that go beyond the protection granted by international law and domestic regulations, as described above.

To overcome this inherent problem, it is recommended that rights holders avoid claiming applicability of copyright protection to the content. Licences as such are a viable mechanism to protect whatever one aims to protect, once the agreement is realized (for example when licence conditions are accepted by the user). This mechanism lacks the features of a negative right that copyright confers on its owner, but at least binds the parties involved to follow the agreed conditions of behaviour.[105]

Another way out is to reform copyright, which is however unlikely, particularly on the level of international law, or to introduce new forms of

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104 See *supra*, § 18.2.1.

105 See *supra*, § 18.2.3.

protection that fit the purpose. Attempts in this regard were made, specifically with regard to database protection. The European Union introduced a *sui generis* protection of the content of databases that were made through substantial investment[106] in 1996. However, the legislation appeared to be ineffective: a finding that was supported even by the internal evaluation of the Database Directive.[107] This experience shows how careful and well balanced changes and additions to the current body of law governing IP protection in general should be.[108]

18.3 PATENT

18.3.1 International Law Instruments on Patent Protection

Patent constitutes another type of IP protection that is used to protect industrially applicable or otherwise usable inventions. Due to the specificities of space activities, in particular their high-tech and innovation aspects, as well as the cost and prices for hardware used to conduct them, adequate patent protection is vital for the development of this field of economic activity. A patent regime is based on more formalized and stringent criteria for protection than those required by a copyright regime, as well as a special procedure for granting or registering patents, which is as a rule carried out by designated public authorities.

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[106] *Cf.* the Database Directive, *supra* n. 32, as discussed *i.a. supra*, § 18.2.1.

[107] See First evaluation of Directive 96/9/EC on the legal protection of databases *supra* n. 37, as discussed *supra*, § 18.2.1.

[108] This concerns also regulation that does not affect the scope of copyright or IP protection itself. An interesting example is inclusion in the United Nations Convention on the Law of the Sea (United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 and 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39) of the provision regarding jurisdiction of states over unauthorized broadcasting from the high seas that allowed capture of persons involved in the high seas by a number of states responsible or affected. This norm was quite heavily criticized despite having been included in the body of the Convention. For a detailed analysis of the issue see H.B. Robertson, The Suppression of Pirate Radio Broadcasting: A Test Case of the International System for Control of Activities Outside National Territory, 45 *Law & Contemporary Problems* (1982), 71. For possible parallels between jurisdiction in the high seas and activities on the internet, see S.R. Swanson, Google Sets Sail: Ocean-Based Server Farms and International Law, 43 *Connecticut Law Review* (2010–2011), 709.

On the international level the basic principles governing patent protection are laid down in the Paris Convention for the Protection of Industrial Property,[109] which is accepted worldwide.[110] The Paris Convention codifies the national treatment principle,[111] as well as the rules on priority of filing the invention and on the enforcement principles to be adopted and followed by all contracting parties. In addition, the Paris Convention regulates protection of 'utility models, industrial designs, trademarks, service marks, trade names, indications of source or appellations of origin, and the repression of unfair competition'.[112]

Unlike, for example, the Berne Convention and the WIPO Copyright Treaty, the Paris Convention does not contain the criteria for patentability of inventions – this matter is left to the domestic law of the contracting parties. Therefore, universal criteria of patentability do not exist and may substantially differ in various jurisdictions in the absence of relevant rules adopted and accepted internationally. Such an approach to regulating patents on the international level makes patent protection even more territorially limited or dependent than copyright. In the context of space activities this status quo translates into the necessity to regulate patent-related issues either through national laws or through separate ad hoc agreements, in order to successfully carry out a given project or mission, in particular when international participation is envisaged.

Article 2 of the Paris Convention lays down the national treatment principle. The meaning and purpose of this principle in a nutshell is that it establishes that inventors from any state party to the Convention enjoy the same rights in any other such state as its own nationals, and that application for a registration of a patent in any such state domicile or establishment may not be required. At the same time the Convention emphasizes the territorial/jurisdictional character of patent protection by declaring in Article 4*bis* that patents granted for the same invention in different jurisdictions are independent from each other. The effect of this principle is such that a patent holder with rights registered in one jurisdiction may not dispute registration and use of patent rights over essentially the same invention in other countries. Filing a patent in one of

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109 *Supra*, n. 1.

110 Currently, the Paris Convention has 175 contracting states; see www.wipo.int/wipolex/en/wipo_treaties/parties.jsp?treaty_id=2&group_id=1, last accessed 28 January 2014.

111 See Art. 2, Paris Convention, *supra* n. 1. *Cf.* also Art. 5, Berne Convention, *supra* n. 1.

112 Art. 1(2), Paris Convention, *supra* n. 1.

the contracting states only gives the person the right of priority to file for the same patent in other such states within a period of 12 months.[113]

Another important provision that by analogy could be applicable to patented inventions and technology carried on spacecraft and other hardware is Article 5*ter* of the Paris Convention.[114] It exempts vessels, aircraft or land vehicles registered under the flag of a certain jurisdiction passing the territory of a different one while carrying technology that might infringe patent rights registered in the jurisdiction of the state of passage. In this case, such vessels and vehicles retain their right of free movement[115] and may not be accused of a patent infringement. This provision, however, relates to the enforcement of patent rights, not to the issues of patentability.

In addition to the principles and rules established by the Paris Convention, there is another international law instrument – the Patent Cooperation Treaty,[116] which was drafted and adopted to simplify the priority filing principle of the Paris Convention and make its implementation more effective.[117] It is administered by WIPO and provides rules and a dedicated system for international filing of patents that may result in simultaneous protection in several designated jurisdictions, for all of which the patent is filed with one single application. Article 3(1) of the Patent Cooperation Treaty allows for filing of 'applications for the protection of inventions in any of the Contracting States' as international

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113 See Art. 4A(1), Paris Convention, *supra* n. 1.

114 See further on the applicability of this provision to space activities *infra*, § 18.3.3.

115 In any state of the Union that the Paris Convention, *supra* n. 1, established the following shall not be considered as infringements of the rights of a patentee: (1) the use on board vessels of other states of the Union of devices forming the subject of his patent in the body of the vessel, in the machinery, tackle, gear and other accessories, when such vessels temporarily or accidentally enter the waters of the said state, provided that such devices are used there exclusively for the needs of the vessel; (2) the use of devices forming the subject of the patent in the construction or operation of aircraft or land vehicles of other states of the Union, or of accessories of such aircraft or land vehicles, when those aircraft or land vehicles temporarily or accidentally enter the said state.

116 Patent Cooperation Treaty, Washington, done 19 June 1970, entered into force 24 January 1978; 1160 UNTS 231; TIAS 8733; 28 UST 7645; Cmnd. 4530; UKTS 1978 No. 78; ATS 1980 No. 6; 9 ILM 978 (1970); as amended on 28 September 1979, and last modified on 3 October 2001.

117 For an overview of its system see K. Lapenne, Patent Cooperation Treaty, 92 *Journal of Patent & Trademark Office Society* (2010), 192 ff.; also J. Erstling & I. Boutillon, The Patent Cooperation Treaty: At the Center of the International Patent System, 32 *William Mitchell Law Review* (2006), 1583–1601.

applications. This is a procedural treaty, and the question of the patentability of the filed invention is decided by the responsible national authority.

The procedural character of the major international treaties regarding patent protection led to adoption of regional patent conventions, some of which contain substantial provisions regarding patentability, like the European Patent Convention[118] or the Eurasian Patent Convention.[119] It is therefore clear that criteria for patentability cannot be adequately analysed and presented without recourse to the relevant regional and national law. Notwithstanding the fact that relevant or widely accepted international standards in this regard do not exist, it should be noted that in essence patentability criteria in most jurisdictions are similar to each other, and it is mostly the details of specific regulations that differ. However, sometimes even the slightest details may cause discrepancies in filing inventions for patents or using the granted rights. Several examples are discussed below.

18.3.2 Characteristics of Protection

Subject matter of patent protection is an eligible invention. An 'invention' includes any *new* and *useful* process, machine, manufacture or composition of matter,[120] or anything new in any field of technology that is industrially applicable.[121] European legislators often include a list of subject matter that cannot be considered inventions: discoveries, scientific theories and mathematical methods, aesthetic creations, schemes,

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[118] Convention on the Grant of European Patents (hereafter European Patent Convention), Munich, done 5 October 1973, entered into force 7 October 1977; 1065 UNTS 199; UKTS 1982 No. 16; Cmnd. 8510. The Convention is also often known as the Munich Convention, and was revised on 9 November 2000; 1065 UNTS 254, Part II Chapter I.

[119] Eurasian Patent Convention, Moscow, done 9 September 1984, entered into force 12 August 1995; 12 Int. Trade Rep. (BNA) No. 30, at 1289; www.eapo.org/en/documents/norm/convention_txt.html, last accessed 20 April 2014.

[120] See e.g. Sec. 2, Canadian Patent Act, R.S.C. 1985, c. P-4; Sec. 101, US Patent Act, 35 U.S.C.

[121] See e.g. Art. 52(1), European Patent Convention, *supra* n. 118; Art. 1(1), German Patent Law of 16 December 1980 (BGBl. 1981 I S. 1), last amended 10 October 2013 (BGBl. I S. 3830); Sec. 1(1), UK Patents Act of 29 July 1977 (1977 Chapter 3), last amended October 2013.

rules and methods, programs for computers,[122] and presentation of information.[123] It is important that the inventor adds something extra that in fact makes the invention work, and cannot be found by itself in nature (or performing such an action or function). The three fundamental criteria for an invention to be eligible for patent protection are 'novelty', 'non-obviousness' and 'usefulness'.

'Novelty' means that the invention is not part of the prior art.[124] Novelty is destroyed by a single, publicly available source (available or published anywhere in the world according to Canadian and EU law, and until recently available or published in the United States according to US law[125]) that describes the existence of the invention in a manner sufficient for a person skilled in the art to make it when using this information. 'Non-obviousness' or 'inventive step' signifies that a person skilled in the art would not find out easily the way in which the invention works without additional information about it.[126] The test for non-obviousness involves the assessment made by 'the skilled but unimaginative worker',[127] in light of his common general knowledge[128] and awareness of prior art, which, however, does not allow him to understand the invention easily. Finally, the invention needs to be 'useful', that is practically applicable. This notion also has slightly different interpretations across jurisdictions. In Canada it is interpreted as actual and ultimate utility[129] and in the United States as specific, substantial and

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122 However, computer programs are patentable according to the US Patent Act, *supra* n. 120. For a discussion regarding the effect on the protection of IP caused by the differences in various domestic laws see P. Samuelson, Intellectual Property Arbitrage: How Foreign Rules Can Affect Domestic Protections, 71 *University of Chicago Law Review* (2004), 223 ff.

123 See e.g. Art. 52(2), European Patent Convention, *supra* n. 118; Art. 1(3), German Patent Law, *supra* n. 121; Sec. 1(2), UK Patents Act, *supra* n. 121.

124 See Art. 54, European Patent Convention, *supra* n. 118; Art. 3, German Patent Law, *supra* n. 121.

125 This was changed by the Leahy-Smith America Invents Act that came into force on 16 March 2013; H.R. 1249.

126 See Art. 56, European Patent Convention, *supra* n. 118; Art. 4, German Patent Law, *supra* n. 121; Sec. 103, US Patent Act, *supra* n. 120.

127 This is usually defined in patent legislation across jurisdictions as a 'person skilled in the art'.

128 This refers to knowledge that practitioners may be expected to have as a part of their technical capability.

129 This interpretation is based on case law; see e.g. *X v Canada (Commissioner of Patents)* (1981), 59 CPR (2d) 7, [1981] FCJ No 1013; *Apotex Inc v Wellcome Foundation Ltd*, 2002 SCC 77, [2002] 4 SCR 153.

credible utility,[130] whereas in Europe it is conceived of as industrial applicability.[131]

Patent rights can only be recognized and enforced if a formal filing procedure is successfully completed by the inventor. This is another, perhaps the major, difference between patents and copyright, which legitimately exists and is enforceable without any formal recognition or registration. There are two distinct systems for filing inventions: respectively the first-to-file and first-to-invent systems.[132] In the latter, the date and place of the invention can be crucial for the decision as to issuance of patent. The relevant changes to the patent in the United States recently came into force,[133] making the first-to-file system the most used one worldwide.[134]

After the invention is made (but not disclosed) the formal procedure of granting a patent needs to be initiated and completed. This step of obtaining enforceable patent rights in the invention in general requires the following:

- filing of application with patent office (disclosure and claims),
- examination of patent,
- opposition proceedings (if foreseen by law),[135] and
- issuance of patent.

In terms of procedure, the list and requirements regarding the submitted documents are quite stringent. Independent from the jurisdiction where an application is filed a patent application needs to have a description,[136]

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[130] This interpretation is based on case law; see e.g. *Bedford v. Hunt*, 3 F.Cas. 37 (C.C. Mass. 1817); *Newmann v. Quigg*, 877 F.2d 1575 (Fed. Cir. 1989).

[131] *Cf.* Art. 57, European Patent Convention, *supra* n. 118; Art. 5, German Patent Law, *supra* n. 121.

[132] For an overview of the differences between the two patent filing systems, see WIPO, The Importance of Intellectual Property Rights for the Protection of Inventions in Relation to Space Activities, in *Intellectual Property Rights in Outer Space*, ECSL Workshop, 19–20.

[133] See www.uspto.gov/aia_implementation/index.jsp, last accessed 28 January 2014.

[134] For a discussion on differences in the context of the US patent law reform, see R. Maier, House Passes Leahy-Smith America Invents Act; US Poised to Move to a First-Inventor-to-File System, Adopt Other Changes to Patent Laws, 23 *Intellectual Property & Technology Law Journal* (2011), 13–7.

[135] In cases where such a procedure is not foreseen, invalidity of a patent has to be argued in court.

[136] See Art. 5, Patent Cooperation Treaty, *supra* n. 116.

will have to indicate where the invention is disclosed (so that others can use the new state of the art to further improve technology) and should claim in a clear and concise manner what protection is sought.[137] Both are important as they determine the scope of the application of patent rights and determine the precise protected subject matter in each case.

The relevant national and indicated regional instruments also lay down the scope of patent protection. Being an IPR, patent is a negative right of its owner – the exclusive right to make, use or import the invention, as well as to sell it to others to be used.[138] The European Patent Convention prescribes that the scope of right granted by the European patent is equal to the rights conferred by a national patent granted in each nation state member of the European Union.[139]

The term of patent protection is limited, and is significantly shorter than that of copyright. This is most often explained by the risk of slowing down innovation when the term of protection is too long. Currently the rights are granted for a period of 20 years from the date of filing the patent.[140] Similar to copyright, the negative right of patent protection also has exceptions, for instance when governments reserve the right to use the invention for certain goals, usually beneficial to society at large,[141] or when other compulsory licences are prescribed.[142] Another instance is the exception regarding the use of patented inventions for non-commercial experimentation and research. However, 'non-commercial' means different things in different jurisdictions. Also, sometimes it is hard to distinguish pure research from applied research, because the former may also lead to use of the results in industry as useful or commercially viable applications.[143]

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[137] See Art. 6, Patent Cooperation Treaty, *supra* n. 116.

[138] See Sec. 42 Canadian Patent Act, *supra* n. 120; Sec. 154, US Patent Act, *supra* n. 120; Arts. 9–10, German Patent Law, *supra* n. 121; patent as personal property per Sec. 30, UK Patents Act, *supra* n. 121.

[139] See Art. 64, European Patent Convention, *supra* n. 118.

[140] See Sec. 44, Canadian Patent Act, *supra* n. 120; Sec. 154, US Patent Act, *supra* n. 120; Art. 16, German Patent Law, *supra* n. 121; Art. 63, European Patent Convention, *supra* n. 118.

[141] See e.g. Art. 13, German Patent Law, *supra* n. 121.

[142] See e.g. Sec. 48, UK Patent Act, *supra* n. 121.

[143] In addition, differences in the drafting and interpretation of the research exception may lead to the 'migration' of companies to states that recognize this exception in a broader way from those states where this is not the case. For an analysis of this issue in the field of biomedical research, see J.M. Mueller, No 'Dilettante Affair': Rethinking Experimental Use Exception to Patent Infringement for Biomedical Research Tools, 76 *Washington Law Review* (2001), 37 ff.

Infringement of patent rights can be literal, when exact copies of the invention are made by third non-authorized parties, as well as non-literal, when changes made are not significant (for example, substituting one type of metal for another in a component when the change does not affect the operation of the invention). Again, any type of legal action against the alleged infringers can be made before relevant authorities of the state where the patent was issued.

The principles and rules outlined above are a very rough description of the basics of patent protection, which is a quite complex field of law, particularly procedurally. However, this overview enables the analysis of their applicability to inventions made in outer space or otherwise in the course of space activities.

18.3.3 Challenges to Patentability of Space-Related Inventions

The starting point is, as identified earlier, to assess whether and if so what aspects (or rather, types) of space activities that result in patentable inventions may be problematic from the point of view of applying existing patent law and regulations. Some authors maintain that if only a handful of companies/ventures have access to space and conduct experiments for the purpose of inventing patentable subject matter, they might in fact have no need to acquire a patent because nobody else but them will have the ability to conduct research in outer space and to come up with alternatives to their inventions.[144] Such a scenario might be true today, but may very well change with time when more actors will have affordable access to outer space. Therefore, the questions regarding patentability of space inventions will come up and will need to be resolved at some point in the future, or for some actors even today.

It seems only logical that inventions made in the course of producing space-utilized hardware, such as satellites, their sensors or rockets, are treated in accordance with the regulations and procedures that are

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[144] See G. Ghidini, Inventions in Outer Space: Licensing Related Problems, in *Intellectual Property Rights in Outer Space*. ECSL Workshop, 53. The same author suggested *a contrario* that when patents granted for inventions made in outer space tend to distort competition on the relevant market, they should either be patented with reservations (e.g. regarding compulsory licensing), or the patents themselves should be modified and either be made of shorter term or of narrower scope. For an interesting overview of the first practice in this regard in the United States, see R.F. Alnutt, Patent Policy for Communication Satellites: A Unique Variation, 46 *Marquette Law Review* (1962), 63–78.

adopted within the jurisdictions where inventions are made or applications are filed for the patent. However, the nexus to outer space may complicate otherwise clear situations. As for the inventions made in outer space itself, a number of issues can be identified, and they are addressed in this section. With regard to the enforcement of patent rights when the use of the subject-matter or their infringement occurs in outer space, it is necessary to determine the responsible or otherwise appropriate jurisdiction, according to the rules of which remedies should be established and applied.

The first type or range of problems relates to the applicability of the patentability criteria of novelty, non-obviousness and usefulness or functionality to 'space' inventions. For example, when micro-gravity is the most important element based on which an invention is made, it is extremely difficult to prove its functionalities on the ground. If such a problem arises the patent may not be granted for inventions of the kind made in outer space. In addition, in cases where the functionality of an invention is based on micro-gravity, there is a risk that no novelty or non-obviousness can be found in such an invention, and hence a patent may not be issued, as this is one of the mandatory criteria for patent protection.[145]

The second problem refers to the issue of jurisdiction, namely the state where patentable inventions should be filed to acquire rights if an invention is made in outer space. This may be particularly problematic in a situation where space activities are carried out by partners that are nationals of several different states. In such cases, rules determining the appropriate jurisdiction and the persons entitled to file inventions for patent protection should be established. Without such a step, these questions may remain unclear or even controversial, and hence difficult to resolve once inventions are made.

Once the appropriate jurisdiction is established and the invention is filed for patent, the inventor may face the risk of an early disclosure, namely, before the patent application is filed, or when specific terms set in the national legislation are not adhered to. This risk may be higher in outer space than on earth because of greater attention being paid to what is happening on, for instance, the International Space Station (ISS).[146] Information released about the invention might be enough for meeting the criteria of disclosure if, for instance, photographs from its modules are published or broadcasts are made. Early disclosure of sufficient

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[145] See e.g. WIPO, *supra* n. 132, 21.
[146] See on the ISS in general *supra*, §§ 11.2–11.6.

information about the invention transfers it into the field of prior art and renders it non-patentable. In relation to prior art, granting patents for inventions made in outer space will lead to further expansion of prior art and further complicate its assessment when other, new inventions are filed for patent protection. This issue, however, is not solely a problem for space activities, but for any activities, wherever they are carried out, which produce patentable inventions, since all of them if or when patented expand the prior art. Ultimate caution regarding the information about the invention that is disclosed is most likely the most effective mechanism to keep it secret until the filing of the patent.

A potentially wider range of difficulties lies within the field of enforcement of patent rights. This is linked to the territoriality of patent protection and the characteristic of outer space as being a 'province of all mankind'.[147] When a patent is issued by a state, or even in accordance with the international filing procedure as per the Patent Cooperation Treaty, and the protection covers several states, it remains unclear whether or where precisely potential infringements that happen in outer space itself can be prevented or ceased, and where remedies can effectively be sought. Also, depending on the regulatory differences among states, companies involved in space activities that may produce patentable inventions may establish contractual arrangements and determine the state where protection is initially sought. This may in turn lead to complications stemming from 'forum shopping' or 'flags of convenience' practices,[148] neither of which is considered an optimal path to follow.

Another example of problems with the enforcement of patent rights is absence of clarity as to applicability to space activities of the exception laid down in Article 5*ter* of the Paris Convention regarding passage of ships, aircraft and land vehicles carrying potentially infringing equipment through territories of states where such equipment or its parts are subject

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[147] *Cf.* Art. I, Outer Space Treaty, *supra* n. 2; see further on this subject e.g. *supra*, § 2.3.1.2.

[148] The essence of the two practices is either to register the patent in a jurisdiction that has the most favourable rules regarding enforcement, or to try and contractually arrange that any disputes will be resolved by a specific (again, the most favourable) jurisdiction; see D. Loftus, International Patent Protection: Time for a fully EU Functioning Supra-National Patent Mechanism, 6 *Journal of International Commercial Law & Technology* (2011), 180 ff. For the context of the internet see J.C. Ginsburg, Copyright without Borders? Choice of Forum and Choice of Law for Copyright Infringement in Cyberspace, 15 *Cardozo Arts & Entertainment Law Journal* (1997), 153 ff.

to patent protection. The wording of the Convention may not allow for an interpretation that includes space equipment from one state that, for example, is moved to a state where the launch site is situated. Such (restrictive) interpretation is confirmed in the WIPO IP and Space Report[149] with the argument that, since the Convention explicitly refers to 'vessels, aircraft or land vehicles',[150] space objects are excluded from the application of this provision and their temporary presence in a foreign territory (for instance for the purpose of launching or return) may not automatically be exempted from patent infringement.[151] This exception, however, is important for space activities, in particular due to the fact that there is only a limited number of launching sites and a vast number of states or companies have to transport their satellites to and through the territories of other states to have them launched into outer space.

18.3.4 Regulatory Responses to Challenges

Patentability of inventions made in outer space can be confirmed through explicit legislative provisions that extend application of a patent protection regime to such inventions. This practice was initiated by the United States when an amendment introduced to the US Patent Act in 1990[152] explicitly laid down that inventions made in outer space are included in its scope. The US Patents in Space Act provides that 'any invention made, used, or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title'.[153] It also makes exceptions to this rule to the extent these are introduced by an international agreement to which the United States is a party, as well as allowing treatment of foreign inventions on the same footing as those registered in the United States if an international agreement so prescribes. The wording of the provision

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149 Intellectual Property and Space Activities (hereafter WIPO IP and Space Report), WIPO Issue paper, April 2004, 20, www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf, last accessed 29 January 2014.

150 Art. 5*ter*, Paris Convention, *supra* n. 1.

151 *Cf.* the discussion regarding the doctrine of temporary presence and its applicability to spacecraft in the United States and France in R. Oosterlinck, The Evolution of the Temporary Presence Exception to Patent Infringement in Relation to Space Applications and the French Space Act of 2008, 34 *Annals of Air & Space Law* (2009), 913–26.

152 See Sec. 1(a), US Patents in Space Act (Patents in Outer Space Act, Public Law 101-580, 15 November 1990; 35 U.S.C. 10; 104 Stat. 2863).

153 Sec. 105(a), US Patents in Space Act, *supra* n. 152.

clearly identifies the basis for introducing such provision – Article VIII of the Outer Space Treaty prescribing that states retain jurisdiction and control over the objects they launch into outer space.[154]

Another state that followed the approach of creating quasi-territorial jurisdiction for the application of patent law is France. The 2008 French Law on Space Operations[155] introduced some amendments to the French Patent Act, including a provision similar to that in the US Patents in Space Act.[156] In addition, two other states have provisions that can be useful for this matter. Article 16 of the Russian Law on Space Activities[157] contains a *renvoi* to the IP-relevant provisions of its Civil Code as applicable to protection of IP 'resulting from development of space technology and equipment'.[158] The wording does not explicitly state that this technology and equipment is produced in outer space, but neither does it rule out such a possibility. Germany, by virtue of signing the Intergovernmental Agreement on the ISS,[159] also modified[160] its patent law so that it is applicable to inventions created on board an ESA-registered module.[161] A similar approach was adopted by Italy.[162] Apart from the examples cited, the national patent laws of other states do not

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[154] Art. VIII, Outer Space Treaty, *supra* n. 2, provides in relevant part: 'A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body.'

[155] French Law on Space Operations (*Loi relative aux opérations spatiales*); Loi n° 2008-518 du 3 juin 2008; unofficial English version 34 *Journal of Space Law* (2008), 453.

[156] See Art. 22(I), French Law on Space Operations, *supra* n. 155; *cf.* also *supra*, n. 153. Further also Oosterlinck, *supra* n. 151, 928.

[157] Law of the Russian Federation on Space Activities (hereafter Russian Law on Space Activities), No. 5663-1, 20 August 1993, effective 6 October 1993; *National Space Legislation of the World*, Vol. I (2001), at 101; the most recent amendment is of 21 November 2011.

[158] Art. 16, Russian Law on Space Activities, *supra* n. 157; author's translation.

[159] *Cf.* Art. 21, Intergovernmental Agreement, *supra* n. 7; see also *supra*, §§ 11.3.2.5, 11.4.2.

[160] See German Act on the Ratification of the Intergovernmental Agreement of 13 July 1990, 1988 BJBL. II, 637.

[161] However, under Art. 6, German Patent Law, *supra* n. 121, the place of discovery of the invention is irrelevant, so long as the invention is filed for patent protection in Germany.

[162] See *supra*, § 11.3.2.5, (text at) n. 77.

contain provisions that would make national patent law applicable on board a spacecraft.[163]

An attempt to extend *verbatim* applicability of patent law to inventions made in outer space was made at the European Union level through the proposed Community Patent Regulation in March 2003.[164] Its Article 3 explicitly included patentable inventions created or used in outer space, including on celestial bodies or on spacecraft that are under the jurisdiction and control of one or more EU member states.[165] The draft proposal was, however, withdrawn in 2012 as obsolete. Another Regulation, implementing enhanced cooperation in the area of the creation of unitary patent protection, was adopted instead. It aims at ensuring unitary,[166] affordable[167] and autonomous[168] patent protection within the European Union, but does not declare applicability of its provisions to inventions made in outer space.

Another widely cited example of how IP in general and patent in particular are regulated in the context of space activities is the ISS Intergovernmental Agreement, which lays down rules applicable to IP in its Article 21. It is interesting to note that the understanding of the term 'IP' in the Intergovernmental Agreement is the same as in the WIPO

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[163] See A.M. Balsano & A. de Clercq, Community Patent and Space Related Inventions, 30 *Journal of Space Law* (2004), 3.

[164] Proposal for a Council Regulation on the Community patent, of 8 March 2004; Interinstitutional File 2000/0177 (CNS); 7119/04 PI 28, http://register.consilium.europa.eu/pdf/en/04/st07/st07119.en04.pdf, last accessed 29 January 2014. Note that already in 1989 an attempt had been made to arrive at a Community Patent; Agreement relating to Community Patents (89/695/EEC), Luxembourg, done 15 December 1989, not yet entered into force; Cm. 1452; OJ L 401/1 (1989).

[165] See Art. 3(2), Proposal for a Council Regulation on the Community patent, *supra* n. 164: 'This regulation shall apply to inventions created or used in outer space, including on celestial bodies or on spacecraft, which are under the jurisdiction and control of one or more Member States in accordance with international law.'

[166] See Art. 3, Regulation of the European Parliament and of the Council implementing enhanced cooperation in the area of the creation of unitary patent protection, No. 1257/2012/EU, of 17 December 2012; OJ L 361/1 (2012).

[167] See Chapter V ('Financial provisions'), Regulation of the European Parliament and of the Council implementing enhanced cooperation in the area of the creation of unitary patent protection, *supra* n. 166.

[168] See Art. 7, Regulation of the European Parliament and of the Council implementing enhanced cooperation in the area of the creation of unitary patent protection, *supra* n. 166.

Convention.[169] This step, however small, also serves harmonization of the approaches to regulate IP. Article 21(2) of the Intergovernmental Agreement in effect partitions the ISS (or its elements) into various quasi-territories that belong to the states (or organization, in case of ESA) on whose registry the elements are present.[170] This creates quasi-territorial effect for the application of national IP laws on the modules (for instance the law of the United States on the US module). A more complex approach is established for ESA-registered elements: any participating ESA member state may claim that its law is applicable to any activity that results in a patentable invention. Article 21(4) and (5) further codifies rules applicable to ESA-registered elements and potentially complex relationships that may develop among European participating states, in particular with regard to the recognition of the rights to exercise IPR (which should always be the case), and to recovery of damages from infringing activities (which should occur only once, in one European partner state).

In addition to the general rule, Article 21(2) contains another provision that may be interpreted as an exception to it. It prescribes that carrying out activities in a foreign element does not affect the jurisdiction over them, which suggests that the state of the element's registry has the jurisdiction.[171] The interpretation of this rule suggests that if an ISS partner wishes to retain jurisdiction rights over activities that are carried out not on or in its elements, it should conclude a separate agreement with the partner under whose jurisdiction that element is. This provision seems to be quite complex, particularly in the context of potential ISS use by commercial entities, which might not necessarily be comfortable with the fact that the law applicable to their activity on the ISS is not that of the state where they are incorporated.

The rule of Article 21(3), however, obliges participating states to not apply their laws concerning secrecy of inventions to enable filing of the

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[169] *Supra*, n. 4.

[170] *Cf.* Art. 5(1), Intergovernmental Agreement, *supra* n. 7, providing 'each Partner shall register as space objects the flight elements listed in the Annex which it provides' and Art. 5(2), providing 'each Partner shall retain jurisdiction and control over the elements it registers in accordance with paragraph 1 above and over personnel in or on the Space Station who are its nationals'; further *supra*, § 11.3.2.3.

[171] The relevant clause provides that 'participation by a Partner State, its Cooperating Agency, or its related entities in an activity occurring in or on any other Partner's Space Station flight element shall not in and of itself alter or affect the jurisdiction over such activity provided for in the previous sentence'; Art. 21(2), Intergovernmental Agreement, *supra* n. 7.

patent application by a foreign national or resident who made the invention on or in its (that state's) element. The wording[172] suggests that the jurisdiction over the inventive activity is independent from the jurisdiction over the ISS elements. This seems to contradict the second rule of Article 21(2) described immediately above. Thus, if, for instance, a US astronaut invents something on board the Japanese module, Japan would not be entitled to obstruct him in trying to achieve patent protection in the US by applying Japanese secrecy-related laws provided that the relevant US legislation provided for similar secrecy requirements. This, however, suggests that the astronaut can use US patent jurisdiction in the first place, which seems to run counter to the basic rule that in this case only Japanese patent law would apply (with a patent under it to be granted to the US astronaut). The more likely correct interpretation therefore would be that *US* law on secrecy of inventions may not stand in the way of a US astronaut claiming patent protection under Japanese law, unless the latter were dissimilar.

Without doubt, the Intergovernmental Agreement is an important example of handling IP-related issues in a project with multiple states and stakeholders involved. Whether it will remain the best option, or the practice will lead to the development of better or clearer rules, remains to be seen. However, in only one article the Agreement covers a wide variety of crucial aspects related to IP protection, such as ownership, jurisdiction, infringement and enforcement. Any agreement that strives to provide for the principles or guidelines regarding IP should follow this approach – to comprehensively regulate as many elements of IP protection as possible and realistic in given circumstances.

When one turns to the stage of enforcing granted patent rights, one aspect that directly affects a lot of space hardware while on the surface of the earth (but in different jurisdictions) is that of how to deal with the instances of temporary presence of spacecraft and other hardware on the territory of a third state (for instance from where the launch is organized) when the technology they carry might be infringing patent rights registered in that third state. The essence of this issue was described above, while in this section regulatory approaches to resolve it are highlighted.

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[172] The relevant clause here provides: 'In respect of an invention made in or on any Space Station flight element by a person who is not its national or resident, a Partner State shall not apply its laws concerning secrecy of inventions so as to prevent the filing of a patent application (for example, by imposing a delay or requiring prior authorization) in any other partner State that provides for the protection of the secrecy of patent applications containing information that is classified or otherwise protected for national security purposes'.

The examples, again, include legislation of the United States and France, as well as the relevant provision of the Intergovernmental Agreement.

The temporary presence doctrine is codified in the US Patent Act,[173] and its application to space vehicles was extended through an amendment of the National Aeronautics and Space Act that reads 'any object intended for launch, launched, or assembled in outer space shall be considered a vehicle for the purpose of section 272 of title 35'.[174] In addition, it prescribes that 'the use or manufacture of any patented invention incorporated in a space vehicle launched by the United States Government for a person other than the United States shall not be considered to be a use or manufacture by or for the United States' for the purposes of patent infringement cases.[175] Thereby any foreign person would avoid liability for patent infringement while on US territory.[176]

The French Law on Space Operations introduced the temporary presence doctrine into its domestic patent legislation by prohibiting extension of patent rights to 'objects intended to be launched in outer space brought onto the French territory'.[177] The ISS Intergovernmental Agreement also provides for special rules in Article 21(6) with regard to the resolution of the issue of the temporary presence. According to this provision,

> temporary presence in the territory of a Partner State of any article, including the components of flight elements, in transit between any place on Earth and any flight element of the Space Station registered by another Partner State or ESA should not in itself form the basis for any proceedings in the first Partner State for patent infringement.

Based on this, transportation of equipment or other hardware of one Partner State to or from the space station through a launching site in

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[173] See Sec. 272, US Patent Act, *supra* n. 120.

[174] Sec. 20135(k), National Aeronautics and Space Act, 18 December 2010, 124 Stat. 3328.

[175] Sec. 20135(k), National Aeronautics and Space Act, *supra* n. 174. A related case where the court had to adjudicate on the issue of infringement of patent rights registered in the US by foreign equipment destined to be launched from the US territory is *Hughes Aircraft Co. v. United States* (1993) 29 Fed. Cl. 197, 240. This case in fact pushed these amendments to the US patent legislation.

[176] For a discussion of this matter, see T. Ro, M.J. Kleiman & K.H. Hammerle, Patent Infringement in Outer Space: Following the White Rabbit down the Rabbit Loophole, 17 *Boston University Journal of Science & Technology Law* (2011), 202 ff.

[177] Art. 22(II), French Law on Space Operations, *supra* n. 155; see also Oosterlinck, *supra* n. 151, 928.

another Partner State does not infringe patents granted and enforceable in the latter state.

These are the major issues that have found their regulatory solution in at least some jurisdictions (Germany, France, Russia, the United States) or within a specific cooperative space project (ISS). There is a need, however, for such regulatory practice to be followed by other states, in particular because outer space is an international environment, meaning in the first place that space actors are nationals of many different states, and that a lot of space projects are and will be carried out in cooperation that involves international[178] actors.

In the absence of detailed and all-encompassing international rules applicable to patentable space inventions this reality requires more attention. The situation can and should be improved through streamlining national laws that are relevant for space activities and IP protection of the results they produce. Such practice will reduce the risk of conflicts, which should facilitate further development of space activities, in particular those carried out by private entities.

18.3.5 Suggestions to Ensure Patent Law is Applicable to Inventions Made in the Course of Space Activities

The absence of a properly harmonized international law approach to patent protection (namely on criteria and applicability to 'space' inventions) without doubt has an influence on the development and the course of space activities that may result in production of patentable inventions. However desirable, harmonization of substantive patent law at the international level in the form of a treaty is far from becoming a reality.[179]

Given these circumstances other options should be pursued, in particular to clarify and extend the applicability of patent law principles to inventions made or used in outer space. It may be argued that Article VIII of the Outer Space Treaty, mentioned earlier, can be used to extend

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[178] Here the term is intended to cover both international organizations, and actors incorporated in different states.

[179] For example, WIPO introduced a draft Substantive Patent Law Treaty in 2000; see historical overview of the work process, www.wipo.int/patent-law/en/draft_splt.htm, last accessed 20 April 2014; however, the draft is nowhere near close to finalization: currently it is not included in the work plan of the Standing Committee on the Law of Patents, which was responsible for these discussions; see www.wipo.int/patent-law/en/news_events/scp_agrees_on_future_work_plan.html, last accessed 29 January 2014.

jurisdiction regarding patent protection of states into outer space, or their space objects in outer space.[180] Therefore, the states that do not have specific IP provisions applicable to space activities may not need to adopt them. In practice this is the approach that most spacefaring nations or their subjects will have recourse to in the absence of relevant provisions and rules on the national level. However, inaction in this regard may lead to unnecessary complications when carrying out space activities that result in patentable inventions or use of patented technology and hardware.

Introduction into the national regulations of clauses that specifically bring this subject-matter under their respective patent law regime is a viable and effective course of action[181] that all states conducting or supervising space activities should pursue. It definitely resolves at least some issues regarding patentability and protectability of inventions made in outer space or in the course of space activities in general, as it establishes differences between approaches in various jurisdictions less pronounced and enables challenges regarding application of patent law to 'space' inventions to be bypassed. Another beneficial practice to follow would be to conclude special agreements that lay down principles of addressing patent law issues where space activities are being conducted internationally, as in the case of the ISS. This practice serves two important purposes: it clears potentially controversial issues ad hoc for the given project, and potentially may serve as an example of harmonized rules that in the future will be followed by (former) partners of that project in other space activities they conduct.

18.4 CONCLUSIONS

IP protection is vital for the development of space activities, as it is useful in safeguarding many of their outcomes, particularly when data and information are generated by satellites, or new patentable inventions are made. It is also widely recognized that not everything with regard to application of IP protection regimes to space-related or -generated subject-matter is clear and non-problematic. According to the conclusions and proposals of the Workshop on Space Law in the Twenty-First Century organized by the International Institute of Space Law within UNISPACE III, many aspects of existing space law need to be revisited

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[180] As per its clause allowing for the exercise of jurisdiction over a registered space object; see *supra*, n. 154.

[181] *Cf.* e.g. the opinion of Balsano & de Clercq, *supra* n. 163, 4.

in view of the privatization or commercialization of space activities. In fact, this suggestion is valid not only for space law: some adjustments should be made to regulations within other fields of law. This includes IPR and technology transfer regulations that may be subject to amendments 'for global uniformity in practice',[182] which as this chapter has shown, is not always the case today. There are difficulties in interpreting norms of both copyright and patent regulations when subject-matter resulting from space activities is involved, equally at the stage of determining applicability of the two regimes and of enforcing the rights with which they provide the IP owners. Some of these difficulties vary between copyright and patent, while others are common to both.

Copyright, or rather the traditional and correct interpretation of its scope, purpose and aim, is currently under extreme pressure, not only due to the development of space activities, but more generally due to current technological developments broadly speaking. The protection that the regime of copyright traditionally offers either does not apply to certain subject matter such as data or other non-creative intellectual products, or does not offer protection suitable to or desired by their owners.

Despite these 'inadequacies' of copyright protection, copyright as a negative right against all third parties is often invoked in transactions with satellite remote sensing data, since it may offer better protection than, for example, a contractual relationship that only concerns the parties to the contract or a licence. Reference to copyright (or the claim to be entitled to the protection this regime grants) by producers of remote sensing satellite data often results in stretching the protection to fit purposes to which the copyright regime does not apply, in particular to protect the content of licensed data. Due to the fact that the criteria, scope, duration, limitations and enforcement of copyright exist only within the legislative framework that set it up, this development cannot be deemed positive as it creates a lot of confusion and distorts the boundaries of the current regime. Instead, where copyright is inapplicable, other ways to protect valuable subject matter should be developed and used.

One of the most problematic issues for inventions resulting from space activities is their patentability – the very fundamental decision as to

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[182] UNISPACE III, Report of the Conference, UN GA A/CONF.184/6, 18 October 1999, 128, www.oosa.unvienna.org/pdf/reports/unispace/ACONF184_6E.pdf, last accessed 29 January 2014. Due to the importance of this UN document for the development and in particular regulation of space activities, quite a few observations made here are based on or supported by findings and recommendations made therein.

whether they may be granted patent protection. In addition, and very much unlike copyright, another outstanding problem with the applicability of patent law of a nation state to space-related inventions is that of jurisdiction. This is particularly true for the inventions that are made in outer space itself: there is a need for a clear rule to determine whether and whose national patent law applies to them. The main reason for this is that while substantive principles of copyright protection are harmonized on the international level and are widely adhered to, comparable norms with regard to criteria and scope of patent protection do not exist or are of limited nature. For this reason some states have introduced provisions in their national space or patent laws to explicitly allow application of their patent protection regime to the inventions made in outer space. Unfortunately this practice is not shared by many space-faring nations.

Both copyright and patent face issues regarding enforcement of the rights they grant and protect. The main reason is the territoriality of IP protection on the one hand, and on the other the use of equipment and products related to space activities that goes beyond boundaries of one state or even the entire earth itself.[183] The extra-territoriality and international character of space activities should be adequately reflected in IP regulations in order to provide the IP owners with the real, enforceable ability to use their rights and to bar infringing activities of third parties. The strategy of adopting an international basis for determining the responsible jurisdiction that is recognized and not contested would be an important step in facilitating generation of IP in outer space and otherwise as part of space activities.

A possible example could be adoption of a protocol to an existing relevant convention based on good practice and coordinated law-making efforts of states. Such an update or an improvement is much less cumbersome than a new treaty, and potentially not as difficult or controversial to agree upon due to its ultimately procedural character and its sole purpose to resolve the conflict of laws in this field. Such a protocol could be adopted within WIPO, potentially with the active involvement of UNIDROIT. The preparatory work could greatly benefit from, for example, the relevant work of the European Max Planck Group

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[183] See e.g. the analysis in the WIPO IP and Space Report, *supra* n. 151, 10: protection of IP is governed by an applicable territorial legal framework. The international treaties have achieved a certain level of harmonization of such frameworks, but ‘considerable differences among national/regional intellectual property laws which lead to a different level of intellectual property protection in the territory of each country (region)’ still exist.

for Conflict of Laws in Intellectual Property, which developed Principles for Conflict of Laws in Intellectual Property.[184] Unfortunately, in the light of so far failed attempts to regulate substantive IP (especially patent) issues, due to the lengthy and ineffective process of international law-making, a 'bottom-up' approach of regulating at the national and regional level seems a more suitable and realistic option to implement.

Regulation on the national level and in an ad hoc fashion for cooperative projects is necessary, and the cases of regulatory response to the issues of IP protection and space activities highlighted in this chapter should serve as examples for nations who are considering adopting relevant legislation. The current analysis, as well as the overview of literature and the recommendations of UNISPACE III show that the most important rules or principles developed and adopted should encompass applicability of national IP legislation in outer space, ownership and use of IP developed in the course of conducting space activities, as well as licences. In addition, these legal rules should strike the right balance between various interests by taking into account the rationale and goals of both IP protection regimes and the principles governing space activities, particularly those codified in the Outer Space Treaty.[185]

As pointed out earlier, IPR, including patents and copyright, essentially aim at protecting and encouraging creativity, while ensuring that society at large benefits from the results of such creativity by publication, distribution or disclosure of the protected subject-matter. Therefore, any modifications or special arrangements regarding existence, exercise and enforcement of IPR in outer space should be carried out taking these objectives into account. In addition, the special regime applicable to outer space as per the Outer Space Treaty should inevitably influence the choices made within the national regulations. Its most important principles are quite widely accepted by spacefaring nations,[186] and would make a solid basis for at least some of the relevant amendments in the IP laws and regulations, as for instance in the case of the US Patent Act

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184 See Principles on Conflict of Laws in Intellectual Property, European Max Planck Group on Conflict of Laws in Intellectual Property (CLIP), of 1 December 2011, www.cl-ip.eu/files/pdf2/Final_Text_1_December_2011.pdf, last accessed 29 January 2014.

185 Such a holistic approach was proposed in UNISPACE III Report of the Conference, *supra* n. 182, at 137 stating 'protection and enforcement of IPRs should be considered together with the international legal principles developed by the UN, such as those relating to principles of non-appropriation of outer space'.

186 See on the Outer Space Treaty (*supra*, n. 2) in general *supra*, § 2.3.1.

using the notion of jurisdiction and control to determine applicability of the US law to inventions made in outer space.

In the sphere of use and dissemination of satellite remote sensing data, any rules should at the same time preserve the principle of non-discriminatory access to remote sensing data, and accommodate the interests of the growing commercial providers of remote sensing data.[187] The trends of providing access to, and enabling sharing and use of remote sensing data without restrictions should also be taken into account, in particular when a country participates in initiatives like GEOSS or Copernicus.[188]

Outer space, however, is not the only area the international character of which may negatively affect development of space activities because of posing hurdles or inconsistencies as to the applicability of IP protection to space-related subject-matter due to the differences in national regulations and absence of sufficiently unified and harmonized international law provisions in this field. There are other territories or spaces where regulation of economic activities poses challenges to the legislator, those in charge of law enforcement, and ultimately those who carry them out or benefit from them.

One of them is the internet: its seemingly borderless nature often poses jurisdictional challenges, especially when enforcement of IPR is at stake. No adequate approach to regulate the issues regarding acquisition, and most importantly use of IPR has yet been found, particularly due to the jurisdictional problems involved in the governance of activities in this 'space'.[189] Despite the lack of substantial regulatory success,[190] the relevant research, as well as available case law may be relevant and useful in the context of regulating space activities. Another field that could give some guidance in searching for the optimal regulatory choices for effective IPR regimes, in particular patents, are offshore zones and

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187 See UNISPACE III Report of the Conference, *supra* n. 182, 129.

188 See *supra*, § 18.2.4.

189 For an overview and analysis of the major issues involved, see T. Scassa, New First Principles? Assessing the Internet's Challenges to Jurisdiction, 42 *Georgetown Journal of International Law* (2011), 4.

190 This lack of result is partially caused by the necessity to match interests of IPR holders that are rooted in the traditional principle of territorial jurisdiction and the apparent need to adopt conceptually new mechanisms for the activities that take place in and around internet. For an interesting overview of the issues involved, see A. Lester, The Implications of the Google Books Search Dispute for the Private International Law of Intellectual Property, 16 *Journal of Technology Law & Policy* (2011), 121 ff., incl. references to further useful reading.

rules applicable to economic activities conducted in them.[191] The analogy between the internet, offshore zones, the high seas and outer space would allow learning about and consideration of the regulatory experience, which may be helpful when elaborating on the solutions for the intellectual results of space activities and their effective protection by virtue of IPR.

[191] See, for a note which highlights some judicial practice in the United States in this regard, J. Galvin & M.N. Subjeck, Does Offshore Mean Off-Limits? Courts Address the Geographic Scope of Patent Laws, *New York Law Journal*, 7 January 2013.

19. Dispute resolution regarding space activities

Maureen Williams

19.1 THE BACKGROUND – THE LAW IN FORCE: PUBLIC INTERNATIONAL LAW/SPACE LAW

So far there are no binding dispute settlements mechanisms in the UN treaties on outer space except for the 1972 Liability Convention,[1] which envisages the setting up of a Claims Commission which, as will be seen later, never managed to come into operation. Be that as it may, the awards of this Commission are merely recommendatory unless the parties to the dispute have previously agreed to the contrary.[2]

One of the main reasons accounting for this situation was that, at the time of the drafting of these treaties in the 1960s and 1970s, the rapid progress of science and technology was not foreseen in its proper dimensions. In those days only two space powers dominated the field where space activities were conducted. Nowadays, by contrast, space technologies are being accessed by a large part of the developing world on the basis of cooperation agreements and, moreover, the commercial sides of space activities are growing on an unprecedented scale. Indeed the activity of non-space actors in outer space is constantly increasing; the possibility of disputes became greater and the available mechanisms of public international law threatened to become less effective.

At the same time the new political settings were changing, for example in the field of earth observation from space where a non-binding instrument – the UN Principles Relating to Remote Sensing of the Earth

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[1] Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971). See further *infra*, § 19.1.3.

[2] *Cf.* Art. XIX(2), Liability Convention, *supra* n. 1.

from Outer Space adopted in 1986[3] – provided a number of guidelines of a general nature. Remote sensing activities were defined as 'the sensing of the Earth's surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and the protection of the environment'.[4]

Some of these Principles were controversial at the time, notably Principle XII, on the right of access of the 'sensed State' to the data concerning its territory coupled with claims from the developing countries 'that they were being spied on by the space-faring countries'. This provision triggered sharp confrontations between the developing world and states having the technology to observe the earth from space. At this point in time, however, that antagonistic attitude has lost momentum as a result of developing countries gradually accessing the modern technologies and becoming 'sensing' states as well.[5] In this context the significant commercial aspects of space activities also had an important part to play.

As indicated earlier, these are the major reasons leading the international community to think of more agile dispute settlement procedures in the field of space activities in which private parties could participate as well. This objective clearly reflected a reality of the times. In fact, the first step in this direction was given by the International Law Association (ILA) with the adoption of what is seen as one of the first examples of rules to govern the new situation, namely the 'Convention on the Settlement of Space Law Disputes' (1984)[6] and a Revised Final Text entitled 'Convention on the Settlement of Disputes Related to Space Activities' (1998).[7] Both these texts carried a provision on the possibility of non-governmental actors being parties to the procedures on dispute settlement laid down by the draft Conventions.[8]

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[3] Principles Relating to Remote Sensing of the Earth from Outer Space (hereafter Remote Sensing Principles), UNGA Res. 41/65, of 3 December 1986; UN Doc. A/AC.105/572/Rev.1, at 43; 25 ILM 1334 (1986).

[4] Princ. I(a), Remote Sensing Principles, *supra* n. 3.

[5] The term 'sensing State' is common shorthand for terms such as 'State carrying out remote sensing activities', 'State participating in remote sensing activities' and 'State operating a remote sensing satellite', as they are used by the Remote Sensing Principles, *supra* n. 3; see e.g. Principles V, VII, X–XIV.

[6] See *ILA Report of the Sixty-First Conference*, Paris, 1984, 325–55.

[7] See *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 239–75.

[8] Art. 10 of both Conventions reads as follows: '1. All the dispute settlement procedures specified in this Convention shall be open to Contracting Parties. 2. The dispute settlement procedures specified in this Convention shall

In this light, and supported by a general opinion showing concern regarding the lack of effective means for dispute settlement related to outer space activities, where private parties were not considered, the Permanent Court of Arbitration (PCA) embarked on the drafting of Optional Rules for Arbitration of Disputes Relating to Outer Space Activities, Rules on Outer Space Disputes for short, with the objective of covering those gaps in the law. The Rules became effective on 6 December 2011.[9]

With the adoption of the 1979 Agreement governing the Activities of States on the Moon and other Celestial Bodies[10] the United Nations, having moved away from the classic principles and solutions of international law applicable on earth, closed a unique phase of progressive development of international law.[11] In the first place, sovereignty claims were ruled out whether based on use or occupation, or by any other means.[12]

The treaty-making stage of the United Nations began with the adoption of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, also known as the Outer Space Treaty. It was followed shortly by the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,[13] the

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be open to entities other than States and international intergovernmental organisations, unless the matter is submitted to the International Court of Justice in accordance with Article 6.' The latter article refers to the choice of procedure.

9 See Fifty-first session of the UNCOPUOS Legal Subcommittee, 19–30 March 2012, Doc. A/AC.105/C.2/2012/CRP.17.

10 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereafter Moon Agreement), New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979).

11 See also *supra*, §§ 1.1, 2.2.1.1, 2.2.1.2.

12 See Art. II, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

13 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereafter Rescue Agreement), London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968).

1972 Liability Convention,[14] the 1975 Convention on Registration of Objects Launched into Outer Space[15] and, as pointed out earlier, the 1979 Moon Agreement.[16] These are the five binding international instruments relating to space law today. They all enshrine rules of customary law and general principles of law but, at the same time, they are introducing new features which, in no uncertain terms, are rules of progressive development of the law.

In 1982 a new era began. States appeared reluctant to get involved in treaty obligations of which the implications in the years to come were uncertain.[17] Consequently, in the following ten years, three sets of UN Principles dealing with rather sensitive matters were adopted, as follows:

1. Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982);[18]
2. Principles Relating to Remote Sensing of the Earth from Outer Space (1986);[19] and
3. Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992).[20]

Finally, in 1996, the United Nations General Assembly adopted the Benefits Declaration, that is the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the

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[14] *Supra*, n. 1.

[15] Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

[16] *Supra*, n. 10.

[17] See *ILA Report of the Seventieth Conference*, New Delhi, 2002, 14–6; S. Hobe, The Relevance of the Current International Space Treaties in the 21st Century, 27 *Annals of Air & Space Law* (2002), 340.

[18] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (hereafter Direct Broadcast Principles), UNGA Res. 37/92, of 10 December 1982; UN Doc. A/AC.105/572/Rev.1, at 39.

[19] *Supra*, n. 3.

[20] Principles Relevant to the Use of Nuclear Power Sources in Outer Space (hereafter NPS Principles), UNGA Res. 47/68, of 14 December 1992; UN Doc. A/AC.105/572/Rev.1, at 47.

Interest of All States, taking into Particular Account the Needs of Developing Countries.[21]

Unlike the UN space treaties, the Principles and UN Declarations are not binding in themselves unless they are declaring rules of customary international law. In this case the Principles would become binding on the basis of international custom in accordance with Article 38 of the Vienna Convention on the Law of Treaties of 1969.[22]

It would now be opportune to provide an overview, in chronological order, of the dispute settlement procedures embodied in the above-mentioned UN international instruments.

19.1.1 The Outer Space Treaty

Two sections on dispute settlement are enshrined in the Outer Space Treaty, namely Article III and Article IX. One of the major points of disagreement in the course of the negotiation stage was the firm rejection by the Soviet bloc of the US proposal on conferring obligatory jurisdiction to the International Court of Justice (ICJ)[23] for disputes concerning the interpretation and application of the treaty.[24] The Soviet Union, for the resolution of disputes, would not go beyond direct negotiations.

The first-mentioned clause provides that

> States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.[25]

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[21] Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries (hereafter Benefits Declaration), UNGA Res. 51/122, of 13 December 1996; UN Doc. A/RES/51/122.

[22] Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969).

[23] The ICJ can only entertain disputes between states which have, in one of a few specific ways, accepted its jurisdiction; *cf.* Art. 36, Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1.

[24] See B. Cheng, *Studies in International Space Law* (1997), 270.

[25] Art. III, Outer Space Treaty, *supra* n. 12.

It follows that any dispute over the interpretation and application of this provision should be resolved by traditional means of public international law, namely negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies and arrangements, or other peaceful means of their own choice, as listed in Article 33 of the UN Charter.[26] In other words, this is an underlying obligation to submit disputes in accordance with the principle of free choice of means, but not to resolve the controversy.

Customary international law is at the root of the Vienna Convention on the Law of Treaties. It applies, as such, to disputes over the interpretation and application of treaties. Article 31 contains guidelines on the matter in which the right of the parties to the choice of means is duly respected. In principle, a treaty should be applied in good faith, in accordance with the ordinary meaning of its terms and in the light of its object and purpose.[27] These provisions follow a functional (or teleological) school of thought, with a slight inclination to the intention of the parties. However, in

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[26] Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 and 6711; CTS 1945 No. 7; ATS 1945 No. 1.

See further on these various forms of dispute settlement e.g. C.H, Bower, Arbitration, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. I (2012), 531 ff.; N. Butler, Arbitration and Conciliation Treaties, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. I (2012), 549 ff.; J.P. Cot, Conciliation, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. II (2012), 576 ff.; R. Wolfrum, Cooperation, International Law, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. II (2012), 783 ff.; E.J. Roncati, Diplomacy, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. III (2012), 97 ff.; R. Lapidoth, Good Offices, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. IV (2012), 528 ff.; A. Pellet, Judicial Settlement of International Disputes, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VI (2012), 526 ff.; F. Orrego Vicuna, Mediation, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VII (2012), 45 ff.; L. Boisson de Chazournes & D. Campanelli, Mixed Commissions, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VII (2012), 301 ff.; K. Hapaka, Negotiation, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VII (2012), 588 ff.; A.L. Daverede, Negotiation, Secret, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VII (2012), 595 ff.; A. Pellet, Peaceful Settlement of International Disputes, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum) Vol. VIII (2012), 201 ff.

[27] See Art. 31(1), Vienna Convention on the Law of Treaties, *supra* n. 22.

practice, some conflict has arisen on the application of these schools of thought, particularly in ICJ case law.[28]

Article IX of the Outer Space Treaty, for its part, mainly focuses on damage to the earth environment.[29] It does no more than establish a duty of international cooperation and mutual assistance on the states parties to this treaty and indicates, for instance, that states shall pursue studies of outer space, the moon and other celestial bodies so as to avoid harmful contamination or adverse changes in the environment of the earth resulting from the introduction of extra-terrestrial matter. Moreover, where necessary, they shall adopt appropriate measures and if there is reason to believe that any activity or experience carried out in those areas would cause potential harmful interference with activities of other states parties in outer space they should undertake international consultations. The weakness of this clause is clearly manifest as being quite limited in scope.[30] Nowadays, states, international organizations and private entities are fully immersed not only in the exploration but also in the exploitation

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[28] Interesting, for their implications, are some ICJ Advisory Opinions, such as *Namibia*, ICJ Reports 1971. See *i.a.* J. Dugard, A Commentary, 59 *Netherlands International Law Review* (2012), 305, reviewing *The Vienna Conventions on the Law of Treaties* (Eds. D. Corten & P. Klein) (2011).

[29] Art. IX, Outer Space Treaty, *supra* n. 12, provides in full: ‘In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.’

[30] See F. Vallat, The Outer Space Treaties, 73 *Journal of the Royal Aeronautical Society* (1969), 755; also M. Williams, *Derecho Internacional*

and use of outer space. Actors include both industrialized and developing countries.

In fact, Article IX of the Outer Space Treaty was open to question from the very beginning of the adoption of that treaty and became a target for severe criticism by the doctrine.[31] Many of the key words in Article IX remain open to interpretation with the uncertainties and dangers this situation may entail. For example, when should contamination be 'harmful', or 'adverse' changes considered such? Who is going to determine whether the measures taken were indeed 'necessary'? Furthermore, to speak of states having 'reason to believe' is a subjective requirement left entirely to the discretion of states.

The Vienna Convention on the Law of Treaties is not too clear on these points either. In fact, Article 66 on procedures for judicial settlement, arbitration and conciliation provides that any party to a dispute concerning the application or interpretation of any of the articles in Part V of the Convention[32] may set in motion a procedure envisaged in the Annex to the Convention[33] by submitting its request to the Secretary-General of the United Nations. This does not apply to Articles 53 and 64 – dealing with peremptory norms of general international law – and where the ICJ is to decide.[34]

The Annex provides that a list of conciliators, consisting of qualified jurists, shall be drawn up and maintained by the Secretary-General of the United Nations who, upon request, shall refer the dispute to a Conciliation Commission.[35] This Commission shall make proposals to the parties to the dispute with a view to reaching an amicable settlement and report to the Secretary-General who, in turn, shall transmit it to the parties

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Contemporáneo (1990), 107–22, reflecting moreover the current general opinion in the ILA Space Law Committee.

31 See Vallat, *supra* n. 30, 705.

32 It should be borne in mind that, unlike other sections of the Vienna Convention on the Law of Treaties, *supra* n. 22, Part V on Invalidity, Termination and Suspension of the Operation of Treaties does not, in general, reflect customary international law and that Art. 66, containing procedures for judicial settlement, arbitration and conciliation, was adopted with the lowest number of affirmative votes required for that purpose.

33 The Annex is attached to the Vienna Convention on the Law of Treaties, *supra* n. 22; 1155 UNTS 353.

34 See on the latter Art. 66, Vienna Convention on the Law of Treaties, *supra* n. 22.

35 See paras. 1, 2, Annex, Vienna Convention on the Law of Treaties, *supra* n. 22.

involved.[36] Neither the Commission's report nor its conclusions are binding on the parties but merely of a recommendatory nature.[37] Therefore, dispute settlement mechanisms for the interpretation of Article IX of the Outer Space Treaty by means of the Annex to the Vienna Convention on the Law of Treaties are hardly of any use at this point in time.

19.1.2 The Rescue Agreement

The Rescue Agreement is, essentially, of a humanitarian nature. Addressing dispute settlement procedures in this context would go beyond the scope of this analysis as no specific rules are included in this instrument. Hence the general rules of Article III and Article IX of the Outer Space Treaty would apply.[38]

Moreover, this topic is today linked to issues surrounding space traffic management and 'space tourism' and, in some measure, to the 1998 Intergovernmental Agreement concerning cooperation on the civil International Space Station (ISS)[39] to which a limited number of states are parties. Dispute settlement is addressed, in this framework, in Article 23 listing consultations, conciliation, mediation or arbitration as possible means.[40] This is largely a political solution agreed by the parties to this Agreement, namely Canada, Japan, the Russian Federation, the United States and the European Space Agency (ESA).[41]

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36 See paras. 5, 6, Annex, Vienna Convention on the Law of Treaties, *supra* n. 22.

37 *Cf.* para. 6, Annex, Vienna Convention on the Law of Treaties, *supra* n. 22.

38 See further *supra*, § 19.1.1.

39 Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station (hereafter Intergovernmental Agreement), Washington, done 29 January 1998, entered into force 27 March 2001; TIAS No. 12927; Cm. 4552; *Space Law – Basic Legal Documents*, D.II.4.

40 The list of Art. 23, Intergovernmental Agreement, *supra* n. 39, is not exhaustive but simply mentions the most frequently used means; freedom of choice remains the general principle.

41 ESA is the ISS Partner on behalf of 11 ESA member states, qualifying as Partner States; see further *supra*, §§ 11.3, 11.4.

19.1.3 The Liability Convention

The Liability Convention was an important step forward in the field. However, like any human construction, it has merits and also flaws. Among the merits – which largely outnumber the flaws – is the important progress on the legal personality of international organizations[42] and the inclusion of the principle of integral compensation for damage.[43] Furthermore the Convention envisages a review possibility[44] and includes nuclear damage as a source for compensation.[45] Overall the greatest merit was reaching consensus for adoption in the middle of the Cold War and in a field where political ambitions did not easily give way.[46]

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[42] *Cf.* Art. XXII, Liability Convention, *supra* n. 1; see further *supra*, generally Chapter 5, also § 2.3.3.8.

[43] *Cf.* Art. XII, Liability Convention, *supra* n. 1, which provides in full: 'The compensation which the launching State shall be liable to pay for damage under this Convention shall be determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.'

[44] *Cf.* Art. XXVI, Liability Convention, *supra* n. 1, which *inter alia* provides that 'the question of the review of this Convention shall be included in the provisional agenda of the United Nations General Assembly in order to consider, in the light of past application of the Convention, whether it requires revision'.

[45] Art. I(a), Liability Convention, *supra* n. 1, defines damage as 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations'. On the inclusion of nuclear damage in this context, see e.g. S. Gorove, *Studies in Space Law: Its Challenges and Prospects* (1977), 140; B. Cheng, Convention on International Liability for Damage Caused by Space Objects, in *Manual on Space Law* (Eds. N. Jasentuliyana & R.S.K. Lee) Vol. I (1979), 115; W.F. Foster, The Convention on International Liability for Damage Caused by Space Objects, 10 *Canadian Yearbook of International Law* (1972), 155–7.

[46] As observed by Brisibe, while the liability regime for damage caused on earth is no doubt an exception to the general reluctance of states towards rules imposing strict liability, other aspects of liability and responsibility for injurious consequences of outer space activities depend on the establishment of fault, in respect of which neither is fault defined nor are there binding guidelines for standards of care or provisions for imputing negligent conduct to others or for the attribution of vicarious liability; see T.C. Brisibe, The International Normative System and a Code of Conduct for Outer Space Activities, in *Decoding the International Code of Conduct for Outer Space Activities* (Ed. A. Lele) (2012), 128–9. See further, on this point, The Role of Arbitration in Settling Disputes

The weaknesses of the Liability Convention concern mainly the dispute settlement mechanisms. In fact, the recommendatory nature of the awards of the Claims Commission – a body to be set up when the dispute fails to be settled by direct negotiation – remains a matter of concern and is hardly consistent with today's international context where swift technological development is a sign of the times. In perspective, the solutions provided by the Liability Convention for dispute settlement are understandable given the political winds blowing in all directions during those early days. However, they are hardly appropriate in today's international scenarios.

At the 69th Conference of the International Law Association (held in London, 2000) the ILA Space Law Committee became involved in a 'Review of the Space Law Treaties in View of Commercial Space Activities'. The point of departure was Article VI of the 1967 Space Treaty which covered – and continues to cover – most possibilities of private activities in space that, in accordance with the state of the art, are viable and commercial, and their consequences. The principle underlying this Article is freedom of action of private enterprises under the responsibility of the state concerned.[47]

Article VI of the Outer Space Treaty – today seen as part of customary international law[48] – imposes direct responsibility on states for national

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Relating to Outer Space Activities, 120 *Financier Worldwide* (Dec. 2012), 48–50, www.financierworldwide.com/login.php?url=article.php%3Fid%3D10036, last accessed 21 April 2014.

[47] *Cf.* also Arts. I, VI, Outer Space Treaty, *supra* n. 12; further Statement by the Board of Directors of International Institute of Space Law on Claims to Property Rights Regarding the Moon and Other Celestial Bodies, www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf, last accessed 31 January 2014; also e.g. V. Kayser, *Launching Space Objects: Issues of Liability and Future Prospects* (2001), 34; J. Hermida, *Legal Basis for a National Space Legislation* (2004), 7.

[48] These are conclusions reached in different ILA Reports; see e.g. *ILA Report of the Seventieth Conference*, New Delhi, 2002, 194–6, 219, 222; *ILA Report of the Seventy-First Conference*, Berlin, 2004, 4. *Cf.* further e.g. C. Chaumont, Orientation actuelle du droit de l'espace, 28 *Revue Générale Air et Espace* (1965), 8; M. Lachs, *The Law of Outer Space: An Experience in Contemporary Law-Making* (1972), 139 ('It was … declaratory, confirming in treaty language the principles and rules already adopted and accepted as law'). Not only is the codification of existing customary international law in a subsequent treaty recognized in international law (*cf.* Art. 38, Vienna Convention on the Law of Treaties, *supra* n. 22); the jurisprudence of the ICJ also considers that customary law can evolve from treaty law; see e.g. *Nottebohm Case* (Second Phase) (Liechtenstein v. Guatemala), International Court of Justice, 6 April 1955,

activities in outer space, whether carried on by governmental agencies or by non-governmental entities. The latter require authorization and continuing supervision by the appropriate state party to the Treaty. In the case of activities carried on by an international organization the responsibility shall be borne by the international organization and the states under Article VI of the Outer Space Treaty, as well as for liability purposes by those which are parties to the Liability Convention and member states of the organization.[49]

Article VI of the Outer Space Treaty establishes a real duty for states to authorize and supervise all private national activities in space, making them responsible to that effect. This provision is a clear example of indirect state responsibility.[50]

Coming back to the Liability Convention, it should be borne in mind that Article III thereof considers damage caused elsewhere than on the surface of the earth – such as the collision between Iridium-33 and Cosmos-2251 on 9 February 2009[51] – where liability based on fault is applicable. Article VI of this Convention, for its part, is the only provision addressing exclusion or exemption from liability thus softening the very strict rule of absolute liability contained in Article II of the Liability Convention.[52]

Next, specific areas of the Liability Convention which relate to dispute settlement should be addressed in order to establish their consistency in

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I.C.J. Rep. 1955, 22–3. Further K. Doehring, Gewohnheitsrecht aus Verträgen, in 36 *Zeitschrift für ausländisches öffentliches Recht und Völkerrecht* (1976), 82; R. Baxter, Treaties and Custom, 129 *Recueil Des Cours* (1970 I), 25; R.J. Lee, Reconciling International Space Law with the Commercial Realities of the Twenty-first Century, 4 *Singapore Journal of International & Comparative Law* (2000), 203.

[49] *Cf.* again Art. XXII, Liability Convention, *supra* n. 1.

[50] See Cheng, *supra* n. 24, 644.

[51] See further on this e.g. M. Mejia-Kaiser, Collision Course: 2009 Iridium–Cosmos Crash, in *Proceedings of the International Institute of Space Law 2009* (2010), 274–84; R.S. Jakhu, Iridium–Cosmos Collision and its Implications for Space Operations, in *Yearbook on Space Policy 2008/2009* (Eds. K.U. Schrogl *et al.*) (2010), 254–75; F.G. von der Dunk, Too-Close Encounters of the Third-Party Kind: Will the Liability Convention Stand the Test of the Cosmos 2251–Iridium 33 Collision?, in *Proceedings of the International Institute of Space Law 2009* (2010), 199–209.

[52] See F. Tronchetti, L.J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K.U. Schrogl) Vol. II (2013), 148–9.

today's world. These are Article XII on the applicable law and Article XIX on dispute settlement.

Article XII, when dealing with the compensation for damage to be paid by the launching state, refers to international law and the principles of justice and equity in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, state or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred (which amounts to *restitutio in integrum*[53]).

This provision was, in fact, one of the most controversial within the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space (COPUOS) and ultimately the result of a compromise among the delegations holding conflicting views on the matter.[54] However, it is fair to say that, under extremely difficult circumstances, the Liability Convention succeeded in imposing an obligation to restore the victim of damage to the *status quo ante*.

During the negotiation of the Liability Convention within the Legal Sub-Committee of COPUOS the pressure to include a mention of the law of the place where the damage had occurred (the so-called *locus regit actum*) or, alternatively, the law of the claimant state, was persistent but unsuccessful in the end.[55] The nitty-gritty of the question seemed to be the fear of many delegations that their own nationals, if injured, would receive token compensation depending on the way the principle of reciprocity was interpreted. There seemed to be a great deal of confusion surrounding the application of public international law and not a few

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53 This provision is based in the joint proposal to the COPUOS Legal Subcommittee made by Belgium, Brazil and Hungary (Doc. A/AC.105/C.2/L-79, of 21 June 1971) on *restitutio in integrum* which spoke of restoring the victim to a condition 'equivalent' to that which would have existed if the damage had not occurred. In the adopted text of Art. XII the word 'equivalent' was left out which was seen with favour by many delegations, *i.a.* the Argentine one, as the obligation to restore would be weakened should the word 'condition' be qualified (*cf.* Doc. A/AC.105/C.2/SR 163, 10, of 24 June 1971). See Williams, *supra* n. 30, 23–4; also Cheng, *supra* n. 24, 341, particularly as regards the positions of the various delegations to the Legal Sub-Committee concerning limitation of liability.

54 See Cheng, *supra* n. 24, 332, also 340; further also *ILA Report of the Sixty-Ninth Conference*, London, 2000, 574–5.

55 See Cheng, *supra* n. 24, 332, also 340. Cheng mentions that some delegations remained unsatisfied as the *lex loci* was not included: *i.a.* India, Sweden, Japan, Austria, India, and Iran (see Cheng, at n. 297). See further also *ILA Report of the Sixty-Ninth Conference*, London, 2000, 574–5.

delegations to the COPUOS Legal Sub-Committee fell into a maze of theoretical discussion surrounding the issue of conflict of laws.[56]

In fact, there is nothing vague – or obscure – in the drafting of Article XII of the Liability Convention, as sometimes pointed out by the doctrine at the time[57] and even in more recent years. A clear illustration was the comments by some PCA delegates during the drafting of the Optional Rules for Arbitration of Disputes Relating to Outer Space Activities in 2011.[58] Indeed it is hard to see 'international law' in the context of Article XII as abstract or too general. Quite the contrary, international law encompasses treaty law, customary international law and general principles of law, as listed in Article 38 of the ICJ Statute.[59] And whenever international tribunals were called upon to give a decision in accordance with international law, the task was never a great challenge.

As to the 'principles of justice and equity', they seem clear enough today to ensure, as declared in the Preamble of the Liability Convention, 'the prompt payment … of a full and equitable measure of compensation to victims'.[60] Some of the classic case law on this question shall be highlighted as follows.[61]

In 1922, for example, the PCA based its decision in the *Norwegian Ship Owners Case* on 'principles of justice and equity' and described these principles as 'general principles of justice'.[62] Of special interest in this case is the recognition of the objective existence of these principles which were seen, at the same time, as independent from the national

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[56] This follows from a thorough analysis of the records of the Legal Sub-Committee; see *ILA Report of the Sixty-Ninth Conference*, London, 2000, 574–5; also Cheng, *supra* n. 24, 332–41.

[57] See e.g. a discussion of the different views of the doctrine in S. Gorove, Dispute Settlement in the Liability Convention, in *Settlement of Space Law Disputes* (Ed. K.H. Böckstiegel) (1980), 43–50.

[58] Optional Rules for Arbitration of Disputes Relating to Outer Space Activities (hereafter Rules on Outer Space Disputes), The Hague, 6 December 2011, www.pca-cpa.org/showpage.asp?pag_id=1188, last accessed 2 February 2014. More recently the question was reviewed by the present author in answer to the questions raised by the Republic of Belarus on the then PCA Draft Optional Rules; document on file with the author (2011).

[59] *Supra*, n. 23.

[60] 4th para., Preamble, Liability Convention, *supra* n. 1.

[61] See *ILA Report of the Sixty-Ninth Conference*, London, 2000, 574–5; also Williams, *supra* n. 30, 23–34.

[62] *Norwegian Shipowners' Claims*, Norway v. USA, 13 October 1922; Vol. XI, Reports of International Arbitral Awards (RIAA).

legal systems and common to all civilized nations. Indeed, the PCA has used the terms 'law', 'justice' and 'equity' as synonyms.[63] In a more recent context some authors consider that if a decision is given in accordance with 'law and equity' this would lead the tribunal to choose principles widely recognized and precise enough to serve in the given case, or else to give an *ex aequo et bono* decision to fill gaps in the law.[64]

The law of the sea provides a good illustration of the way 'international law and the principles of justice and equity' were being applied by international courts and tribunals following the entering into force of the Liability Convention. In 1982 the ICJ decided on the delimitation of the continental shelves between Libya and Tunisia and, faithful to the principle that the land dominates the sea, the Court considered that delimitation should not advance on, or overlap with, the opposite coastal areas of the parties. The equitable principles applied were grounded on the principle of proportionality and, in an effort to define the scope of the principles on which it was instructed to decide, the Court held that equity sprang directly from justice and was a principle to be applied *ipso jure*. Hence the Court took into account the existence of oil wells and the conditions underlying the exploitation concessions. In this way the Court – in spite of the acid criticisms made by four of its judges in their dissenting opinions – evaluated the situation, including an element of equity to the other available documentation.[65]

Also interesting, for their implications, were the *Gulf of Maine Case*[66] decided by a Special Chamber of the ICJ in 1984 and the *Guinea-Bissau* arbitration[67] concluded in 1986. In the first case the Court gave its decision in accordance with 'the rules and principles of international law', making a distinction between 'rules of customary international law'

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[63] See Reports of International Arbitral Reports, 1922; also B. Cheng, Justice and Equity in International Law, in *Current Legal Problems* (Eds. G.W. Keeton & G. Schwarzenberger) (1955), 185 ff.

[64] See e.g. S.W. DeVine, Polyconnotational Equity and the Role of *Epieikeia* in International Law, 24 *Texas International Law Journal* (1989), 149 ff.

[65] See *ICJ Reports 1982*; also M.B. Feldman, The Tunisia-Libya Continental Shelf Case: Geographical Justice or Judicial Compromise? 77 *American Journal of International Law* (1983), 219–38.

[66] See ICJ Reports 1984.

[67] See *Maritime delimitation dispute between Guinea Bissau and Senegal* (Guinea Bissau vs. Senegal); Arbitral Award of 31 July 1989 (Guinea-Bissau v. Sen.), 1991 I.C.J. 53 (Nov. 12); 25 ILM 251 (1986).

and 'principles of law'.[68] This meant, in practice, the application of different criteria to a specific question as the Court found that customary international law did not provide criteria applicable to all delimitations of maritime areas. In Guinea-Bissau the arbitral tribunal was instructed to give its award in accordance with the 'rules of international law', which meant identifying 'equitable' and 'objective principles'.[69] The tribunal decided that each state should control, as best as it could, the maritime area opposite its coastline and in its vicinity with due respect for the delimitations already carried out in the region.

The foregoing analysis reflects a few samples of the dimension in which the international courts and tribunals have been interpreting and applying international law and the principles of justice and equity over the years since the adoption of the Liability Convention. These precedents – in addition to the weight they carried given their thorough examination by judges and arbitrators – were clearly showing a trend towards pragmatic solutions which would inspire generations of space lawyers.

The net conclusion is that Article XII of the Liability Convention should be maintained in its present reading and be seen as one of the greatest achievements of the Liability Convention. It is a rule of public international law proper which raises no questions of conflict of laws.[70] Indeed, public international law has its own rules of private international law.[71] Moreover, this provision is totally compatible with the most recent development in the field of dispute settlement, namely the 2011 PCA Rules for Arbitration of Disputes Relating to Outer Space Activities.[72]

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[68] See *Case Concerning Delimitation of the Maritime Boundary in the Gulf of Maine Area*, Judgment of 12 October 1984, www.icj-cij.org/docket/index.php?sum=346&p1=3&p2=3&case=67&p3=5, last accessed 31 January 2014.

[69] See 25 ILM 251 (1986).

[70] During the drafting of the Rules on Outer Space Disputes, *supra* n. 58, some PCA member states underlined the need for the Rules 'to be refined' in order to prevent a conflict of laws. The present author answered along the lines expressed in the above text when addressing Art. XII, Liability Convention, namely that the article raises no issue of conflict of laws and that it is a rule of public international law.

[71] See Cheng, *supra* n. 24, 336.

[72] See Rules on Outer Space Disputes, *supra* n. 58; also Permanent Court of Arbitration, Arbitration Rules (2012), www.pca-cpa.org/showpage.asp?pag_id=1188, last accessed 31 January 2014. See for the 2011 Rules on Outer Space; also Fifty-first session of the UNCOPUOS Legal Subcommittee, 19–30 March 2012, A/AC.105/C.2/2012/CRP.17.

These Rules on Outer Space Disputes are of a procedural nature and will be examined at a later stage in this analysis.[73]

Turning to Article XIX of the Liability Convention, it should be read together with Articles I, XIV, XVI and, of course, Article XII, which sets the tone for the whole dispute settlement system. Article XIV establishes a system of direct negotiation by diplomatic channels for compensation claims. If no settlement is reached within one year Article XIV envisages the establishment of a Claims Commission at the request of either party. All decisions and awards of the Commission, according to Article XVI, shall be by a majority vote and, as Article XIX states, they shall be final and binding if the parties have so agreed; otherwise the Commission shall render a final and recommendatory award, which the parties shall consider in good faith.

Here is where the greatest failure of the Liability Convention lies, that is to say, taking an exception as a general rule. Despite the fact that a number of delegations to the Legal Sub-Committee of COPUOS were favouring a system of binding decisions, the harsh facts of politics made this impossible at the time of adoption of the text of this Convention. At first sight a valid conclusion would be that if and when the Convention is revised, the principle embodied in Article XIX, third paragraph, should be reversed.[74]

Be that as it may, 40 years of the dispute settlement mechanisms of the Liability Convention have not managed to prove their effectiveness. The crash of the Soviet Cosmos-954 satellite, equipped with a nuclear reactor, left radioactive fragments in Canada. The case was settled by direct negotiations between the parties.[75] The Soviet Union argued that the

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73 See *infra*, § 19.3.

74 As observed by the Argentine delegate to the Legal Subcommittee (Doc. A/AC.105/C.2/SR, 163, of 24 June 1971, 12), in most legal systems the rule was that awards be binding. However, in the case of the Liability Convention, *supra* n. 1, this became the exception instead of the rule. Thus, the principle *par in parem non habet imperium* was falling to pieces. The Austrian delegation at the 1998 session of the Legal Sub-Committee actually proposed, supported by other delegations, 'to consider measures for obtaining a binding dispute settlement system particularly under the Convention on International Liability for Damage Caused by Space Objects'; *cf.* e.g. ILA Resolution No. 13/2000, Space Law, § 2; www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&ved=0CEAQFjAD&url=http%3A%2F%2Fwww.ila-hq.org%2Fdownload.cfm%2Fdocid%2FC9859BBD-F2C3-412C-90A25EEE26A1D7FE&ei=-5eKUs_xC4Xr2AW6z4CQCg&usg=AFQjCNGmcTMvgMUB9l4T1sdfobRxbevSAA, last accessed 31 January 2014.

75 See also *supra*, § 2.3.3.9.

Liability Convention did not apply to the situation given that no personal injuries or property damage had occurred. As pointed out by an American author, the records relating to the settlement suggest that US assistance in this case was provided in return for potential access to intelligence data.[76] It is pointed out that the Liability Convention has had little use and that, following the Cosmos-954 accident, there has been 'no further occasion for exploring the efficacy of the liability regime'.[77]

At this point in time it seems reasonable to support the application of more agile procedures on this matter. In this sense, the PCA Optional Rules on Arbitration of Disputes Regarding Outer Space Activities, effective since 6 December 2011, will be seen to set a striking example, even present a watershed.

19.1.4 The Registration Convention

There is not much to be said about dispute settlement procedures concerning the interpretation and application of the Registration Convention.[78] However so, given the case, Article III of the Outer Space Treaty would apply, leading to Article 33 of the United Nations Charter.[79]

19.1.5 The Moon Agreement

Article 15 of the Moon Agreement lays down the pillars for dispute settlement which are based on the principles of international cooperation and free choice of means. Its drafting style is reminiscent of Article IX of the Outer Space Treaty. The Agreement envisages a system of consultations when states parties have reason to believe that another state party is not fulfilling the obligations incumbent upon it pursuant to the Agreement. Should consultations not result in a mutually acceptable

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[76] See M.J. Peterson, *International Regimes for the Final Frontier* (2005), 262.

[77] Peterson, *supra* n. 76, 123.

[78] *Supra*, n. 14; in general on the Registration Convention, *supra* n. 15, further *supra*, § 2.3.4.

[79] Art. III, Outer Space Treaty, *supra* n. 12, provides that 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.'

settlement, any state party may seek the assistance of the Secretary-General of the United Nations to resolve the controversy.[80]

As may be seen the Moon Agreement fails to cover the gaps left by the Outer Space Treaty in the field of dispute settlement and there is no progressive development of the law in this respect. Having in mind the weak support for this Agreement by the international community,[81] the issues arising in the field of dispute settlement do not become a matter of deep concern at the time and are anyway covered by the obligations embodied in the Outer Space Treaty and the UN Charter.

19.1.6 The UN Principles on Outer Space Adopted by the General Assembly

The three sets of UN Principles adopted so far by the General Assembly include similar provisions on dispute settlement, as follows.

Principle E of the 1982 Principles on Direct Television Broadcasting,[82] addressing the peaceful settlement of disputes, states that any international dispute arising from activities covered by these Principles should be settled through the established procedures for the peaceful settlement of disputes agreed upon by the parties to the dispute in accordance with the provisions of the Charter of the United Nations.[83]

Principle XV of the 1986 Principles on Remote Sensing[84] provides that any dispute arising from the application of these Principles shall be resolved through the established procedures for the peaceful settlement of disputes.[85]

Principle 10 of the 1992 Principles on the Use of Nuclear Power Sources in Space[86] states that any dispute arising from the application of

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[80] *Cf.* Art. 15, Moon Agreement, *supra* n. 10. See in general on the Moon Agreement further *supra*, §§ 2.3.5 and 14.4.2.2.

[81] To date, the Moon Agreement has been ratified by 15 states and signed but not ratified by four more, except for France and India none of them major spacefaring nations; see www.unoosa.org/oosa/SpaceLaw/treatystatus/index.html, last accessed 31 January 2014.

[82] *Supra*, n. 18.

[83] *Cf.* Art. 33, UN Charter, *supra* n. 26; Art. 38, Statute of the International Court of Justice, *supra* n. 23.

[84] *Supra*, n. 3.

[85] *Cf.* again Art. 33, UN Charter, *supra* n. 26; Art. 38, Statute of the International Court of Justice, *supra* n. 23.

[86] *Supra*, n. 20.

these Principles shall be resolved through negotiations or other established procedures for the peaceful settlement of disputes, in accordance with the Charter of the United Nations.[87]

The conclusion on dispute settlement within the UN Principles is that the lowest common denominator would be the principle of free choice of means embodied in Article 33 of the Charter of the United Nations, coupled with the obligation to negotiate in good faith.[88]

Briefly, neither the five space treaties nor the three sets of Principles adopted under the auspices of the United Nations contain dispute settlement procedures consistent with today's international settings. These international instruments, inasmuch as dispute settlement procedures are concerned, were missing out on fundamental developments as they only considered subjects of public international law as parties and did not grasp the growth of non-governmental activities in outer space.

The growing commercial aspects of space activities and privatizations were not envisaged at that stage of development of international space law within the United Nations. So far, only subjects of public international law have been taken into account in dispute settlement procedures designed, and not the slightest indication has been provided of other possibilities. It was only the ILA in Paris in 1984 with the first Convention on the Settlement of Disputes Related to Space Activities that included the famous Article 10 (also appearing in the Final Text of 1998), which provided a clear departure from the former – intergovernmental – models.[89] In brief: the UN space treaties carried the seeds of frustration.

19.2 THE LANDMARKS AND PRECEDENTS FOR PROGRESSIVE DEVELOPMENT OF THE LAW

Having made reference to the various dispute settlement procedures in public international law embodied in the UN outer space treaties and Principles, a few landmarks may be distinguished in hindsight. The main reason to give dispute settlement procedures a more realistic spin was the

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[87] *Cf.* once again Art. 33, UN Charter, *supra* n. 26; Art. 38, Statute of the International Court of Justice, *supra* n. 23.

[88] See further Art. 38, Vienna Convention on the Law of Treaties, *supra* n. 22, which clarifies that neither the UN dispute settlement systems nor the UN Principles in themselves are binding, unless they are declaring customary international law, that is to say they may become binding by force of an extraneous factor.

[89] See *supra*, n. 8.

growing number of actors getting involved in space activities. For a glimpse of the way opinion was moving in those days some of the closest precedents will be looked at in the next paragraphs.

Indeed, at the time of adoption of the above-described UN instruments, disputes over the interpretation and application thereof were mainly of an academic nature. Besides, the commercial sides of space activities were not yet envisaged in their proper dimensions. Hence the lack of effective means of dispute settlement was not too serious a problem in the early stages of the space era.

Yet those initial phases of exploration and academic activity were – unnoticed perhaps – opening the door for a stage of exploitation and use of outer space to move in fast. In this sense the increasing use of remote sensing technologies and the coming into force of the INTELSAT Agreements[90] provided a first example. It is not surprising that, nowadays, satellite communications should be applying the GATS and WTO dispute resolution methods.[91]

These landmarks reflect the efforts of the international community to give a more precise legal meaning and agility to the existent procedures for dispute settlement with a view to having simple, prompt and amicable mechanisms to be applied in the changing international scenarios. Among the various steps taken to this end some precedents have been chosen as indicative of their strong influence on the drafting of the new 2011 PCA Rules on Outer Space Disputes which is one of the most recent developments on the matter. Some of these precedents, leading to the adoption of these PCA Rules, are based on the personal experience of the present author.

19.2.1 The 1971 INTELSAT Agreements

As expressed, none of the UN international instruments on outer space is suitable today for the settlement of space law disputes for the simple

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[90] See *infra*, n. 94.

[91] See Arts. XXII, XXIII, General Agreement on Trade in Services (GATS), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1869 UNTS 183; UKTS 1996 No. 58; Cm. 3276; ATS 1995 No. 8; Art. IV(3), Agreement Establishing the World Trade Organization (hereafter WTO Agreement), Marrakesh, done 15 April 1994, entered into force 1 January 1995; 1867 UNTS; UKTS 1996 No. 57; ATS 1995 No. 8; 33 ILM 1125, 1144 (1994); further *supra*, § 15.2.1.3.

reason that only states and – to some extent[92] – international intergovernmental organizations can be parties thereto.

The Interim INTELSAT Agreement of 1964[93] stands out, in the early phases of the regulations of communication satellites, as a realistic illustration of dispute settlement procedures. These arrangements worked well and hardly gave rise to complaints. They were followed in the next decade by the (definitive) 1971 INTELSAT Agreement and Operating Agreement, which entered into force on 12 February 1973.[94] Like their predecessors, the 1971 Agreements were developed outside the UN system and focused entirely on the practical sides of the use of outer space for satellite communications. They were of a highly technical nature; one reason, no doubt, for being able to move forward on dispute settlement procedures given the limited field of space activities addressed.

In short, as far as dispute settlement was concerned the system worked as follows. The 1971 INTELSAT Agreement carried an Annex C on the settlement of disputes,[95] which should be read together with Article

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92 *Cf.* also e.g. *supra*, § 2.3.3.8.

93 Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System, and Relative Special Agreement (hereafter Interim INTELSAT Agreement), Washington, done 20 August 1964, entered into force done 20 August 1964; 514 UNTS 25; 15 UST 1705; TIAS 5646; 1966 UKTS 12; 3 ILM 805 (1964); see e.g. F. Lyall & P.B. Larsen, *Space Law – A Treatise* (2009), 326–7. Also one part of the Interim INTELSAT Agreement was intergovernmental and the other – usually referred to as the Special Agreement – envisaged the participation of private parties as well.

94 Respectively Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 21; TIAS 7532; 23 UST 3813; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 909 (1971); Operating Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) (hereafter INTELSAT Operating Agreement), Washington, done 20 August 1971, entered into force 12 February 1973; 1220 UNTS 149; TIAS 7532; 23 UST 4091; UKTS 1973 No. 80; Cmnd. 4799; ATS 1973 No. 6; 10 ILM 946 (1971); see M. Williams, *Telecomunicaciones por Satélites* (1981), Pt. II, *Solución de Controversias*, 51–85; also further *supra*, § 5.4.1.

95 Annex C, Provisions on Procedures Relating to Settlement of Disputes Referred to in Article XVIII of this [INTELSAT] Agreement, *supra*, n. 94 and Article 20 of the [INTELSAT] Operating Agreement, *supra*, n. 94.

XVIII of the Agreement[96] (among governments, parties to this Agreement) and Article 20 of the Operating Agreement[97] (to which private entities were parties as well). Compulsory arbitration was extensively debated during the drafting of the 1971 arrangements and ultimately only accepted for legal disputes among governments parties to the Agreement or between governments and the INTELSAT organization if not settled within a 'reasonable' time.[98]

The INTELSAT negotiations did not agree to a system of compulsory arbitration for disputes involving governments and Signatories to the Operating Agreement (which, as pointed out, could be private entities), so arbitration remained optional. Binding arbitration was adopted for disputes involving rights and obligations under the Agreement or the Operating Agreement between Signatories, or between the organization and one or more Signatories unless settled within a 'reasonable' time by negotiation or other means short of arbitration.[99]

These arrangements have been open to criticism insofar as they left a good number of questions unanswered. For instance, who was to determine whether a 'reasonable' time had, in fact, elapsed? Furthermore, what was the reach of the terms 'negotiation or other means short of arbitration'? Did it encompass the exhaustion of local remedies as well? Ultimately what the petitioner needed to prove was his compliance with the obligation to negotiate in good faith. And this remains, over time, a matter largely open to interpretation.

However so, the 1971 INTELSAT Agreements were breaking new ground and should be seen as an important contribution to the development of international law in the thorny field of dispute settlement relating to space activities. As noted earlier, an important development to be highlighted in this field was the fact that dispute settlement mechanisms envisaged in the GATS/WTO rules could be applicable to issues concerning satellite communications. The WTO continues to operate on its GATT-based experience and dispute settlement continues its relative success under a system of majority ruling in panels and the Appellate

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96 Art. XVIII, INTELSAT Agreement, *supra* n. 94, referred all disputes between states parties, between a state party and signatories and/or the organization itself to arbitration in conformity with Annex C to the Agreement, provided the parties to the dispute so agreed.

97 Art. 20, INTELSAT Operating Agreement, *supra* n. 94, referred all disputes between signatories and/or the organization itself to arbitration in conformity with Annex C to the Agreement.

98 See Art. XVIII(a), INTELSAT Agreement, *supra* n. 94.

99 See Art. 4(iii), Annex C, Operating Agreement, *supra* n. 94.

Body. This dispute settlement body has the exclusive possibility of setting up special groups of experts to examine the dispute and accept or reject the conclusions of those special groups or the results of appeal procedures.[100] The principle of 'reverse consensus' no longer allows a losing party to block the adoption of the report.[101]

Overall, the doctrine has at times severely criticized the difficulties and lack of effectiveness in the implementation of the GATT and GATS Rules, which is probably due to the absence of an international obligation making the Panel decisions effective.[102] Thus, the binding nature of the decision may only be grounded in state practice.[103] In fact, nowadays states are increasingly reluctant to engaging in binding agreements with uncertain emerging obligations. As acutely observed with reference to the conditions governing international rule-making, the perceived need on the part of the states concerned, the propitious political will, and the due representation of the dominant section of international society are not to be found.[104]

Essentially similar systems of dispute settlement focusing on arbitration as a default option could be found in the constitutive documents of the two other international satellite organizations with formal participation of (originally public) telecommunication operators as signatories of Operating Agreements. This concerned respectively INMARSAT, notably Article 31 of the INMARSAT Convention,[105] Article XVI of the INMARSAT Operating Agreement[106] and the Annex attached to the

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[100] See Art. 2, Annex 2, WTO Agreement, *supra* n. 91.

[101] See *ILA Report of the Seventy-Fourth Conference*, The Hague, 2010, 614.

[102] See WTO, Understanding on Rules and Procedures Governing the Settlement of Disputes, 55; www.wto.org/english/thewto_e/whatis_e/tif_e/utw_chap3_e.pdf, last accessed 31 January 2014; also W.J. Davey, Dispute Settlement in Gatt, 11 *Fordham International Law Journal* (1987), 81–90.

[103] See on this point O. Marzorati, *Derecho De Los Negocios Internacionales* (2007) Vol. 1, 241–2.

[104] See Cheng, *supra* n. 24, 666.

[105] Convention on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Convention), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 105; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 1052 (1976). See on INMARSAT in general also *supra*, § 5.5.1.

[106] Operating Agreement on the International Maritime Satellite Organization (INMARSAT) (hereafter INMARSAT Operating Agreement), London, done 3 September 1976, entered into force 16 July 1979; 1143 UNTS 213; TIAS 9605; 31 UST 1; UKTS 1979 No. 94; Cmnd. 6822; ATS 1979 No. 10; 15 ILM 233, 1075 (1976).

INMARSAT Convention;[107] and EUTELSAT, notably Article XX of the EUTELSAT Convention,[108] Article 20 of the EUTELSAT Operating Agreement[109] and Annex B to the EUTELSAT Convention.[110]

After INTERSPUTNIK, the formerly communist international satellite organization, changed its structure in 2002 so as to also include an Operating Agreement,[111] it also introduced a dispute settlement mechanism, which deviated considerably from the approach taken by INTELSAT, INMARSAT and EUTELSAT. It provided for four stages: (1) Notice of existence of a dispute, (2) Bilateral consultations, (3) Examination by the Operations Committee established by Article 3 of the Operating Agreement, and (4) Arbitration using Russia's International Commercial Arbitration Court.[112]

After INTELSAT's privatization, giving rise to a private operator Intelsat under the aegis of a much-reduced intergovernmental overseer ITSO,[113] the dispute settlement system also was simplified, as per the

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[107] Annex on Procedures for the Settlement of Disputes Referred to in Article 31 of the Convention and Article XVI of the Operating Agreement.

[108] Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9069; *Space Law – Basic Legal Documents*, C.II.1. See on EUTELSAT in general also *supra*, § 5.6.1.

[109] Operating Agreement Relating to the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Operating Agreement), Paris, done 15 July 1982, entered into force 1 September 1985; UKTS 1990 No. 15; Cm. 956; Cmnd. 9154; *Space Law – Basic Legal Documents*, C.II.2.

[110] Annex B, Arbitration Procedure.

[111] INTERSPUTNIK Operating Agreement (Operating Agreement of the INTERSPUTNIK International Organization of Space Communications, entered into force 4 February 2003, as most recently amended 15 November 2011; INTERSPUTNIK D.B./D.C./XXXIX/13-OC/7-2011-1; www.intersputnik.com/userfiles/files/protocol_annex_7_operating_agreement.pdf, last accessed 31 January 2014); following the Protocol on the Amendments to the Agreement on the Establishment of the 'INTERSPUTNIK' International System and Organization of Space Communications, done November 1996, entered into force 4 November 2002; *Space Law – Basic Legal Documents*, C.VIII.2. See on INTERSPUTNIK in general also *supra*, § 5.7.1.

[112] See Art. 12, esp. (2)–(5), INTERSPUTNIK Operating Agreement, *supra* n. 111.

[113] *Cf.* Agreement Relating to the International Telecommunications Satellite Organization (ITSO) (hereafter ITSO Agreement), Washington, done 20 August 1971, entered into force 12 February 1973, as amended 13 November 2000, amended version entered into force 30 November 2004; Cm. 5092; *Space Law –*

new Article XVI and Annex A,[114] but still called for arbitration as the preferred means of dispute resolution. Essentially the same could be said of the new IMSO and Inmarsat succeeding INMARSAT[115] and the new EUTELSAT IGO and Eutelsat.[116]

19.2.2 The International Telecommunication Union (ITU)

At this point a word on the International Telecommunication Union (ITU)[117] seems opportune, having in mind the importance of this institution in the field of satellite communications. It is a UN specialized agency with a membership of 193 states and more than 700 private entities and academic institutions.[118] It is responsible for the allotment of frequencies in the geostationary orbit (GEO) and, in so doing, keeping

Basic Legal Documents, C.V.1; the INTELSAT Operating Agreement, *supra* n. 90, ceased to be operative. See further on this *supra*, § 5.4.2.

[114] See Annex A, Provisions on Procedures Relating to Settlement of Disputes.

[115] *Cf.* Art. 15, Convention on the International Mobile Satellite Organization (hereafter IMSO Convention), London, done 3 September 1976, entered into force 16 July 1979, as amended 1998, amended version entered into force 31 July 2001; ATS 2001 No. 11. See further on this *supra*, § 5.5.2.

[116] *Cf.* Art. XV, Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT) (hereafter EUTELSAT Convention as amended), Paris, done 15 July 1982, entered into force 1 September 1985, as amended 20 May 1999, amended version entered into force 28 November 2002; Cm. 4572; *Space Law – Basic Legal Documents*, C.II.1. See further on this *supra*, § 5.6.2.

[117] The ITU is a UN specialized agency with a membership of 193 states and over 700 private (non-governmental) organizations and academic institutions. Its headquarters are in Geneva. It is currently based on the Constitution of the International Telecommunication Union (hereafter ITU Constitution), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1; and the Convention of the International Telecommunication Union (hereafter ITU Convention), Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71; as repeatedly amended since 1992. See further *supra*, § 8.2.

[118] See www.itu.int/en/about/Pages/default.aspx, last accessed 31 January 2014.

the other orbital positions and orbits in mind.[119] The prime task of the ITU as far as GEO is concerned is the coordination of frequencies in GEO which is, so far, the ideal position for satellite communications on account of its very wide coverage of the earth. In this framework states may apply for the use of frequencies and, in doing so, shall indicate which orbital slots they intend to use, either directly or on behalf of a private entity operating within their jurisdiction.[120] This is obviously linked to questions of interference with other applications, a question leading to negotiation.

Hence, the ITU has a master role in the field of satellite communications and coordination thereof, which implies a responsibility in avoiding potential disputes or, at least, settling them in their initial phases.[121] Consequently, the ITU dispute settlement procedure should be briefly assessed here. It provides for a choice between negotiation, applicable 'procedures established by bilateral or multilateral treaties concluded' between parties or 'any other method mutually agreed upon'.[122] If none of those methods were adopted, recourse to arbitration as per the ITU Convention or the Optional Protocol on the Compulsory Settlement of Disputes Relating to this Constitution, to the Convention, and to the Administrative Regulations would be open to member states.[123]

19.2.3 The Munich International Colloquium, the Córdoba Round Table on Dispute Settlement and Beyond

The year 1979 stands out as a year of important contributions, in different latitudes, to the progressive development of the topic of reference. In the light of the current, relatively immature state of dispute settlement options and law in the context of space activities, these illustrate in an excellent manner the various key issues at play, as well as the various options to address them, and may thus provide helpful pointers of the direction in which dispute settlement in space law may be

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[119] Strictly speaking, the ITU is not allotting orbital positions or orbits but frequencies, and in doing so keeps the orbital positions and orbits respectively in mind. See further *infra*, § 8.2.3, esp. § 8.2.3.4.

[120] Cf. e.g. F. Lyall, *The Law and Space Telecommunications* (1989), 381–96.

[121] See F.G. von der Dunk, *Private Enterprise and Public Interest in The European 'Spacescape'* (1998), 95 ff.; also *supra*, § 8.2.

[122] Art. 56(1), ITU Constitution, *supra* n. 117.

[123] See Art. 56(2), (3), ITU Constitution, *supra* n. 117; Art. 41, ITU Convention, *supra* n. 117.

going. Among others, an international Colloquium in Munich, Germany, and a Round Table in Córdoba, Argentina, will be highlighted.

On 13–14 September 1979 the Institute of Air and Space Law of the University of Cologne, in cooperation with the Space Law Committee of the ILA, the International Institute of Space Law (IISL) and the German Society for Aeronautics and Astronautics, organized an International Colloquium on 'The settlement of space law disputes – The present state of the law and perspectives of future development'.[124]

The Colloquium covered a wide range of topical questions surrounding the deficiencies of dispute settlement procedures in current international law and, particularly, space law. The emerging conclusions were in line with the views registered in other meetings of the time, such as the Córdoba Round Table held a couple of months earlier.[125] The recurrent notes were compulsory jurisdiction, binding decisions and certainty of execution.[126] The following conclusions were drawn, as far as relevant here:[127]

1. If progress is to be achieved in the development of procedure for the peaceful settlement of disputes in space law, most of the time not enthusiastic recommendations, but rather a pragmatic endeavour to choose the settlement method best fitted and most acceptable to states for a given type of case or a specific area of space law seems the wise approach. A number of specific criteria might be taken into account in the deciding process.
2. The method finally required for at least certain practically relevant areas of space law, in order to assure peaceful cooperation or at least coexistence of the international community in space activities, will be compulsory third-party settlement.

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[124] See *Settlement of Space Law Disputes* (Ed. K.-H. Böckstiegel) (1980).

[125] See further *infra*, esp. text at n. 128.

[126] The programme of the Cologne Colloquium consisted of four sections covering (1) dispute settlement in public international law, (2) rules for dispute settlement in present space law, (3) rules and experiences in comparable fields of law, and (4) perspectives for further development of space law. The speakers came from different parts of the world representing public and non-governmental institutions involved in space law, academies and universities. The conclusions were summarized by the then Director of the Institute of Air and Space Law of the University of Cologne, Karl-Heinz Böckstiegel.

[127] See Settlement of Space Law Disputes, *supra* n. 124, 199–200.

3. States can only be expected to be willing to accept this latter method for those areas of space law where a reasonable certainty as to the applicable rules exists, not, however, for highly controversial areas.
4. A greater number of states may be found ready to accept compulsory third-party settlement if they are given a choice between adjudication and arbitration.
5. Where such a combined system is considered not fit or too complicated for a limited area such as space law, a settlement by the more flexible method of arbitration will normally be more effective and more easily acceptable to states than the jurisdiction of a permanent international court.
6. Space lawyers have the responsibility to elaborate further criteria and alternative solutions in this field, which states may then draw upon.
7. Most probably, if progress is to be achieved in state practice at all, it may be in limited areas of space law, especially in the law of space communications and other such fields, where the functioning of the system is in the interest of all states concerned and depends on disputes being settled without delay.

In July of that same year in Córdoba, Argentina, a Round Table on The Settlement of Space Law Disputes[128] brought together the specialists of the region in what was seen as a dress rehearsal for the Munich International Colloquium. A number of conclusions were drawn at this regional meeting in preparation for what was further discussed in Munich.[129] The need for binding procedures for dispute settlement was a recurrent note at this meeting. The sessions included a debate on the need for appropriate procedures in positive space law and possible solutions to this problem. It was agreed that the responsibility to work out alternatives to confront this situation in realistic terms was in the hands of international lawyers.[130] Both the 1964 and the 1971 INTELSAT Agreements were considered inspiring examples in that they envisaged the establishment of a tribunal composed of experts whenever a controversy indicated this need. The view was expressed that agreements designed for specific space law disputes – such as those underlying communication satellites –

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[128] See Consejo de Estudios Internacionales Avanzados (Council of Advanced International Studies), Córdoba, Argentina, *Solución de Controversias en Derecho Espacial/Settlement Of Space Law Disputes* (1981).

[129] See Consejo de Estudios Internacionales Avanzados, *supra* n. 128.

[130] See again in general *ibid*.

should include compulsory jurisdiction and also provide the means to ensure that awards and decisions be recognized and executed.[131]

19.2.4 The Contribution of the International Law Association

19.2.4.1 Montreal 1982: Resolution of the ILA Sixtieth Conference

Following a Working Paper discussed at the ILA Fifty-Ninth Conference held in Belgrade,[132] the Space Law Committee was entrusted with the drafting of a convention on this subject. It was considered that, at that point in time, there was extensive documentation and material available from the previous meetings (Munich 1979, Córdoba 1979, and the Belgrade Conference in 1980), and that agreement should be reached on certain basic principles for a draft convention.

The first step was a set of six questions addressed to the members of the Space Law Committee.[133] It was generally thought that, *inter alia*, a line should be drawn between compulsory jurisdiction and the binding nature of decisions, on the one side, and the question of the certainty of enforcement on the other. It was further considered that the latter term suggested the idea of an execution of the debtor's property and was thus inadmissible in public international law.[134]

The Conference Resolution recommended that the Space Law Committee start the formulation of a Draft Convention on the Settlement of Space Law Disputes incorporating the following basic principles:

1. The Convention should provide states with a choice for its application to (a) all space law disputes with other states parties, (b) specific areas of space law as may be dealt with in specific bilateral or multilateral treaties, and/or (c) a certain category of disputes or certain sections of the Convention, subject to such exceptions that the state may wish to claim.
2. The Convention should in one section provide for non-binding settlement methods including recommendatory awards, but should in another section provide for binding methods of settlement upon application by one of the parties, if the other party does not agree to the conclusions of such non-binding methods.
3. The Convention should provide states with a choice among different settlement methods which, for binding settlement, should

[131] See *ibid.*, 42, 79–80.
[132] See *ILA Report of the Fifty-Ninth Conference*, Belgrade, 1980, 188–97.
[133] See *ILA Report of the Sixtieth Conference*, Montreal, 1982, 510–7.
[134] See *ibid.*

include adjudication by the ICJ as well as administered and ad hoc arbitration.

4. The Convention should provide that states parties have to select one method for binding settlement within the choice given according to principle 3.
5. The Convention should stress that states parties have an obligation to fulfil decisions of the tribunal chosen under principle 4.
6. In the Convention or as an annex thereto a 'dispute settlement clause' should be drafted which could serve as a model to be included into future bilateral or multilateral treaties on space law.[135]

19.2.4.2 Paris 1984: First ILA Draft

On these bases and terms of reference the ILA Space Law Committee embarked on the formulation of a draft Convention on the Settlement of Space Law Disputes and a Model Clause.[136]

The initial text took as an example the procedures on dispute settlement embodied in the 1982 United Nations Convention on the Law of the Sea[137] and its Annex[138] and made slight adaptations for consistency with the special characteristics of the new fields addressed. For example – and unlike the International Tribunal for the Law of the Sea[139] – the suggested 'International Tribunal for Space Law' only appears as an option for the parties if and when, at a later stage, such a tribunal were to be set up.[140]

In the first draft, from the very beginning an overall realistic approach was taken, namely that the rules designed should be of a strictly procedural nature.[141] This approach was maintained in the Revised Text

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135 See *ibid.*, 12–3.

136 See for the text of the Draft Convention and comments, *ILA Report of the Sixty-First Conference*, Paris, 1984, 326–55.

137 See Part XV, Arts. 279–299, United Nations Convention on the Law of the Sea, Montego Bay, done 10 December 1982, entered into force 16 November 1994; 1833 UNTS 3 and 1835 UNTS 261; UKTS 1999 No. 81; Cmnd. 8941; ATS 1994 No. 31; 21 ILM 1261 (1982); S. Treaty Doc. No. 103-39.

138 Annex V, United Nations Convention on the Law of the Sea, *supra* n. 137, entitled 'Conciliation', provided for the details of the conciliation procedure, including compulsory submission to it as appropriate.

139 *Cf.* Art. 287(1) and Annex VI, United Nations Convention on the Law of the Sea, *supra* n. 137.

140 See *ILA Report of the Sixty-First Conference*, Paris, 1984, 327.

141 See *ILA Report of the Sixty-First Conference*, Paris, 1984, 325 ff. The report was prepared by Professor Böckstiegel, then Rapporteur of the Committee, in consultation with members of the Committee.

of the Draft Convention (1998)[142] and followed – albeit with greater flexibility and simplicity – in the new PCA Rules on Outer Space Disputes adopted in 2011, to be addressed further below.[143]

The Paris Draft Convention consisted of a Preamble, seven sections and an Annex containing a Model Dispute Settlement Clause, as follows:[144]

- Section I: Scope of Disputes Settled under this Convention, Articles 1–2;
- Section II: Non-binding Settlement Procedures, Articles 3–4;
- Section III: Binding Settlement Procedures, Articles 5–13;
- Section IV: Conciliation Procedure, Articles 14–23;
- Section V: Arbitration Procedure, Articles 24–36;
- Section VI: International Tribunal for Space Law, Articles 37–68;
- Section VII: Final Provisions, Articles 69–76; and
- Annex: Dispute Settlement Clause.

The Model Dispute Settlement Clause, also incorporated as an Annex to the Revised Text of this Draft Convention in 1998 and to the ILA Buenos Aires International Instrument on the Protection of the Environment from Damage Caused by Space Debris[145] in 1994, reads: 'Any dispute arising in connection with this Treaty shall be settled in accordance with the Convention on the Settlement of Space Law Disputes which is hereby made an integral part of this Treaty. Ratification of the Treaty is therefore also to be considered as a ratification of that Convention. The instrument of ratification will therefore be also deposited with the Secretary-General of the United Nations.'[146]

One of the striking features of the 1984 Draft was the introduction of Article 10 providing that all dispute settlement procedures specified in the Convention shall be open to entities other than states unless the

142 See Art. 10, Final Text.
143 See *infra*, § 19.3.
144 See *ILA Report of the Sixty-First Conference*, Paris, 1984, esp. 334, generally 326–55.
145 Hereafter Buenos Aires International Instrument on Space Debris; see *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994, 7–13; also *supra*, § 13.3.2.4.
146 *ILA Report of the Sixty-First Conference*, Paris, 1984, 355.

matter is submitted to the ICJ in accordance with Article 6 of the Convention (on the choice of procedures).[147]

19.2.4.3 Buenos Aires 1994: The ILA International Instrument on Space Debris

The ILA International Instrument on Space Debris was the outcome of the work of the Space Law Committee during 1990–94 over three Biennial Conferences, notably Queensland, Australia, in 1990;[148] Cairo, Egypt, in 1992;[149] and Buenos Aires, Argentina, in 1994, where it was adopted, without dissent, by the Sixty-Sixth Conference of the ILA. Unlike the Paris Draft on Dispute Settlement, most of its provisions are substantial.[150]

In accordance with the line of thought followed by the ILA Space Law Committee in Paris in 1984 in the sense that a more precise legal meaning should be given to dispute settlement in international law, this Instrument provides, in its Article IX, that where the interpretation and application of the Instrument is concerned any dispute shall be subject to consultation at the request of any of the parties thereto with a view to reaching a prompt and amicable settlement. Failing this, if the parties have not agreed on a means of peaceful settlement within 12 months the dispute shall be referred, at the request of any of the parties, to arbitration or adjudication in which case the ILA Model Clause (adopted in 1984 in Paris) shall be applicable unless one of the parties to this Instrument has excluded such application, in part or in full.

The Article of reference envisages the possibility, for the parties to this Instrument, of declaring that they accept any of the non-binding or binding settlement procedures laid down in the Annex. The prescription of interim measures is likewise considered in this Article to prevent serious damage to the environment, or persons or objects.[151]

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147 See Art. 10, 1984 and 1998 Conventions; *ILA Report of the Sixty-First Conference*, Paris, 1984, 338; also *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 252.

148 See *ILA Report of the Sixty-Fourth Conference*, Queensland, 1990, 154–80.

149 See *ILA Report of the Sixty-Fifth Conference*, Cairo, 1992, 142–62.

150 For the full text of this Instrument, with comments and caveats by its author, and the report of the working session in Buenos Aires, see *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994, 305–25.

151 Art. 1(e), International Instrument on Space Debris, provides: '"Damage" means loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organisations, or any adverse modification of the

Interesting is the fact that Article IX of the Instrument established a 12-month limit for consultation – unlike the ILA Conventions on Dispute Settlement of 1984 and 1998 which chose the term ‘expeditiously’[152] – after which any of the parties to the disputes may resort to arbitration or adjudication. This would go a long way in avoiding unending consultations with sometimes very serious damage to the environment. As often occurs in environmental treaties, the obligation to negotiate in good faith is a common denominator to the provisions of the Instrument which, in Article 5(e), provides that among the obligations of the parties is that of negotiating in good faith.[153] Good faith, naturally, means not only holding consultations or talks but also pursuing them with a view to reaching a solution.[154]

19.2.4.4 The 1996 ILA Helsinki Conference as pre-stage to the adoption of the 1998 Revised Text of a Convention for the Settlement of Disputes related to Space Activities

Following the Buenos Aires Conference the ILA Space Law Committee became involved in analysing the most recent stages in the development of dispute settlement procedures and discussing the need for changes to the 1984 Draft Convention. A Report on these matters was submitted by the Committee to the Helsinki Conference and adopted thereby.[155] This Report is the closest precedent of the 1998 Revised Text to be addressed under the present heading.

So far Article 10 of the Paris Draft Convention has been seen with favour by the doctrine.[156] Thus, whatever course of action were to be chosen for the future it was clear that this provision – enabling private entities to use the mechanisms laid down in the Paris Draft Convention for Dispute Settlement – should remain intact.

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environment of areas within or beyond national jurisdiction or control.’ See *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994, 10; *cf.* also 118, 237–42, 311–7, 322–4. The idea was to include damage under a wide interpretation; for this reason the concept of ‘damage’ was not qualified in order to avoid restrictive interpretations.

[152] See Art. 5 of both texts.

[153] See Art. 26, Vienna Convention on the Law of Treaties, *supra* n. 22, for the basic obligation of *pacta sunt servanda* in good faith.

[154] See also *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 358.

[155] See *ILA Report of the Sixty-Seventh Conference*, Helsinki, 1996, in particular with reference to the working session held in that framework, 457–76.

[156] This was the conclusion of the Space Law Committee; see *ILA Report of the Sixty-Seventh Conference*, Helsinki, 1996, 459–66.

The Committee's Report to the Sixty-Seventh Conference and the Helsinki working session gave priority to discussing the position of private enterprises in the field.[157] The objective was to establish whether the existing rules and institutions for international commercial arbitration provided a sufficient framework for dispute settlement arising from space activities. The underlying opinion was that private entities already had acceptable legal mechanisms for that purpose but possibly needed some adjustment for consistency with the specific field of space law.[158]

To sum up, the majority considered that the 1984 Paris Draft provided a useful and realistic starting point from which to make the slight adjustments demanded in today's world and agreed that it should not carry substantive rules on liability, the appropriate place being the 1994 Buenos Aires Instrument on Space Debris.[159] Moreover, prompt procedures and simpler language were essential if the amendment of the Paris Draft were to be decided. On this point a Committee member suggested as a model the 1992 PCA Rules for Arbitration of Disputes Relating to Natural Resources and/or the Environment.[160] Accordingly the mandate from the Sixty-Seventh ILA Conference was to elaborate a Revised Draft Convention on the Settlement of Disputes Related to Space Activities and submit that Draft with commentary to the Sixty-Eighth Conference in 1998.

Work ahead of Helsinki consisted of adjustments and minor changes to the Paris Draft. This meant rough edges had to be ironed out and that a balanced interplay of freedom and regulation were crucial to keep pace with developments recorded during 1984–98. The use of outer space had grown beyond belief and it was reasonable to presume that risk of disputes in this field would be increasing as well.

On general lines the 1998 Revised Text stands as an example of simplification and updating. Yet, none of the changes to its predecessor are substantial in nature. *Inter alia*, the term 'High Contracting Party' has been replaced throughout the text with 'Contracting Party'. There is a departure from the rules of the United Nations Convention on the Law of the Sea in order to ease the application of the 1998 Revised Text to this

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[157] See *ILA Report of the Sixty-Seventh Conference*, Helsinki, 1996, 471–6.

[158] *Ibid.*, 468–70.

[159] See *ILA Report of the Sixty-Sixth Conference*, Buenos Aires, 1994; Annex, Buenos Aires International Instrument on the Protection of the Environment from Damage Caused by Space Debris, 7–13.

[160] This was Professor Peter Malanczuk; see *ILA Report of the Sixty-Seventh Conference*, Helsinki, 1996, 470.

new field of international law.[161] The wording was simplified as well, the number of independent judges on the 'International Tribunal for Space Law'[162] brought down from 21 to 15 and, thus, a quorum of nine is now required.[163] The terms of office of the members of the Tribunal was reduced to five years.[164] In addition, Article 69 of the Paris Draft, dealing with signature, was shortened in the Revised Text to make it consistent with the present times. It now simply states that the Convention shall be open for signature by states, including partly self-governing states,[165] which have internal and external competence on the matter and international intergovernmental organizations.

The scope and implications of the term 'private space activities' were discussed at the 1998 working session of the ILA Conference. These terms concerned procedural questions whilst 'commercial space activities' was related to substantive law. Commercial space activities could also be undertaken by public entities (that is subjects of public international law acting in a private capacity).[166]

There was not much to be argued about disputes between subjects of public international law during the 1998 revision of the Paris Draft. The ILA Space Law Committee was aware that binding procedures were hardly welcome for disputes involving states and international intergovernmental organizations which frequently surrounded sensitive political issues. Hence, during the 1998 revision it seemed unrealistic to go further than an obligation to settle the dispute, coupled with a free

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[161] Essentially, both ILA Draft Conventions (of 1984 and of 1998) are of a more procedural nature than the United Nations Convention on the Law of the Sea: the former contain rules of a procedural nature but almost nothing of substance unlike the latter where rules of substance are quite frequent, such as in Part II when defining and laying down the applicable law to the different maritime areas (territorial sea and so forth).

[162] The setting up of an International Tribunal for Space Law was seen as a possibility for the future. At the working session of the Sixty-Eighth Conference (see *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 273–7), voices were raised for and against this possibility which in the end prevailed. Similarly the idea of a special chamber within the ICJ was suggested but discarded in light of the discouraging precedent that, so far, the special chamber for the environment was not being selected.

[163] See Arts. 38, 49, Revised Text.

[164] See Art. 41(1), Final Text ILA Convention.

[165] This was a formula taken from the Paris Draft, having in mind cases such as Hong Kong, the PLO/Palestine and Curacao; see *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 244–5.

[166] See *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 277.

election of the means, and some reasonable time limitation to avoid conflicts being prolonged indefinitely. To go beyond was a jump into the void.[167]

The Sixty-Eighth Conference of the ILA thus adopted by consensus the 1998 Revised Convention on the Settlement of Disputes Related to Space Activities.[168]

19.3 REDESIGNING THE SYSTEM: THE INDISPENSABLE REFORM

19.3.1 Introduction to the PCA Rules

In fact, none of the UN instruments is consistent with today's world for the simple reason that only states and international intergovernmental organizations can be parties to dispute settlement procedures. Moreover, commercial activities have grown at unprecedented speed and an increasing number of developing countries are gradually accessing the latest space technology by means of agreements based on international cooperation.

In the aftermath of the Sixty-Eighth ILA Conference, both the 1994 Buenos Aires Instrument on Space Debris and the 1998 Revised Convention on Dispute Settlement continued under permanent review by the Space Law Committee. The Committee Reports for the following Conferences always carried a word on these topics and their consistency in the present world scenarios. The Space Law Committee's Report to the Seventy-Fifth Conference of the ILA (Sofia, 2012),[169] for its part, contained a detailed analysis of the PCA Optional Rules on Arbitration of Disputes Relating to Outer Space Activities, effective from 6 December 2011.[170]

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[167] This reflects the general conclusion on this issue of the working session and exchange of letters before the 1998 ILA Conference.

[168] For the final text of this Convention see *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 249–67.

[169] See *ILA Report of the Seventy-Fifth Conference*, Sofia, 2012, 281–320, also 40–8. *Cf.* further UN Doc. A/AC.105/C.2/103 and A/AC.C.2/2013//CRP.6 where the ILA Sofia Report is introduced to the Legal Sub-Committee of COPUOS.

[170] Rules on Outer Space Disputes, *supra* n. 58. See e.g. Pt. I by the Chair of the Space Law Committee, Sec. B, 11–5; *ILA Report of the Seventy-Fifth Conference*, Sofia, 2012.

One outstanding feature of the new Rules on Outer Space Disputes is their great flexibility. They are, indeed, reflecting a sign of the times and filling the gaps left by the UN outer space treaties and general international law, particularly as regards dispute settlement mechanisms. Moreover, they are enabling an effective management of sophisticated technical evidence. In fact, two essential elements in dispute settlement procedures have remained intact over the years, namely free choice of means and flexibility. These are the pillars on which an effective instrument on dispute settlement should be built. Furthermore, a strong current of thought considers that no substantive rules on liability should be included in any instrument on dispute settlement.[171]

With these premises in mind, in 2009 the PCA opened the way for the indispensable reform.

19.3.2 The Drafting History of the PCA Rules on Outer Space Disputes

A brave decision was taken in 2009 by the PCA when embarking on the drafting of the Optional Rules on Arbitration of Disputes Relating to Space Activities. This was a realistic follow-up to its nearest precedent, that is the 1992 Optional Rules for Arbitration of Disputes Relating to Natural Resources and/or the Environment (the PCA Environmental Rules).[172] Both sets of Rules are procedural and have close resemblances between them. They were elaborated in the framework of an international intergovernmental institution to which 115 states are parties today.[173]

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[171] This was the general opinion as per the *ILA Report on the Seventy-Fifth Conference,* Sofia, 2012, and also the consensus of the Advisory Group at The Hague when discussing the need for having new PCA Rules during the drafting of these Rules (see exchange of letters and responses to questionnaires circulated by Judge Pocar; on file with the author).

[172] Optional Rules on Arbitration for Disputes Relating to Natural Resources and the Protection of the Environment (hereafter Environmental Rules), Permanent Court of Arbitration, The Hague 1992. See www.pca-cpa.org/showpage.asp?pag_id=1188, last accessed 1 February 2014.

[173] The PCA was established in 1899 by the Convention for the Pacific Settlement of International Disputes, The Hague, done 29 July 1899, entered into force 4 September 1900; ATS 1901 No. 130; as an intergovernmental organization providing a variety of dispute resolution services to the international community; see further www.pca-cpa.org, last accessed 1 February 2014.

The examples set by the Hague Conventions on the Peaceful Settlement of Disputes of 1899 and 1907[174] – by extending their application to private parties – were already indicating the way opinion was moving. The approach of the PCA Rules on Outer Space Disputes, particularly regarding the possibility of private entities participating in the adopted procedures, is mindful of the ILA stance in both its 1984 Draft Convention and 1998 Final Text of a Revised Convention on the Settlement of Disputes related to Space Activities.[175]

The project was set in motion in 2009 by the PCA Secretary-General, Christiaan M.J. Kröner, motivated by the number of gaps in the current dispute settlement procedures in international space law. Besides the serious limitations in the personal and material scope of classic procedures, these lacunae conspired against their effectiveness. The Rules were developed by the International Bureau of the PCA in conjunction with an Advisory Group of leading experts in the field[176] chaired by Judge Fausto Pocar.

The drafting stage unfolded during 2010–11, taking as a model the 1992 PCA Environmental Rules and the 2010 UNCITRAL Arbitration Rules.[177] The new rules departed, however, from this pattern for reasons of specificity and consistency with the new international scenarios and had in mind the distinctive features of space law. A final meeting of the Advisory Group was held at the Peace Palace on 5–6 December 2011 when the 184th Administrative Council of the PCA adopted the Rules.

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[174] Respectively Convention for the Pacific Settlement of International Disputes, The Hague, done 29 July 1899, entered into force 4 September 1900; ATS 1901 No. 130; and Convention for the Pacific Settlement of International Disputes, The Hague, done 18 October 1907, entered into force 26 January 1910; ATS 1997 No. 6.

[175] Both texts contain an Art. 10 whereby private parties may avail themselves of the mechanisms of the Convention envisaged for subjects of public international law. See further *ILA Report of the Sixty-Eighth Conference*, Taipei, 1998, 239–77.

[176] The acting members were Tare Brisibe, Frans von der Dunk, Joanne Gabrynowicz, Ram Jakhu, Armel Kerrest de Rozavel, Justine Limpitlaw, Francis Lyall, V.S. Mani, José Monserrat, Haifeng Zhao, Stephan Hobe and Maureen Williams.

[177] The 2010 UNCITRAL Arbitration Rules, as revised in 2010, were based on UNGA Resolution 31/98, of 15 December 1976, A/RES/31/98; recommending the use of the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL) in the settlement of disputes arising in the context of international commercial relations, particularly by reference to the Arbitration Rules in commercial contracts.

In line with the ILA approach, the PCA Rules on Outer Space Disputes apply to disputes between states, international intergovernmental organizations and private parties.[178] The inclusion of non-governmental entities was vital. It eased the way for new mechanisms and minimized the risk of disruption procedures by unexpected claims based on sovereign immunity.

19.3.3 The Structure of the New Rules

19.3.3.1 General comments

In addition to the 1992 PCA Environmental Rules, the ILA models and other contributions from the doctrine,[179] the new PCA Rules on Outer Space Disputes had in mind the example of the 2010 UNCITRAL Arbitration Rules. As explained by the PCA, some adjustment was needed in the event of the latter being given the special features of space activities so that they:

> (i) reflect the particular characteristics of disputes having an outer space component involving the use of outer space by States, international organisations and private entities;
> (ii) reflect the public international law element that pertains to disputes that may involve States and the use of outer space, and international practice appropriate to such disputes;
> (iii) indicate the role of the Secretary-General and the International Bureau of the Permanent Court of Arbitration (PCA) at The Hague;
> (iv) provide freedom for the parties to choose an arbitral tribunal of one, three or five persons;
> (v) provide for the establishment of a specialised list of arbitrators mentioned in article 10 and a list of scientific and technical experts mentioned in article 29 of these Rules; and
> (vi) provide suggestions for establishing procedures aimed at ensuring confidentiality.[180]

The comments on the Rules by PCA member states were valuable both in essence and form and worthy of the deep consideration given to them, all of which was reflected in the responses by the Advisory Group.[181] Some of these comments, however, suggested the addition of further

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[178] Art. 1(1), Rules on Outer Space Disputes, *supra* n. 58, simply refers to 'parties' in this respect.

[179] See e.g. L.F. Castillo Argañarás, *Comercio, Espacio y Telecomunicaciones Satelitales. Responsabilidad internacional y solución de controversias* (2008).

[180] See Introduction to the Rules on Outer Space Disputes, *supra* n. 58.

[181] Relevant documents are on file with the author.

details which, in general, the Advisory Group decided not to include, mainly for practical reasons and also due to the special traits of the topic addressed.[182] As experience has often shown, flexibility and general principles are usually less brittle and more likely to survive than detailed regulation. This supports the idea of beginning at a low level of compulsion and leaving for a later stage the possibility of moving forward by means of international standards or guidelines aimed at giving a more precise meaning to the provisions included in the PCA Rules on Outer Space Disputes.

19.3.3.2 Specific comments

A few reflections based on comments made by PCA members to the Draft Rules on Outer Space Disputes will follow hereunder.

19.3.3.2.1 Multiple languages During deliberations at The Hague the idea of importing the language of Article 39 of the ICJ Statute was introduced.[183] This meant, in practice, adding to Article 34 of the Draft Rules a sentence to the effect that, in the event of multiple languages, the award must indicate which language shall be considered as authoritative. The Advisory Group, after some discussion, decided against the proposal based on the differences between inter-state proceedings before the ICJ and ad hoc arbitration under the Draft Rules. Furthermore, such inclusion could weaken the main objective of the Rules, namely the role to be played by private parties in the field.[184] This approach eased the way to dispute settlement procedures between private parties.

In both the 1984 and 1998 ILA Conventions Article 10(b) states, in no uncertain terms, that the dispute settlement procedures specified in that instrument shall be open to entities other than states and international intergovernmental organizations unless the matter is submitted to the ICJ

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[182] Relevant documents are on file with the author.

[183] Art. 39, Statute of the International Court of Justice, *supra* n. 23, provides: '1. The official languages of the Court shall be French and English. If the parties agree that the case shall be conducted in French, the judgment shall be delivered in French. If the parties agree that the case shall be conducted in English, the judgment shall be delivered in English. 2. In the absence of an agreement as to which language shall be employed, each party may, in the pleadings, use the language which it prefers; the decision of the Court shall be given in French and English. In this case the Court shall at the same time determine which of the two texts shall be considered as authoritative. 3. The Court shall, at the request of any party, authorize a language other than French or English to be used by that party.'

[184] Relevant documents are on file with the author.

in accordance with Article 6 (on the choice of procedure). The PCA Draft Rules followed this example closely.

These provisions should be read together with Article VI of the 1967 Outer Space Treaty concerning the international responsibility of states for national activities in outer space, the moon and other celestial bodies which entails their obligation to authorize and supervise the activities of non-governmental entities in those areas.

19.3.3.2.2 Scope of application Article 1(1), as part of Section I, Introductory Rules, provides that a dispute need not be labelled as relating to space activities to come under the jurisdiction of the Rules on Outer Space Disputes. The flexibility involved in this provision is notable: as it currently reads it goes a long way in meeting one of the main objectives of the Advisory Group, namely that as many disputes should be settled in accordance with the Rules as the parties wish.

Article 1(2) provides another example of flexibility of the Rules on Outer Space Disputes.[185] It goes a long way in facilitating procedures and avoiding the frustration of arbitration agreements in case of omission of an explicit waiver of sovereign immunity.

19.3.3.2.3 Notice of arbitration As noted in previous comments on the Rules, Article 3(3)(d) is an interesting example of progressive development of the law and goes further than the PCA Environmental Rules.[186] In addition, the language is clearer than in the 2010 Arbitration Rules. In fact, this provision widens the sources of law and makes clear that a contract, or compromise, is not the only valid basis for arbitration.

19.3.3.2.4 Appointing authority Article 6 on the appointing authority is yet another example of a wise move towards easing the procedure, as it refers to the Secretary-General of the PCA. This at least was the general

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[185] Art. 1(2), Rules on Outer Space Disputes, *supra* n. 58, reads in full: 'Agreement by a party to arbitration under these Rules constitutes a waiver of any right of immunity from jurisdiction, in respect of the dispute in question, to which such party might otherwise be entitled. A waiver of immunity relating to the execution of an arbitral award must be explicitly expressed.'

[186] Art. 3(3)(d), Rules on Outer Space Disputes, *supra* n. 58, provides that the notice of arbitration shall include '[i]dentification of any rule, decision, agreement, contract, convention, treaty, constituent instrument of an organization or agency, or relationship out of, or in relation to which, the dispute arises'.

view within the Advisory Group.[187] It also stands out for simplification. The Advisory Group thought it unnecessary to include, as did the 2010 UNCITRAL Rules on Arbitration, a provision similar to that of Article 6(6) of the 2010 Rules.[188] In fact, under Articles 3(1) and 4(1) of the PCA Rules on Outer Space the Secretary-General of the PCA, as appointing authority, will be duly informed of the initiation of the process and notice of arbitration by the claimant and, within the following 30 days, of the response to that notice.

19.3.3.2.5 Appointment of arbitrators Article 9 of the Rules on Outer Space Disputes handles the appointing of arbitrators. The Advisory Group supported the idea of including in the Rules, from the initial stages and for practical reasons, the possibility of setting up a panel of five arbitrators. Thus, Article 9 provides that if five arbitrators are to be appointed, the two party-appointed arbitrators shall choose the remaining three arbitrators and designate one of those three as the presiding arbitrator of the tribunal. The Advisory Group thought it pertinent to include the possibility of a five-member tribunal at that stage.

With reference to the expertise of the arbitrators, the parties and Secretary-General are free to designate persons who are not members of the PCA.[189] Article 10(4) further facilitates the task of the parties which are also by no means bound to accept an expert from the list of persons qualified in the subject matter of the dispute provided to the parties by the Secretary-General, which is merely of a recommendatory nature.

The general principle underlying the Rules on Outer Space Disputes is due respect of the will of the parties which, if they so wish, may agree on a tribunal composed of a number other than the one laid down in the Rules.[190]

19.3.3.2.6 Disclosures and challenges Articles 12(4) and 14(2) of the Rules on Outer Space Disputes handle disclosures by and challenge of arbitrators. The provisions laid down in these Articles are in the interest

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[187] Relevant documents underpinning this conclusion are on file with the author.

[188] This clause provided: ‘When the appointing authority is requested to appoint an arbitrator pursuant to Articles 8, 9, 10 or 14, the party making the request shall send to the appointing authority copies of the notice of arbitration and, if it exists, any response to the notice of arbitration.’

[189] See Art. 10(4), Rules on Outer Space Disputes, *supra* n. 58.

[190] *Cf.* Art. 10(2), Rules on Outer Space Disputes, *supra* n. 58.

of simplification, on which there was early consensus within the Advisory Group and not much discussion.[191] Briefly, these Articles establish that when one arbitrator fails to participate on a three- or five-person panel, the other members of the tribunal shall decide on the continuation of proceedings, unless the parties agreed otherwise. The tribunal may also declare the seat vacant and appoint a substitute arbitrator.

The powers given in this context by the Rules to the 'remaining arbitrators' are notable.[192] This was agreed by the Advisory Group on the basis that the tribunal was better suited for a decision of the kind than the Secretary-General. It aims at protecting the parties' right to due process whenever the evaluation of the particular case so indicates.

The solutions adopted in Articles 12(4) and 14(2) mean a clear departure from the 2010 UNCITRAL Rules on Arbitration, enlarging the powers conferred to the 'remaining arbitrators' who will have the power in their sole discretion to continue the arbitration and to make any decision, ruling or award without the participation of an arbitrator.[193]

19.3.3.2.7 Exclusion of liability With respect to the exclusion of liability, other suggestions, in line with the 2010 UNCITRAL Rules on Arbitration, favoured a reference to 'intentional wrongdoing' in Article 16 of the PCA Rules on Outer Space Disputes. The Advisory Group thought long about this and finally decided to leave it out. The reason was that to include this suggestion would be likely to unchain a string of accusations of the wrongdoing being 'intentional' and open the door widely for such accusations.

This Article now deals with the *a priori* waiving by the parties, to the fullest extent permitted under the applicable law, of any claim against the arbitrators and any person appointed by the arbitral tribunal based on any act or omission in connection with the arbitration. In moving away from the 2010 UNCITRAL Rules on Arbitration, and deciding against the inclusion of the words 'intentional wrongdoing', the PCA Rules on Outer Space Disputes stand as an example of progressive development of the law. A waiver of sovereignty should not include, therefore, 'intentional wrongdoing'.

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[191] Relevant documents underpinning this conclusion are on file with the author.

[192] *Cf.* Art. 12(4), Rules on Outer Space Disputes, *supra* n. 58.

[193] As for the 2010 UNCITRAL Rules on Arbitration, Arts. 8–10 handle the appointment of arbitrators; e.g. Art. 8(d) provides that 'if for any reason the appointment cannot be made according to this procedure, the appointing authority may exercise its discretion in appointing the sole arbitrator'.

19.3.3.2.8 Applicable law and 'amiable compositeur' With respect to the issues of applicable law and '*amiable compositeur*', the Advisory Group examined a few proposals. For example, it was suggested that Article 35(1) should be supplemented by a reference to the 'international conventions in force'. The provision currently states that in resolving the dispute the arbitral tribunal shall apply the law designated by the parties or, in the absence of such designation, the national and/or international law it determines appropriate. On this suggestion the Advisory Group believed that the term 'applicable law' encompassed treaty law, customary international law and general principles of law, in accordance with Article 38(1) of the ICJ Statute,[194] which would make any further addition superfluous.

19.3.3.3 Other general comments on the Rules

First, the compatibility of the PCA Rules on Outer Space Disputes with the public international law system was another issue of stimulating debate during the drafting of the Rules, particularly as regards Article XII of the 1972 Liability Convention[195] addressing the applicable law. It was observed that indeed the Rules should be compatible with the international public law system of liability embodied by that Convention and that, in order to prevent the conflict of laws, the Rules should be refined.

In fact, Article XII, like most of the provisions underlying the Liability Convention, is one of substance. It does not raise an issue of conflict of laws.[196] It provides that the compensation which the 'launching State' shall be liable to pay for damage shall be determined in accordance with international law and the principles of justice and equity. This Article, rather, embodies a rule of public international law totally compatible with the PCA Rules on Outer Space Disputes.

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[194] Art. 38, Statute of the International Court of Justice, *supra* n. 23, is widely regarded as presenting the major sources of public international law, referring in particular to treaties, customary international law and general principles of law.

[195] Art. XII, Liability Convention, *supra* n. 1, provides: 'The compensation which the launching State shall be liable to pay for damage under this Convention shall be determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.'

[196] The question was thoroughly discussed by the ILA, see *ILA Report of the Sixty-Ninth Conference*, London, 2000, 571–603; also *supra*, § 19.1.3.

Hence the conclusion that the Liability Convention – which lays down rules of substance – together with the Rules on Outer Space Disputes which are procedural in nature and do not include provisions of substance, appear an appropriate and clear set of applicable legislation for dealing with dispute settlement arising from space activities and dissipate the risk of double recovery or forum shopping. When Article XII of the Liability Convention refers to international law this clearly includes treaty law, customary international law and general principles of law as stated in Article 38 of the Statute of the ICJ. In the absence of precise rules within the first two sources it seems reasonable to look for solutions in the third, under which the principles of justice are no doubt included. It is a well-known fact that whenever international tribunals were called upon to give a decision in accordance with international law the task raised no great problems.

Second, as to 'classified information' and 'confidentiality', a question raised with some frequency in the comments from delegations, the Advisory Group fully supported the flexible stand taken by the Rules on Outer Space Disputes in Articles 17(7) and 17(8) to ensure appropriate protection.[197] In fact:

> The idea of a 'confidentiality adviser' [as now included in Article 17(8) of the Rules] hardly raised problems during the drafting stage of the Rules (2010–2011). In general, it was considered as an interesting innovation to be tried out by the parties to a dispute, if they so decided, bearing in mind the flexibility of the new set of Rules. Confidentiality issues were, in fact, raised with some frequency during the drafting phases but no stumbling block stood in the way regarding this somewhat unique figure.[198]

The question continued under discussion among the members of the ILA Space Law Committee, in preparation for the ILA Seventy-Sixth Conference held in Washington, DC, in April 2014 and remains on the Committee's agenda.

This issue is generally viewed by the ILA Committee as a creation of an abstract nature given that a role of the kind has no clear precedents. However, the question is likely to prompt an interesting debate over

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[197] These clauses provide for the potential to have information classified as 'confidential', and even for a 'confidentiality adviser' who can report on the basis of such information without disclosing it as such to the tribunal or the other party, let alone the outside world.

[198] ILA Space Law Committee, Draft Conference Report Washington 2014, available at www.ila-hq.org/en/committees/index.cfm/cid/29, last accessed 21 April 2014, 6.

subtleties involving confidential aspects. In this context it is necessary not to lose sight of the fact that the Rules stand out for their flexibility and have a potential – and, hopefully, important – part to play in covering lacunae left by the UN space treaties on dispute resolution procedures to which private parties, in those contexts, have no access. It is precisely that feature – flexibility – which enables parties to a dispute to accept the confidentiality adviser's services or leave them out when they feel that the confidential sides of the dispute will not be protected fairly. Indeed, the space left to the autonomy of the parties is at the very root of the PCA Rules.

Third, the Advisory Group could not agree with a general statement made by a delegation during the drafting stages of the Rules in the sense that they did not strengthen the UN treaties on outer space. Conversely, the Group considered they *did* from the moment they were striking a realistic balance among the various interests involved and reflected in those treaties. No doubt the UN treaties were – and still are – in need of procedural provisions for dispute settlement. In the case of the Liability Convention, in particular, the PCA Rules on Outer Space Disputes would contribute to its effectiveness.

Indeed, as Judge Pocar noted during deliberations, the Rules on Outer Space Disputes will not conflict with the existing obligations arising from the UN space treaties but, rather, enhance the dispute settlement system embodied in the Liability Convention as the Rules could be adopted by the Claims Commission envisaged by the Liability Convention. In fact, there is nothing to preclude this possibility, which is highly recommendable and would go a long way in revitalizing the UN treaties and, at the same time, provide a test of effectiveness for the newly adopted Rules. As pointed out earlier, compatibility between the PCA Rules on Outer Space Disputes and the UN space treaties is unquestionable in this field.

Fourth, another issue concerned interim measures. Doubts were expressed as to whether Article 26(2) of the Rules[199] addressing this possibility would be restricted by the provisions in Article V of the 1967

[199] Art. 26(2), Rules on Outer Space Disputes, *supra* n. 58, provides: 'An interim measure is any temporary measure by which, at any time prior to the issuance of the award by which the dispute is finally decided, the arbitral tribunal orders a party, for example and without limitation to: (a) maintain or restore the status quo ante pending determination of the dispute; (b) take action that would prevent, or refrain from taking action which is likely to cause, (i) current or imminent harm or (ii) prejudice to the arbitral process itself; (c) provide a means

Outer Space Treaty[200] laying down a general humanitarian principle relating to assistance to astronauts and Article 8 of the Rescue Agreement dealing with amendments.[201] The Advisory Group understood that, in the absence of agreement by the parties to the application of the Rules, they would have no effect upon those treaties. Moreover, should the parties to those treaties decide that disputes be solved under the Rules on Outer Space Disputes, these could be modified accordingly.

Fifth, as to transparency and confidentiality, the flexibility of the Rules on Outer Space Disputes enables the conclusion of agreements for the application of stricter measures and the drawing up of international standards for protection in this field. The Rules, in their present reading, do not preclude this possibility in any way, because of their extreme flexibility in full respect of the autonomy of the will of the parties. This is a recurrent note in the PCA Rules throughout their various sections.

Sixth, some proposals favoured, as an Annex to the Rules on Outer Space Disputes, the drafting of a model for the waiver of immunity. This idea seemed realistic. Yet, the suggested model could be prepared in a second phase if and when the drafting of guidelines or international standards becomes necessary.

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of preserving assets out of which a subsequent award may be satisfied; or (d) preserve evidence that may be relevant and material to the resolution of the dispute'.

[200] Art. V, Outer Space Treaty, *supra* n. 12, states: 'States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle. In carrying on activities in outer space and on celestial bodies the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties. States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.'

[201] Art. 8, Rescue Agreement, *supra* n. 13, states: 'Any State Party to the Agreement may propose amendments to this Agreement. Amendments shall enter into force for each State Party to the Agreement accepting the amendments upon their acceptance by a majority of the States Parties to the Agreement and thereafter for each remaining State Party to the Agreement on the date of acceptance by it.'

Finally, the Advisory Group discussed the need for practical guidelines to address further details. The prevailing view supported addressing this at a later stage.[202]

19.3.3.4 Closing comments

The Chair of the PCA Advisory Group introduced the Rules on Outer Space Disputes to the United Nations at the Fifty-first Session of the Legal Sub-Committee of COPUOS on 29 March 2012. He summed up the main reasons for arbitration being particularly indicated in the field of space law disputes in the following terms:[203]

- Arbitration is open to all parties active in the field, both public and private.
- As reflected throughout the Rules, arbitration is a voluntary mechanism based on the consent of all parties, which can be provided by insertion of an arbitration clause in the legal instrument that defines the parties' relationship; as clearly apparent in Article 1(1) of the Rules.[204]
- This is of particular importance where states are concerned, as they may be better prepared to agree to a binding dispute resolution under discrete agreements than to enter into a new significant multilateral treaty.
- Arbitration results in final and binding decisions, as set forth in Article 4(2) of the Rules, in contrast with the recommendatory nature of decisions under, for example, the 1972 Liability Convention.

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[202] Relevant documents supporting this statement are on file with the author.

[203] See F. Pocar, An Introduction to the PCA's Optional Rules for Arbitration of Disputes Relating to Outer Space Activities, 38 *Journal of Space Law* (2011), 171 ff.

[204] Art. 1(1), Rules on Outer Space Disputes, *supra* n. 58, states: 'Where parties have agreed that disputes between them in respect of a defined legal relationship, whether contractual or not, shall be referred to arbitration under the Permanent Court of Arbitration Optional Rules for Arbitration of Disputes relating to Outer Space Activities, then such disputes shall be settled in accordance with these Rules subject to such modification as the parties may agree. The characterization of the dispute as relating to outer space is not necessary for jurisdiction where parties have agreed to settle a specific dispute under these Rules.'

- Arbitral awards are internationally recognized and enforceable in all signatory states of the New York Convention,[205] currently 146.
- Parties to arbitration choose their own decision makers. Unlike in a court, parties in arbitration have the option of selecting arbitrators with specialized competences in the relevant fields, which may be as diverse as economics, cutting-edge space technology, and a tangle of related scientific branches.
- Arbitral procedure is flexible and can be modified by agreement of the parties, as provided in Article 1(1) of the Rules.
- Arbitration can serve to preserve the confidentiality of sensitive information. Hearings need not be public and awards need not be published, as provided in Articles 28(3) and 34(5) of the Rules.[206]

Another reason for supporting the advisability of using the PCA Rules for disputes relating to space activities is that national judges are normally limited by the provisions of their own national law, both from the procedural standpoint and on the merits, which means that the autonomy of the parties – as established by Article 35 of the PCA Rules – would be restricted. Even though, in many cases, national laws do respect that autonomy and favour self-regulation, national laws may contain certain barriers which cannot be bypassed. Moreover, it should be borne in mind that, usually, national judges are allocated randomly (by extracting the names from a bag or other container) but not *ratione materiae*. Therefore it is likely that the judge called upon to decide is not fully seized of the points in question and perhaps unfamiliar with the specific area of space law or the scope of the 'outer space component'

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[205] Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention), New York, done 10 June 1958, entered into force 7 June 1959; 330 UNTS 3; TIAS 6997; 21 UST 2517; UKTS 1976 No. 20; Cmnd. 1515; ATS 1975 No. 25; 7 ILM 1046 (1968).

[206] Art. 28(3), Rules on Outer Space Disputes, *supra* n. 58, provides: 'Hearings shall be held *in camera* unless the parties agree otherwise. The arbitral tribunal may require the retirement of any witness or witnesses, including expert witnesses, during the testimony of such other witnesses, except that a witness, including an expert witness, who is a party to the arbitration shall not, in principle, be asked to retire.' Art. 34(5), Rules on Outer Space Disputes, states: 'An award may be made public with the consent of all parties or where and to the extent disclosure is required of a party by legal duty, to protect or pursue a legal right or in relation to legal proceedings before a court or other competent authority.'

underlying the dispute, as stated *sub* (i) of the Introduction to the PCA Rules.[207]

Following the presentation of the PCA Rules on Outer Space Disputes to the Legal Sub-Committee of COPUOS they were introduced to a number of institutions, public and private, in different countries, such as the Seventy-Fifth Conference of the ILA (in Sofia, Bulgaria, August 2012), the Fifty-Fourth Colloquium on the Law of Outer Space (in Naples, Italy, October 2012), the Fiftieth Congress of the Ibero-American Institute of Air and Space Law (in Cádiz, Spain, October 2012), the UN/Argentina Workshop on Space Law (in Buenos Aires, Argentina, November 2012) and other institutions, academies, universities and law firms in different parts of the world.

19.4 THE CONCLUSIONS SO FAR: SPARKLES OF HOPE

There is much to be said for the great flexibility of the 2011 PCA Rules on Outer Space Disputes and their strictly procedural nature. Therefore, rather than weakening the force of the dispute settlement clauses embodied in the UN space treaties and Principles, the new Rules should play a constructive role in revitalizing and enriching the existing procedures.

A cursory glance at the Rules on Outer Space Disputes' nearest precedent, that is the Environmental Rules, also procedural, reveals that the subject matter of the latter is very close to that of space activities. They essentially comprise 'sister' sets of Rules. Hence, a fruitful interaction between both sets of Rules seems desirable and is expected before too long. For example, both sets of Rules would be referring to each other and, thus, helping each other to be more widely applied and accepted. Then, uniform practice in the application of both may possibly start reflecting a general practice coupled with an *opinio juris generalis*, leading to the formation of rules of customary international law.

Both areas are highly influenced by technological development of which glaring examples are the use of satellites for monitoring compliance with international agreements, particularly concerning the management of water resources, climate change and the protection of the ozone layer.

[207] See also G. Duberti, *Normas de Arbitraje Aplicables a Controversias Relativas a Actividades Espaciales, III Seminario sobre Actividades Espaciales y Derecho* (2013), 177–88.

Both areas, environmental law and space law, are highly and closely intertwined as well. In the latter example – protection of the ozone layer – space technologies, because of their extreme precision, are a powerful tool in establishing the alterations in stratospheric ozone in different parts of the stratosphere and at any time of the year. The figures provided by earth observation satellites – in Dobson units – are showing that the international agreements in force are proving successful. It follows that the dimension of this problem can now be measured with precision by means of space technology. And when a problem can be measured the way to realistic solutions is eased.[208]

Furthermore, these Rules might prove useful for dispute settlement in new specific areas such as the value of satellite data in international litigation, the use of space technologies in robotics and other 'remote presence' applications which are being developed at the moment.

The general opinion concurs that the time is right for having procedural rules on dispute settlement relating to outer space activities and that, possibly in the medium term, the PCA Rules on Outer Space Disputes would provide an excellent tool for the settlement of disputes arising from exploration and use of outer space and celestial bodies, as well as from the exploitation of those areas.

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[208] See *ILA Report of the Seventy-Fifth Conference*, Sofia, 2012, Part I (by the present author), 15.

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