A COMPARATIVE LEGAL ANALYSIS OF LIABILITY AND INSURANCE REGIMES IN SPACE TOURISM: EVOLVING DOCTRINES AND REGULATORY CHALLENGES IN INDIAN NATIONAL LEGISLATION AND U.S. FEDERAL LEGISLATION

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Abstract

Space tourism has emerged as a rapidly evolving industry, raising complex legal and regulatory challenges. This article examines the legal frameworks governing space tourism, focusing on liability, insurance and emerging policies. It evaluates international treaties, national regulations and recent developments in environmental sustainability and governance. The study highlights gaps in the current legal infrastructure and explores emerging trends to ensure safety, accountability and growth in this frontier sector.

Keywords: *Space Tourism, Liability, Insurance, Emerging Policies, International Law, National Regulations, Environmental Sustainability*

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INTRODUCTION

The commercialization of space activities, particularly space tourism, necessitates robust legal frameworks to address liability, insurance and operational standards. With the advent of private players like SpaceX, Blue Origin and Virgin Galactic, the legal landscape must adapt to ensure safety, sustainability and compliance with international obligations. This paper explores the key legal provisions governing space tourism and examines emerging policies.

INTERNATIONAL LEGAL FRAMEWORKS

Key Treaties- International governance of space activities are primarily based on the following treaties:

Outer Space Treaty (1967)

The Outer Space Treaty (officially known as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestial Bodies) was implemented due to several key factors during the mid-20th century, primarily driven by geopolitical, scientific and security concerns. The Treaty established a legal foundation for activities in outer space, including prohibiting territorial claims and mandating the use of space for peaceful purposes. The Partial Nuclear Test Ban Treaty (1963) was growing emphasis on disarmament.

The Outer Space Treaty extended disarmament principles to space by prohibiting weapons of mass destruction (WMDs) in orbit or on celestial bodies. This treaty mandates following principles.[1]

- Establishes principles for peaceful exploration and prohibits national sovereignty claims over celestial bodies,
- Mandates that nations are responsible for regulating private entities operating in outer space, and
- Enforces liability on states for damage caused by their space activities, even if conducted by private actors.

Liability Convention (1972)

[1] Michelle Bentley, *Weapons of Mass Destruction and US Foreign Policy: The Strategic Use of a Concept* (Routledge, London, 2014); *available at*: https://doi.org/10.4324/9780203381649

This convention imposes absolute liability on launching States for damages caused on Earth and fault-based liability for damages in outer space. It also defines procedures for claims and dispute resolution.

Registration Convention (1976)

The Registration Convention (1976), formally known as the Convention on Registration of Objects Launched into Outer Space, is administered by the United Nations Office for Outer Space Affairs (UNOOSA). The UNOOSA headquarters is located at the United Nations Office at Vienna (UNOV) in Vienna, Austria. The primary aim is to enhance accountability and transparency in space activities by creating a centralized registry, promoting peaceful use of outer space and preventing conflicts.

Rescue Agreement (1968)

The Rescue Agreement (1968), officially known as the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, is one of the key international treaties governing space activities.[2]

Key Provisions:

1. Rescue of Astronauts (Articles 1 and 2):

If astronauts land accidentally or face an emergency, the host country must provide assistance and promptly notify the launching authority and the United Nations. Astronauts must be safely returned to their home country.[3]

2. Assistance to Astronauts in Danger (Article 3):

Requires all possible steps to rescue astronauts and render emergency aid if they are in distress, whether on Earth or in outer space.

3. Return of Space Objects (Articles 4 and 5):

Space objects or components that land unintentionally in foreign territories must be returned to the launching authority. The launching state must provide identification details to claim its property.

[2] Nandasiri Jasentuliyana, *International Space Law and The United Nations*, (Brill, Germany, 2023)
[3] *Ibid.*

4. Notification to the United Nations:

Member states must notify the UN Secretary-General about any recovery operations and space objects found.

Moon Agreement (1984):[4]

The Moon Agreement, officially known as the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, is an international treaty that expands upon the principles of the Outer Space Treaty (1967) concerning the Moon and other celestial bodies. Recognizes the Moon and other celestial bodies as the 'common heritage of mankind.' It prohibits exploitation of resources without international regulatory frameworks, although it lacks widespread ratification.

ITU Regulations:

The International Telecommunication Union (ITU) is a specialized agency of the United Nations (UN) responsible for global telecommunication regulations and the management of radio-frequency spectrum and satellite orbits.

Emerging Frameworks

- Artemis Accords (2020):[5] The Artemis Accords (2020) are a set of non-binding agreements established by NASA and several partner nations to promote peaceful, cooperative, and transparent exploration of the Moon, Mars, and beyond. They build upon the principles of the Outer Space Treaty (1967) and aim to establish a framework for international collaboration in space exploration, particularly under the Artemis Program, which seeks to land the first woman and the next man on the Moon by 2025. Initially signed by 8 countries (October 2020) including the USA, Australia, Canada, Japan, Luxembourg, Italy, UAE, and the UK. As of now, over 30 countries have joined. A U.S.-led initiative emphasizing lunar exploration and resource utilization with provisions for interoperability and transparency.

[4] United States Senate, *The Moon Treaty: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, (University Press of the Pacific, US, 2005)

[5] Melissa de Zwart, Stacey Henderson (eds.), *Commercial and Military Uses of Outer Space*, (Springer Nature Singapore, 2021)

- Sustainability Guidelines: UN Space Debris Mitigation Guidelines focus on reducing space debris through best practices, including end-of-life disposal and collision avoidance systems.

NATIONAL REGULATIONS

United States- The U.S. has the most developed legal infrastructure for commercial space activities. The United States leads the forefront in space tourism due to its advanced technological capabilities, private sector innovation, strong regulatory framework and early investments in space exploration.

- FAA (Federal Aviation Administration): Licenses commercial launches and re-entries under the Commercial Space Launch Act (1984). It Sets liability and insurance requirements for operators.
- NASA (National Aeronautics and Space Administration): Facilitates partnerships with private entities and conducts regulatory oversight.
- NOAA (National Oceanic and Atmospheric Administration): Regulates remote sensing satellites.
- FCC (Federal Communications Commission): Allocates radio frequencies for communication and satellite operations.
- CFIUS (Committee on Foreign Investment in the United States): Reviews foreign investments in U.S. space firms for national security risks.

Significance of U.S. Space Regulations:

- Encourages Innovation: Supports private sector growth in space exploration and commercial ventures like satellite internet, space tourism, and resource mining.
- Ensures Safety and Accountability: Provides a legal framework for safety standards, liability rules, and insurance requirements.
- Protects National Interests: Safeguards U.S. technologies and critical infrastructure while promoting international leadership in space.
- Promotes Global Cooperation: Facilitates partnerships under agreements like the Artemis Accords to establish peaceful and sustainable exploration of outer space.

This legal infrastructure allows the U.S. to remain at the forefront of space exploration while addressing emerging challenges such as space debris, resource utilization, and military threats

in orbit.

India- Indian Space Research Organisation (ISRO) and Policies:

- ISRO is the governmental agency responsible for the development and launch of satellites, rocket technology, and space exploration programs in India,
- It has played a pivotal role in establishing India's global presence in space with cost-effective, efficient missions. Some of its landmark achievements include the Chandrayaan (lunar missions) and Mangalyaan (Mars Orbiter Mission), among many others,
- IN-SPACe is the regulatory body formed by the Indian government to promote private sector participation in space activities and streamline licensing and authorization of space-based activities, and
- Its mission is to facilitate private space ventures, provide clearance for launches, and ensure safety and compliance with national and international space law.

Key Policies and Regulations

Space Activities Bill (Draft)[6]

A *draft Space Activities Bill* has been proposed by the government, aiming to provide a comprehensive legal framework for the regulation of space activities in India. It focuses on:

- Licensing for space launches and satellite operations,
- Ensuring safety, security, and environmental protection,
- Addressing the liability and insurance aspects for commercial space operations, and
- Regulating the use of outer space in compliance with international space law (such as the Outer Space Treaty).

Key provisions:

- Ensures that space missions are conducted peacefully, in accordance with international treaties.
- Allows for commercial space operations under the supervision of government agencies like IN-SPACe.

[6] Department of Space, Government of India, "Draft Space Activities Bill, 2017", *available at*: https://prsindia.org/files/bills_acts/bills_parliament/1970/Draft%20Space%20Activities%20Bill%202017.pdf (last visited on: 27.03.2025)

- Establishes insurance norms for commercial launches.
- Establishes penalties and liabilities for non-compliance and damages caused by space activities.

Remote Sensing Data Policy (2011)[7]

- Regulates access to data generated from India's remote sensing satellites,
- Government control is maintained over sensitive and security-related data, while non-sensitive data is made available for commercial use,
- Ensures that data is provided with a clear framework for sharing and use, which is in line with international standards.

National Space Policy (Draft 2020)[8]

The Draft National Space Policy 2020 outlines the strategic goals and **vision** for India's space exploration and commercial space activities over the next decade. Some of the key provisions include:

- Promoting Private Sector Participation: Encouraging Indian private companies to take part in space research, satellite development, launch services, and space tourism,
- Space Exploration: Emphasizing India's human spaceflight program (Gaganyaan), lunar and Mars missions, and satellite constellations,
- International Cooperation: Enhancing India's role in global space governance, space law, and joint missions with other spacefaring nations, and
- Sustainability: Addressing the growing issue of space debris and space traffic management to ensure sustainable use of outer space.

Space Policy for Commercial Launches

- India has created a separate policy to encourage private sector involvement in commercial space launches, and

[7] National Remote Sensing Centre, "Remote Sensing Data Policy" *available at*: https://www.nrsc.gov.in/EOP_irsdata_Policy/page_1?language_content_entity=en (last visited on: 27.03.2024)

[8] Department of Space, Government of India, "Draft Space RS Policy 2020", *available at*: https://ispa.space/indian-policies.html#:~:text=The%20Draft%20Space%20Remote%20Sensing,a%20wider%20variety%20of%20stakeholders (last visited on: 27.03.2025)

- The government has opened up the launch market to private players under the framework of IN-SPACe.
- These private players are responsible for innovative technologies for space missions and launching small satellites, with ISRO providing technical support.
- The policy facilitates joint ventures, partnerships with foreign space agencies, and the development of satellite-based services in India.

LIABILITY AND INSURANCE FRAMEWORKS IN UNITED STATES AND INDIA

India's Liability and Insurance Framework

a) Governing Framework
   - International Treaties: India is a signatory to the Outer Space Treaty (1967) and the Liability Convention (1972), holding the state liable for damage caused by space objects.
   - Domestic Framework: Currently, India does not have a comprehensive domestic law governing liability for space activities. Instead, regulations are managed through ISRO and IN-SPACe policies.[9]

b) Liability and Insurance Policy
   - State Responsibility: The Government of India is responsible for damages caused by space objects launched or operated under its jurisdiction. Private players must indemnify the government under contractual agreements when participating in launches.
   - Proposed Space Activities Bill:
     1. Establishes clear liability provisions for private sector participation.
     2. Requires mandatory insurance coverage for third-party liability and potential damage caused during launches or re-entries.
     3. Ensures private operators indemnify the government against claims arising from damages.
   - **Current Practices**:

[9] *Ibid*

1. ISRO secures launch insurance for its missions based on project requirements.
2. Insurance is tailored for each mission, covering risks related to launch, operations, and payloads.

c) Challenges in India

- No Comprehensive Legislation: Reliance on administrative guidelines rather than codified laws.
- Private Sector Regulation: The growing participation of private companies like Skyroot Aerospace and Agnikul Cosmos requires stricter legal frameworks.[10]
- Insurance Gaps: Lack of detailed policies for space debris or human spaceflight insurance.

United States' Liability and Insurance Framework-

a) **Governing Framework**

- Commercial Space Launch Act (1984): Regulates commercial launches and establishes insurance and liability requirements.
- International Obligations: Fulfils obligations under the Outer Space Treaty (1967) and Liability Convention (1972).

b) **Liability and Insurance Policy**

- **Mandatory Insurance**: Operators must carry insurance coverage for:
  1. Third-party liability (personal injury, property damage). Government property damage (e.g., NASA facilities).
  2. The FAA (Federal Aviation Administration) sets minimum insurance levels based on risk assessments for each launch.
- **Government Indemnification**: The U.S. government provides indemnification above the insurance cap, up to $3 billion for catastrophic losses.[11]

[10] Ahaana Chowdhry, "Regulating Private Space Ventures: Analyzing India's Legal Framework for Commercial Space Launches and Operations" 2 (4) *International Journal of Legal Studies and Social Science* 11- 25 (2024); *available at*: https://ijlsss.com/wp-content/uploads/2024/10/2.-Ahaana-Chowdhry.pdf (last visited on: 27.03.2025)

[11] Jon Bateman, "War, Terrorism, and Catastrophe in Cyber Insurance: Understanding and Reforming Exclusions" (Working Paper, Carnegie Endowment for International Peace, October 2020); *available* at:

- **Operator Protections**: Private companies like SpaceX and Blue Origin are protected from unlimited liability, encouraging innovation in commercial space ventures.
- **Space Tourism Insurance**: New policies specifically cover space tourists and liability for injuries or fatalities during suborbital and orbital flights.

c) **Challenges in the U.S.**

- Rising Space Traffic: Increased launches and space debris risks require updated liability frameworks,
- Human Spaceflight Insurance: Balancing coverage for space tourists while limiting operator liability is complex, and
- Foreign Investments: CFIUS (Committee on Foreign Investment) reviews foreign investments in U.S. space firms to prevent national security risks.

EMERGING POLICIES AND REGULATORY FRAMEWORKS

Regulatory Moratoriums

- The U.S. FAA has extended its regulatory moratorium to allow industry growth before imposing safety regulations and
- International guidelines for space tourism are expected to be finalized by 2028, providing global regulatory clarity.

Environmental Sustainability

- Growing concerns about rocket emissions and space debris have prompted the inclusion of Environmental Impact Assessments (EIA) as licensing requirements, and
- Companies like SpaceX and Blue Origin are developing reusable launch systems to reduce environmental footprints.

COURT CASES AND DAMAGES AWARDED

- *Hughes Aircraft Co.* v. *United States*:[12] The U.S. government was found liable for patent infringement related to satellite technology, leading to a $154

https://carnegieendowment.org/research/2020/10/war-terrorism-and-catastrophe-in-cyber-insurance-understanding-and-reforming-exclusions (last visited on: 25.03.2025)

[12] 520 U.S. 939 (1997)

million settlement. Though not directly linked to space tourism, it highlights liability for intellectual property in space.

- Virgin Galactic Test Flight Crash (2014): A fatal test flight accident resulted in lawsuits focusing on pilot safety and mechanical failures. Compensation was awarded to the pilot's family, though the exact amount remains confidential. This case emphasized the need for clearer safety regulations and pre-flight testing standards.
- Sea Launch Co. Bankruptcy (2009): Disputes over liability and insurance claims arose after a failed launch, showcasing the financial risks involved in commercial space ventures.

FUTURE DIRECTIONS

- Policy Harmonization: Harmonizing international treaties with national laws to ensure unified standards.
- Liability Revisions: Updating informed consent provisions and insurance requirements to balance innovation with passenger safety.
- Environmental Protocols: Establishing stricter sustainability protocols for space operations.

CONCLUSION

Space tourism represents the next frontier in commercial space activities, requiring comprehensive legal and regulatory frameworks. While international treaties and national regulations provide a foundation, emerging challenges necessitate continuous updates to address liability, insurance, and sustainability concerns. Collaborative efforts at both international and national levels are essential to ensure safe and sustainable growth in this sector.