TAKSHASHILA INSTITUTION

Satellite Internet Explained

How It Works & Why It Matters

Ashwin Prasad

Takshashila Discussion Document 2025-09
Version 1.0, April 2025

Satellite megaconstellations mark a new age in space-based internet. They comprise of hundreds or thousands of satellites working together to deliver internet services with a global coverage. This technology has wide-ranging applications across various civilian and military domains, making it a critical infrastructure with significant geopolitical and economic implications.

Recommended Citation:
Ashwin Prasad, "Satellite Internet Explained", Takshashila Discussion Document 2025-09, Version 1.0, April 2025, The Takshashila Institution

Contents

0.1 Executive Summary

The age of astropolitics has dawned upon the world. A nation's technological capabilities in space is paramount–economically and strategically. India occupies a very small share of the rapidly growing global space economy. Regulation and production of space activities were hitherto in the hands of the Indian Space Research Organisation. This concentration constricted ISRO's ability to fulfil the technological needs of the country as well as undertake strategically critical missions. Being among the elite space-faring nations, the number of satellites launched by ISRO is dwarfed by those of the United States and China. The space ecosystem in India needed more participants and the resulting competition to drive innovation and scale.

Appreciating this need, the Indian government set about liberalising the space arena to stimulate private sector participation. A slew of reforms were announced in 2019 that re-examined the role of the government in the space sector. NewSpace India Limited was established as a commercial arm to take over ISRO's routine operations through the commercial space sector. Indian National Space Promotion and Authorisation Centre was set up to regulate all space activities in India; Government-owned data and infrastructure was opened up to private sector. ISRO's priorities were repositioned to align with Indian strategic needs. Most recently, the Foreign Direct Invest limits were eased for activities in the space sector.

Examining some of the other national space policies lends perspective into space sector regulation and growth. The United States of America, Japan and the United Arab Emirates were considered to study three distinct space programs and policy models. The United States follows a "exploit what we have, buy what we can, and build what we must" approach as it seeks to actively leverage the full capabilities of its commercial space industry. It resorts to government production only when procurement from the private sector is unviable. The principles of its space policy has permeated to its various commercial and military procurement policies, space priorities frameworks and space authorisation frameworks.

The Japanese follow a similar policy of procurement and partnership to boost its private sector. Having recognised the significance of space for their economy and national security, they are enlarging their

space budgets and focusing on building capabilities. The United Arab Emirates has a relatively young space program. The country has made space a priority focus sector. Given its lack of talent and faculty in the field, it is focusing on attracting startups with its friendly regulatory environment and financial incentives. All three nations have enacted a law for space regulation to demonstrate comprehensibility and coherence in their space policies.

It is important for India to take the progress and momentum of its space reforms forward by addressing some of the gaps in the policy regime.

1. IN-SPACe has promotional and regulatory responsibilities that cannot coexist in a single agency. These should be split up. NSIL also faces similar conflicting roles as a promoter and service provider.
2. IN-SPACe cannot remain an autonomous body under DoS. It needs independence and separation and should be provided with a statutory backing.
3. As the space regulator, IN-SPACe's decisions may lead to disputes. The act has to also set up a disputes settlement and appellate tribunal.
4. To give some legal backing to the space policy and establish regulatory certainty in the space ecosystem, the Space Activities Bill must be authorised and enacted by the Parliament on a priority basis. The act should forge a liberal regulatory environment with market-friendly provisions related to space resource utilisation.
5. Finally, government procurement will be a key driver in developing the commercial space industry of our country. The Indian government is partial to funding ISRO to build things internally rather than buying from the private sector. In the first case, public funds are spent in building ISRO's capabilities. In the second, public funds are spent in building the startup industry which can ultimately result in more R&D, job creation and scale.

The space sector offers enormous potential for development and progress in almost all facets of the society. India must reimagine its approach to this sector by setting its sights not just one ISRO, but

on proliferating multiple ISRO like corporations to amass significant space power.

0.1.1 Abbreviations

DoS - Department of Space IN-SPACe - Indian National Space Promotion and Authorisation Centre ISRO - Indian Space Research Organisation NSIL - NewSpace India Limited PSLV - Polar Satellite Launch Vehicle UAE - United Arab Emirates USA - United States of America

1 What the Space Reforms are

On 24th June, 2020, the Union Cabinet of India initiated significant reforms in the Indian space domain.[1] These space reforms have a few broad objectives, each closely linked to the rest:

- Boost private sector participation in the Indian space sector,
- Unburden Indian Space Research Organisation from its routine operation tasks so that it can focus on critical R&D, deep space exploration and human-spaceflight,
- Put India on a path to self-reliance in advanced space technology,
- Aid in advancing India's space ambitions.

An overview of the pre-reform space sector is needed to understand why the government undertook these reforms,

1.1 Backdrop of the Reforms: The Indian Space Sector

In today's age of astropolitics, space technology is deeply consequential for civilian and military applications. The great powers of the world are vying for control and influence in outer space. The size of the global space economy will triple to reach $1.8 Trillion by 2035.[2] Despite being an elite space-faring nation with significant technological achievements, India's share of this economy is less than 2%.[3] The Indian government needed to increase the national space capabilities to occupy a larger

share of the global space economy, address India's growing technology needs and gain an influential voice in the global dialogues related to outer space affairs.

This voice needs to be a resonant chorus emerging from diverse stakeholders in the country operating across various domains. This ecosystem was largely missing in India with almost the entire space sector restricted to one organisation. ISRO was single-handedly responsible for both promotion and regulation. The autonomy this extended was beneficial for a nascent space agency during the cold war. However, considering the size and potential of the space economy, this is no longer prudent. The Indian space ecosystem needed new and independent stakeholders besides ISRO. With their entry into the scene, regulatory mechanisms independent of ISRO would follow–enhancing transparency and accountability.

ISRO was also responsible for commercialisation of the space sector. Being the only launch capable space agency, ISRO was tied up with routine tasks of production and operation in trying to sell its launch services to foreign payloads as well as fulfilling Indian launch needs. That left ISRO limited time and personnel for its more strategic objectives related to human-spaceflight, lunar and interplanetary missions.

Even in its routine operations, ISRO was not self-sufficient. ISRO has grown to a 17,300[4] strong organisation and cannot scale disproportionately further, even with weighty resource infusions. ISRO had outsourced parts of its supply chain to the private sector to make up for the limited in-house capacity even before the reforms. While these vendors produced specific components and sub-systems for ISRO, they had limited intellectual property and no end-to-end space capabilities. ISRO has had remarkable successes in its space endeavours and prides itself for its cost-effective space operations. However, the absence of competition from a burgeoning space industry has had an impact on driving scale and innovation up while driving costs down. The American space industry has done just that for the American space sector. India needs a SpaceX of its own.

While human-spaceflight, lunar and interplanetary exploration offer interesting possibilities for the future, almost all of the benefit from outer space is currently derived closer to home–from the satellites

in orbit around earth. The number of satellites launched and operated by a nation is a crude proxy for the development and scale of its space capabilities. The number of operational satellites of the US and China dwarves India's count. The gap grows larger each year.[5] ![[Pasted image 20240424153755.png]] *(as of May 2023)*

In the light of this reality, the State realised that it cannot remain a domain exclusive to government agencies.

1.2 The Space Sector is undergoing Reform

The reforms were doled out in stages through a gradual process that began in 2019 and is still ongoing:

1. On March 6, 2019, NSIL was incorporated to take over ISRO's commercial role.[6]
2. On May 16, 2020, the Union Finance Minister Nirmala Sitharaman announced the government's intention to reform the Indian space sector.[7]
3. On June 24, 2020, the Union Cabinet approved the reforms and created IN-SPACe. NSIL's mandate was also expanded.[8]
4. On April 6, 2023, the Cabinet Committee approved the Indian Space Policy.[9]
5. On February 21, 2024, the Government liberalised the FDI policy for space sector.[10]

The specifics of the reform can be understood by examining the new roles and responsibilities of NSIL, IN-SPACe and ISRO before reviewing the FDI policy.

1.2.1 NewSpace India Limited

The government created NSIL as a Central Public Sector Enterprise under the DoS.[11] NSIL was well placed to exploit the commercial opportunities in the space sector by taking advantage of ISRO's technological faculties through the private sector. This process would also foster the growth of auxiliary industries and infrastructure in India, resulting in positive externalities.

Initially, in 2019, NSIL's mandate was limited to: the production of the PSLV through industry;

transfer of technology; and, providing other space based services. The 2020 reforms that created IN-SPACe also enhanced NSIL's mandate. NSIL was now tasked with capital intensive functions so as to gradually take over the operational part of ISRO's missions. In addition to its original functions, NSIL would now build, launch, own and operate satellites as per market demand.[12]

In accordance with its mandate, NSIL has begun end-to-end PSLV production. It has found an industry partner in HAL and L&T consortia for the end-to-end production of 5 PSLVs. From issuing the Expression of Interest for this project in 2019 to the signing of the contract in 2022, the process took three long years. The first of the 5 PSLVs is scheduled to delivered to NSIL by 2024 with significant hand-holding by ISRO.[13]

NSIL is offering launch services as well. As of last year, NSIL facilitated the launch of 62 international and 2 domestic commercial satellites aboard ISRO's PSLVs, including 4 dedicated launches.[14] NSIL also commissioned ISRO to build a communication satellite that was launched aboard an Ariane-V rocket highlighting its commercial and demand-driven nature.[15]

In 2022, the Government of India approved the transfer of ownership of 10 in-orbit GSAT satellites to NSIL. NSIL provides satcom services by provisioning transponders across various bands from INSAT/GSAT as well as foreign satellites to Indian users.[16] It also handles all the commercial activities of the Indian Remote Sensing Satellites.[17]

Around 30 technology transfer agreements have also been signed with the industry until 2023.[18] In addition to this, NSIL is involved in many other projects and contracts surrounding ground segment and mission support.

Its revenue from operations has grown year-on-year and so have the profits as indicated in the chart below.[19] ![[Pasted image 20240429115116.png]]

Sample Text Link

1.2.2 IN-SPACe

IN-SPACe is an autonomous body under the DoS that acts as a single-window interface for all the space companies and agencies, including ISRO.[20] It has a team of 12 members made up of bureaucrats, industry experts, academia, and government officials. They have different departments: Promotion Directorate, Program Management and Authorisation Directorate, Technical Directorate, and the Legal, Finance, and Administrative Wing to handle its numerous responsibilities.[21] IN-SPACe's functions can be categorised into its two main roles - regulation and promotion.

As a regulator, IN-SPACe is responsible for authorising all space activities by all the participants.[22] As its primary responsibility, IN-SPACe ensures that these activities adhere to safety, national security, international obligations, and foreign policy considerations.[23] Space-related approvals require the coordination of several departments and ministries such as the Department of Space, Ministry of Information and Broadcasting, Department of Telecommunication, Department for Promotion of Industry and Internal Trade, Ministry of Home Affairs, and Ministry of External Affairs. IN-SPACe serves as a single-window interface for this inter-departmental coordination. The Standing Committee for Inter-Ministerial Coordination provides authorisations for applications whenever necessary.[24] To make this entire process paperless and seamless, IN-SPACe established a digital platform in 2022, and it has received over 450 applications so far.[25]

IN-SPACe has also been tasked with promoting and developing the ecosystem and assisting non-government entities.[26] IN-SPACe has to ensure a level playing field in access to all government-owned facilities and satellite data.[27] A Price Support Policy has been implemented to offer technical support from ISRO to the private sector.[28]

IN-SPACe works with industry and academia to enable linkages.[29] A total of 50 MoUs have been signed to date with non-governmental entities. To create awareness among academia, a National Committee for Adoption of Space Technology Education was formed. IN-SPACe is partnering with the DoS and the MEA to establish connections between the Indian and foreign space industries. IN-SPACe has already conducted roundtable meetings with Australia, Italy, and Luxembourg and plans

to collaborate with more countries in the future.[30]

In-SPACe promotes industry clusters, manufacturing hubs and incubation centres.[31] Start-ups can receive up to 1 crore seed fund assistance for funding, training, mentorship, and networking opportunities. IN-SPACe has established a Design Lab and a Technical Centre with computing facilities, test labs and clean rooms that start-ups can use for their mission planning needs.[32] IN-SPACe is collaborating with various states in India to develop industry clusters. One such recent collaboration was with Tamil Nadu Industrial Development Corporation Limited (TIDCO) to establish a space industrial and propellants park.[33] Another partnership exists with Gujarat to construct a space manufacturing park.[34]

IN-SPACe also facilitates technology transfers to non-governmental entities. Fifteen technologies developed by ISRO have already been transferred to private companies. Private companies can apply for technology transfer through the website. IN-SPACe is also in the process of transferring the Small Satellite Launch Vehicle (SSLV) technology to the private industry.[35]

The efforts of the government, IN-SPACe, and the private sector have resulted in a significant increase in the number of space start-ups operating in India, which has risen from 1 in 2012 to close to 200 in 2023. Investments in the Indian space sector have also increased from $6 million in 2019 to $125 million in 2023.[36]

1.2.3 ISRO

The reforms open up the ISRO's informational, technological and infrastructural resources to the non-governmental entities. In addition to transferring technology to the private sector via IN-SPACe and NSIL, ISRO has enabled open access of its remote sensing data. Output with resolutions 5 metres and coarser is free and open for all while resolutions finer than 5 metres is free and open for the government and is priced for others. [Sidenote: Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text]

ISRO will shift its energies towards more strategic functions. This would entail ISRO focusing on

R&D into technologies critical to the Indian national interest. The Space Policy identifies a few key areas like space transportation, human-spaceflight, in-situ resource utilisation and extra-terrestrial habitability. These technologies aspire for crewed Chandrayaan missions to set up a Indian lunar base in the coming decades.

1.2.4 FDI Liberalisation

On 21st February, the Union Cabinet liberalised the FDI policy for the space sector. The amendment eased automatic FDI entry thresholds for three sets of activities related to satellite operations.[37]

Set of Activities	% of FDI entry allowed without Government Approval
Manufacturing of components and systems/ sub-systems for satellites, ground segment and user segment.	100%
Satellites-Manufacturing & Operation, Satellite Data Products and Ground Segment & User Segment.	74%
Launch Vehicles and associated systems or subsystems, Creation of Spaceports for launching and receiving Spacecraft. Beyond 49% these activities are under government route.	49%

Most parts of the space operations are capital intensive. Funding is going to remain a challenge for most space companies, particularly the start ups. A large portion of the funding will come from local venture capitalists. As the operations scale, the startups will need a larger and a more patient capital source. The new FDI policy can bring in foreign investors and decentralise investment decisions. However, the Indian industry has to compete globally to attract investments.

2 A Preview of Space Policies in other Countries

For the benefit of context, it is useful to outline the policy models of other space-faring countries. This document focuses on the US, Japan and UAE as they represent three different models of developing the space ecosystem.

2.1 USA

The American space ecosystem is the largest in the world in terms of scale and capabilities. The US enjoyed the first movers advantage in the this domain from the space race during the cold war. The legacy space enterprise model in the US wanted the government to own and manage space assets to reduce risk. The US has moved away from this thinking. It presently follows a "exploit what we have, buy what we can, and build what we must" approach as it seeks to actively leverage the capabilities of its private space sector.[38]

To facilitate a pro-growth environment for the development of a flourishing commercial space industry and create scope for private sector investment into space assets, the government enacted the U.S. Commercial Space Launch Competitiveness Act in 2015. [39]

The US National Space Policy, 2020 emphasises on encouraging private space entrepreneurship and innovation in order to preserve the American edge in space operations. The US government seeks to actively identify and invest in commercial technologies that can contribute to the State-led space projects. They do not want to inhibit or compete with the private sector. The government will take it upon itself to develop space systems only when there are no viable options for procurement in the commercial space sector and/or in the interest of national security. The government will be inventive and non-traditional in the process of acquiring commercial space goods and services.[40]

This is evident in NASA's Artemis program, a key characteristic of it being its industry partners.[41] In an effort to build autonomy and competence of its industry, NASA bought end-to-end space services rather than hardware from the space companies.[42] [43] [44]

Given the strategic imperative of space and the USA's reliance on the private sector in this regard, the government wants to provide a fillip to the American space companies to stay in the US. The government will also safeguard the companies against predatory foreign investment to retain strategic ownership within the country.

The U.S. Space Force Commercial Space Strategy is also in direct support of the U.S. National Space Policy, as are the Department of Defense (DoD) Commercial Space Integration Strategy (2024), United States Novel Space Sector Authorisation and Supervision Framework (2023), and United States Space Priorities Framework (2021).[45]

2.2 Japan

The Japanese Space Policy initially restricted its focus to research and development under the Education Ministry. It operated with smaller budgets. The Plan for Space Policy, 2020 overhauled the system by recognising the latent value of space for national economy and security. Public-private partnerships in space domain took priority over the government-led initiatives. One of the major principles of the new space policy is to maximise procurement from the private sector.[46]

Japan became the fourth country to implement a Space Resource Act in 2021 allowing the private entities to explore, extract, and utilise resources in outer space, including water, minerals, and other natural resources existing in outer space. This legislation is expected to spur private investment and development in the space sector.[47]

In 2023, Japan set up a $6.7 Billion, 10-year fund for the Japanese Aerospace Exploration Agency (JAXA). JAXA will invest in budding space startups and technologies that can take a long time to bear commercial fruit.[48]

2.3 UAE

The UAE is a relatively new entrant into the space domain. The UAE Space Agency was set up in 2014 followed by a National Space Policy in 2016.[49] To implement the policy, a Space Regulation Law was enacted in 2019.[50] The law sets out provisions for regulating space activities including space resource utilisation. The National Space Strategy in 2019 details upon the strategic goals of the UAE space program and the initiatives to achieve them. One of the key goals is to develop local capabilities in the space technology value chain.[51]

Due to the lack of technical skill and know-how given that the foray into space in very recent, the UAE has focussed on setting up an suitable regulatory environment, infrastructure and financial assistance to attract space startups into the country. There are express permits for certain space activities. The UAE has established several dedicated space-tech hubs under the Space Economic Zones Program. These hubs aim to provide the private industry with necessary infrastructure, business-friendly environment and investment opportunities.[52]

3 Recommendations for Indian Space Governance

The Indian space reforms offers significant potential for monetisation, infrastructure development, employment generation and arresting brain drain. Having taken these significant steps for reform and improvement, there are a few more improvements that the government should make:

1. Recondition the conflicting responsibilities of the government agencies
2. Make the regulation independent
3. Create an Adjudicatory and Appellate Body
4. Space Activities Act
5. Government Procurement

3.1 1. Recondition the conflicting responsibilities

ISRO was tasked with numerous and often discordant responsibilities. The reforms remedied this but only partially. Cases of incongruous roles still exist.

IN-SPACe is currently responsible for promoting, enabling, authorising as well as supervising the space sector.[53] These tasks are incongruous and should not be done by a single entity. The government must consider splitting IN-SPACe's various directorates into regulatory and promotional groups to avoid conflicts of interest amongst them in the course of their duties.

Similar incongruity exists in NSIL also. NSIL acts as a promoter as well as a service provider. In the due course of its duties of advancing the private industry, a scenario is likely to emerge where the private industry may become NSIL's competitors.

3.2 2. Make the regulation independent

As a regulator, IN-SPACe has to govern the activities of all the participants in the space sector in India, including ISRO. Presently, IN-SPACe is an autonomous agency under Department of Space. The Secretary of the DoS is also the Chairman of ISRO. This means that IN-SPACe is essentially in charge of regulating its own head.

Institutional independence and impartiality is paramount in the regulation of a sector as important as space. The regulatory side of IN-SPACe should get statutory backing outside of the DoS to allow effective discharge of its duties.

3.3 3. Create an Adjudicatory and Appellate Body

As the Indian space ecosystem grows, an institutional mechanism to handle disputes between the licensor (IN-SPACe) and licensees (fprivate sector/government agencies) are likely to surface. The settling of such disputes cannot be arbitrary.

The statutory mechanism for IN-SPACe must also create INDSAT–Indian National Space Dispute Settlement and Appellate Tribunal. The tribunal can handle the adjudicatory and appellate functions.

3.4 4. Space Activities Act

The next logical step in the reforms is for the Parliament to approve and enact the Space Activities Act. The Act should establish a liberal regulatory environment that can instil confidence in the commercial space sector. With market-friendly provisions related to resource utilisation, liability and insurance, the act has enormous potential to complement the Space Policy and FDI reforms. The act is a potential signal to the companies and investors in the world about the Indian space ambitions.

At the present, most Indian space startups are incorporated in the US and Europe to take advantage of the more conducive startup environment and to attract better capital and talent.[54] While the National Space Policy and FDI liberalisation can improve India as a destination with respect to these factors, the Act is required for the legal teeth it provides to the policies.

3.5 5. Government Procurement

The government has a big role to play in creating demand in the commercial industry. A shift from *make* approach to *buy* approach is essential here. The Indian government is spending public funds to *make* things on its own and therefore building ISRO's capabilities. What it should be doing instead is spend the same public funds to *buy* things from the private sector and allow the growth in capability to accrue in the society. [55] These contracts will spur competition resulting in vital R&D and innovation, ultimately shoring up on Indian space power.

4 Conclusion

The overall national space power will decide if India lives up to its potential in the global space economy. This space power of the nation is the sum total of all the space companies, talent, infrastructure as

well as government's abilities. Space sector is emergent, often risky and has long gestation periods. There are enormous positive externalities in investing in this domain, the dispersed benefits of which accrue to the society as a whole. The Indian needs to reimagine the way it engages in this sector by further optimising the regulatory environment and streamlining government procurement. The goal should not be to have one ISRO, but numerous ISRO like corporations will similar capabilities.

Endnotes

Notes

[1]Press Release

[2]https://www.weforum.org/press/2024/04/space-economy-set-to-triple-to-1-8-trillion-by-2035-new-research-reveals/

[3]https://telecom.economictimes.indiatimes.com/news/portal-in-portal/satcom/current-size-of-indian-space-economy-is-estimated-around-usd-8-4-billion-jitendra-singh-in-rajya-sabha/105825325

[4]https://government.economictimes.indiatimes.com/news/technology/space-sector-reforms-were-a-bold-move-by-the-modi-govt-former-officials-of-isro-antrix/100566172

[5]https://nanoavionics.com/blog/how-many-satellites-are-in-space/

[6]https://www.nsilindia.co.in

[7]https://pib.gov.in/PressReleasePage.aspx?PRID=1624536

[8]https://pib.gov.in/Pressreleasepage.Aspx?PRID=1633892

[9]https://www.thehindubusinessline.com/news/science/cabinet-gives-nod-to-indian-space-policy-2023/article66708202.ece

[10]https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2007876

[11]https://www.nsilindia.co.in/

[12]https://www.nsilindia.co.in/sites/default/files/u1/NSIL%20Annual%20Report%20-%20English%2021-22.pdf

[13]https://www.nsilindia.co.in/sites/default/files/u1/Annual%20Report-2022-23%20-%20English.pdf

[14]https://www.nsilindia.co.in/sites/default/files/u1/Annual%20Report-2022-23%20-%20English.pdf

[15]https://www.nsilindia.co.in/sites/default/files/u1/Annual%20Report-2022-23%20-%20English.pdf

[16]https://www.nsilindia.co.in/sites/default/files/u1/Annual%20Report-2022-23%20-%20English.pdf

[17]https://x.com/NSIL_India/status/1785273158720737353

[18]https://www.nsilindia.co.in/sites/default/files/u1/Annual%20Report-2022-23%20-%20English.pdf

[19]https://www.nsilindia.co.in/annual-report

[20]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[21]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[22]https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

[23]https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

[24]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[25]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[26]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[27]https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

[28]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[29]https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

[30]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[31]https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

[32]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[33]https://www.thehindu.com/news/national/tamil-nadu/tidco-bets-big-on-space-sector-signs-mou-with-in-space/article67925841.ece

[34]https://www.linkedin.com/posts/ispa-indian-space-association_concept-paper-activity-7030862829700198400-4Z0u/?originalSubdomain=in

[35]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[36]https://www.inspace.gov.in/inspace/sys_attachment.do?sys_id=772aa89787748210de76a8660cbb35e9

[37]https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2007876

[38]https://www.spaceforce.mil/Portals/2/Documents/Space%20Policy/USSF_Commercial_Space_Strategy.pdf

[39]https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf

[40]https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/12/National-Space-Policy.pdf

[41]https://www.nasa.gov/commercial-lunar-payload-services/

[42]https://www.nasa.gov/wp-content/uploads/2016/08/sp-2014-617.pdf

[43]https://www.nasa.gov/artemis-partners/

[44]https://www.nasa.gov/humans-in-space/commercial-space/commercial-crew-program/commercial-crew-program-overview/

[45]https://www.spaceforce.mil/Portals/2/Documents/Space%20Policy/USSF_Commercial_Space_Strategy.pdf

[46]https://www8.cao.go.jp/space/english/basicplan/2020/abstract_0701.pdf

[47]https://www.loc.gov/item/global-legal-monitor/2021-09-15/japan-space-resources-act-enacted/

[48]https://asia.nikkei.com/Business/Aerospace-Defense-Industries/Japan-to-set-up-6.7bn-JAXA-fund-to-develop-space-industry

[49]https://space.gov.ae/Documents/PublicationPDFFiles/UAE_National_Space_Policy_English.pdf

[50]https://www.moj.gov.ae/assets/2020/Federal%20Law%20No%2012%20of%202019%20on%20THE%20REGULATION%20OF%20THE%20SPACE%20SECTOR.pdf.aspx

[51]https://space.gov.ae/Documents/PublicationPDFFiles/2030-National-Strategy-Summary-EN.pdf

[52]https://u.ae/en/about-the-uae/science-and-technology/key-sectors-in-science-and-technology/space-science-and-technology/space-programmes

[53]https://www.inspace.gov.in/inspace

[54]https://www.sia-india.com/spaceport-sarabhai-s2-indias-first-dedicated-space-think-tank-launched-its-report-why-do-indian-founders-in-the-space-industry-start-their-start-ups-abroad-at-the-in/

[55]https://papers.xkdr.org/papers/MashelkarST2024_rethinking_indian_innov.pdf

The Takshashila Institution is an independent centre for research and education in public policy. It is a non-partisan, non-profit organisation that advocates the values of freedom, openness, tolerance, pluralism, and responsible citizenship. It seeks to transform India through better public policies, bridging the governance gap by developing better public servants, civil society leaders, professionals, and informed citizens.

Takshashila creates change by connecting good people, to good ideas and good networks. It produces independent policy research in a number of areas of governance, it grooms civic leaders through its online education programmes and engages in public discourse through its publications and digital media.