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Research

India's Tryst with Space Exploration

Legal and Regulatory Overview

March 2023

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Introduction

In recent years, we have been seeing a renewed interest in the space sector globally. Last year in 2022, the number of orbital launches were 180 that is more than double of the 86 launches five years ago.[1]

All leading economies are racing to explore and exploit space. This is limited not just to government-sponsored space programs. Space exploration by private players has emerged as one of the fastest emerging industries. A leading private company, SpaceX, alone is planning 100 orbital launches this year in 2023 that is roughly one launch every three days.[2]

India is not behind. Until recently, the Indian Space Research Organisation, a government agency, was the only entity in India with full access to this industry. However, under the 'Aatmanirbhar Bharat' policy, the Government of India has recommended revamping numerous industries and space sector being one of them. Under the umbrella of a new organization called IN-SPACe, India's business sector, including start-ups and diversifying established businesses, will be able to join in the national space journey.

In this paper, we discuss various issues involved in this sector for private entities, specifically the legal and regulatory considerations, foreign direct investment rules, dealing with dual–use technology, intellectual property rights as well as a comparative analysis of the global legal and regulatory framework.

1 Maidenberg, Micah, 2023, Space X Aims to Increase Launches as Rivals Prep New Rockets. The Wall Street Journal, 8 January, https://www.wsj.com/articles/spacex-aims-to-increase-launches-as-rivals-prep-new-rockets-11673132510, last visited 9 January 2023.

2 Id.

Background

India's first foray into space research and exploration came in 1962 with the establishment of the Indian National Committee for Space Research ("INCOSPAR") under the Department of Atomic Energy. INCOSPAR was replaced in 1969 with the Indian Space Research Organization ("ISRO"), with an aim to use space technology to progress the national position in the global competition of space exploration. Further, in 1972, the Department of Space and the Space Commission (DSSC) was formally formed.[1]

With the additional resources added to its repertoire by the DSSC, ISRO built the first Indian satellite, Aryabhata, and launched it with Soviet Union assistance in 1975 as the first achievement of the country's space programme. This led to a greater understanding of satellite technology and related research, including TV broadcasting via the Satellite Instructional Television Experiment (SITE) program.[2] In 1980, Rohini became the first Indian satellite to be successfully placed in the orbit by India using an indigenously made launch vehicle, SLV–3.[3] In 1984, in the first feat of physical space exploration, Rakesh Sharma became the first Indian citizen to go into space as part of a 3 – member Soviet – Indian crew.

Since then, India has expanded Its space program in the areas of communication, broadcasting, meteorology, defence, GEO satellites, astronomy, cartography, academic research, and even exploration of the Moon through two Chandrayaan missions and of planet Mars through its Mars Orbiter Mission, Mangalyaan. Figure 1 below shows all major milestones achieved by the ISRO.

Figure 1 — ISRO Missions & Milestones

Year	Mission	Purpose
1975	Aryabhata	To conduct experiments in X-ray astronomy, aeronomics, and solar physics
1977	Satellite Telecommunication Experiments Project	The main objectives of the experiment were to educate the financially backward and academically illiterate people of India on various issues via satellite broadcasting, and also to help India gain technical experience in the field of satellite communications.
1979	Bhaskara-I	The first experimental remote-sensing satellite which was built in India was launched namely Bhaskara–I. The images sent by it are used to study hydrology and forestry and oceanographic studies.
1980	SLV-3	India's first experimental satellite vehicle was launched namely Satellite launch Vehicle–3 (SLV–3) which makes ISRO sixth nation in space program. SLV–3 launched second time with Rohini. The mission was successful.
1981	Rohini	The satellite carried a solid-state camera using linear array of detectors for remote sensing applications.
1982	Insat–1A	Its objectives were to satisfy various needs in the domains of communications, meteorology, broadcasting, as well as search and rescue operations.

1 Department of Space and ISRO HQ, https://www.isro.gov.in/about-isro/department-of-space-and-isro-hq, last visited June 3, 2022.

2 Aryabhata, https://www.isro.gov.in/Spacecraft/aryabhata-1, last visited June 4, 2022.

3 Rohini Satellite RS-1, https://www.isro.gov.in/Spacecraft/rs-1-1, last visited June 4, 2022.

Year	Mission	Purpose
1984	Soyuz T-10	A joint manned mission of India and Soviet Union had been launched. In this mission the first Indian cosmonaut, Rakesh Sharma, spent eight days in Russian space station Salyut 7.
1987	ASLV	ASLV was launched with SROSS–1 satellite. It was designed to augment the payload capacity to 150 kg, thrice that of SLV–3, for Low Earth Orbits (LEO).
1988	IRA–1A	Remote Sensing Satellite
1991	IRA1–1B	Remote Sensing Satellite
1993	PSLV	PSLV has been used to launch various satellites into Geosynchronous and Geostationary orbits, like satellites from the IRNSS constellation. It launched several satellites for historic missions like Chandrayaan and Mangalyaan.
2001	GSLV	Designed for launching communication satellites.
2002	Kalpana–1	Collection of weather data from low cost unattended data collection platforms- to configure Metsat spacecraft within the lift-off mass constraints of upgraded existing polar satellite launch vehicle for deployment in geo—synchronous transfer orbit (GTO) mission.
2003	GSAT–2	Experimental communication satellite
2004	Edusat	The first dedicated "Educational Satellite" that provides the country with satellite based two-way communication to classroom for delivering educational materials.
2007	Cartosat–2	The objective of the mission was to design, develop, launch and operate an advanced optical remote sensing satellite for providing spot imagery with a high spatial resolution in the Panchromatic band.
2008	Chandrayaan–1	Chandrayaan–1 was launched to orbit the Moon and to dispatch an impactor to the surface. Scientific goals included the study of the chemical, mineralogical and photo geologic mapping of the Moon.
2009	Risat–2	Radar Imaging Satellite
2010	Launch of Cartosat–2B, STUDSAT and three small foreign satellites by PSLV	Remote Sensing Satellites
2011	Resourcesat–2	Resourcesat–2 was launched to continue the remote sensing data services to global users provided by RESOURCESAT–1, and to provide data with enhanced multispectral and spatial coverage as well
2012	Risat–1	Radar Satellite–1 (RISAT–1) is a state-of-the-art Microwave Remote Sensing Satellite carrying a Synthetic Aperture Radar (SAR) Payload operating in C-band (5.35 GHz), which enables imaging of the surface features during both day and night under all weather conditions.
2013	IRNSS–1A	IRNSS–1A transmits navigation service signals to the users.
2014		The mission's primary objective is to develop technologies required in planning, designing,

Year	Mission	Purpose
	Mars Orbiter Mission	The mission's primary objective is to develop technologies required in planning, designing, management and operations of an interplanetary mission. The secondary objective is to explore Martian surface features, mineralogy, morphology and atmosphere using indigenous scientific instruments.
2014	GSLV Mk–III	It was launched to enable India to launch its heavier satellites without dependence on foreign rockets and providers.
2015	Astrosat	India's first dedicated multi-wavelength space observatory.
2016	GSAT–18	Communication Satellite
2016	IRNSS–1E & IRNSS–1F, IRNSS–1G	Indian Regional Navigation Satellite System (IRNSS)
2018	ISRO — BHEL Tieup	Production of Space Grade Lithium–Ion Cells.
2019	Chandrayaan–2	To send an orbiter, lander, and rover to the Moon.

India currently operates two significant satellite systems. They are the Indian Remote Sensing Satellite System (IRS), which is used for monitoring and managing natural deposits, and the Indian National Satellite System (INSAT), which is used for telecommunications, television broadcasting, and meteorological services. India" has the biggest network of remote sensing satellites for civil use in the world."[4] It consists of plethora of satellites to meet national needs.[5]

The Polar Satellite Launch Vehicle (PSLV), is mainly there to launch experiment satellites, remote sensing and payloads of up to 1,600 kg into polar or low Earth orbits, is one of two generations of operational launch vehicles. Second, India has created a Geosynchronous Satellite Launch Vehicle (GSLV) that can launch satellites weighing up to 2,200 kg into orbit. The Indian space program has always emphasized international collaboration. More than 25 agreements involving diverse space technology and services have been struck by ISRO.[6]

ISRO is also well connected with the leading global space-related agencies. ISRO has taken a role in deliberation on the Scientific and Technical as well as Legal sub-committees of the UN-COPUOS in order to formulate policies for the peaceful use of outer space by countries.

4 Gordon, Michael R. & David S. Cloud. 2007. US knew of China's missile test, but kept silent. New York Times, 23 April. Salloum, Anthony. 2007. Canada badly needs a national space policy. Embassy. OPED, 20 June, http://www.embassymag.ca.

5 "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies." 1967, http://www.state.gov/t/ac/trt/5181.htm.

6 US Dept. of State. 2007. Narrative to the Outer Space Treaty, http://www.state.gov/t/ac/trt/5181.htm#treaty.

The other fora are:

- The United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP),
- International COSPAS–SARSAT system for search and rescue operations,
- International Astronautical Federation (IAF),
- International Academy of Astronautics (IAA),
- International Institute of Space Law (IISL),
- Committee on Earth Observation Satellites (CEOS),
- Committee on Space Research (COSPAR),
- Inter-Agency Debris Coordination Committee (IADC),
- Space Frequency Coordination Group (SFCG),
- Coordinating Group on Meteorological Satellites (CGMS),
- International Space Exploration Coordination Group (ISECG),
- International Global Observing Strategy (IGOS),
- International Space University (ISU),
- Asian Association for Remote Sensing (AARS),
- International Society for Photogrammetry and Remote Sensing (ISPRS).

Internationally, ISRO plays active role in sharing its expertise and satellite data for the management of natural disasters through various multi-agency bodies like International Charter for Space and Major Disasters, Sentinel Asia and UNSPIDER. The Centre for Space Science and Technology Education for Asia and the Pacific (CSSTE-AP) has also been set up in India under the initiative of UN Office for Outer Space Affairs (UN OOSA).

The Interagency Space Debris Coordination Committee (IADC), including representatives from various space organizations has ISRO as its member. The UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has the authority to create and formulate several treaties, protocols, and agreements that have effectively become the corpus of international law on outer space. National and international norms, guidelines, procedures, regulations, and treaties that are developed by all these forums are included in the country's international space law. For customary practices, legal issues are significant in launch services, satellite telephone, satellite broadcasting, earth observation (Remote Sensing), satellite data processing and dissemination, navigational systems and intellectual property rights.

Indian Legal Landscape

While the government is actively looking to empower business sector to participate in the space sector, the sector is still under the full domain of the ISRO, a government agency, India has yet to develop a comprehensive space policy for private sector. It is expected that a lot of relevant rules and regulations will be driven by the international treaties in which India is a signatory.

India joined the only international venue for the formulation of international Space Law in 1958 – the General Assembly's ad hoc committee on the Peaceful Uses of Outer Space (COPUOS) and its different subcommittees. This Committee was instrumental in the negotiation of numerous international space accords, of which India is a signatory.

The Treaty on Principles Governing States' Activities in the Exploration and Use of Outer Space, along with the Moon and Other Celestial Bodies 1967 (the Outer Space Treaty) were ratified by India in 1967, although it was not fully ratified until 1982. In 1979, India signed the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space 1968 and recognised the Convention on International Liability for Damage Caused by Space Objects 1972. India also signed the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1979 and acceded to the Convention on Registration of Objects Launched into Outer Space 1975 in 1982.

There are additional regulations in India that are relevant for space applications. The Satellite Communication Policy of 2000 (SATCOM)[1] and the Remote Sensing Data Policy of 2011 (RSDP 2011)[2] are the two main policies.

The SATCOM makes Indian satellites' wireless spectrum (such as INSAT) widely available to a huge part of the economy and population. Since the policy did not specify how it would be implemented, the Department of Space (DoS) has established the necessary standards, rules, and processes.

The RSDP 2011 governs remote sensing activities in India. It was initially introduced in 2001 but was further revised in 2011. It outlines the procedures for obtaining, processing, distributing, and storing remote sensing data in India. It aims to promote the use of remote sensing technology in India for a variety of purposes, such as natural resource management, land use planning, and disaster management. It ensures that remote sensing data is used for the benefit of the country and its citizens, and to protect the interests of the Government of India and other parties. It also seeks to encourage the use of remote sensing data for research and development, and to stimulate the growth of a domestic remote sensing industry in India. The object of the RSDP 2011 is to promote the responsible use of remote sensing technology and data for the benefit of India and its citizens.

Additionally, the Minister of State for Atomic Energy and Department of Space has recently declared that the Space Activities Bill is under "active consideration," reiterating the Indian government's desire to increase private participation in the country's space industry.[3] The Bill aims to regulate and encourage commercial participation in India's space industry. The adoption of this Bill will provide a significant boost to India's space industry, which has been hampered for years by a lack of clear and favourable policies.[4]

1 ISRO, A policy framework for satellite communication in India, https://www.isro.gov.in/sites/default/files/article-files/indias-space-policy-0/satcom-policy.pdf, last visited June 6, 2022.

2 ISRO, Indian Remote Sensing Data Policy 2011, https://lib.icimod.org/record/8866, last visited June 7, 2022.

3 Department of Space, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1740219, last visited June 7, 2022.

4 Explanatory note on Draft Space Activities Bill, 2017, PRS India, https://prsindia.org/files/bills_acts/bills_parliament/1970/Draft Space Activities Bill 2017.pdf, last visited June 8, 2022.

According to the Bill's explanatory note, national space legislation is required to "promote the overall growth of space activities in India." Private organisations shall be controlled in accordance with India's international treaty commitments. Most of the provisions in the proposed law are extensions of and conformance with the Model Law. Some portions of the law, however, are contentious. For example, while the indemnity clause in Section 12 is a positive move, it should also be reflected when licensing is granted to a company to engage in space operations. In other words, when a private organisation is awarded a license, it must have the financial resources and insurance coverage to indemnify the Government in case of any mishaps.

In October 2020, the government also issued a notification exempting satellite launch services provided by the ISRO, Antrix Corporation Limited (ACL), and NewSpace India Limited (NSIL) from goods and services tax (GST). This was a key development since Indian and international registered space enterprises were earlier regarded differently when it came to the application of GST.[5] Furthermore, the Cape Town Convention Bill (which will put the Convention on International Interests in Mobile Equipment into effect) is already in the works, with the Ministry of Civil Aviation serving as the lead ministry. As a result, now this may be the appropriate time for the government to ratify the Space Assets Protocol and include it into the draft national space legislation, or to include the space aspect in the Cape Town Convention Bill.[6]

The Government of India established IN-SPACe (Indian National Space Promotion and Authorisation Centre) on June 24, 2020. IN-SPACe serves as a "single window nodal agency" created to accelerate the commercialization of Indian space activities. The Indian government published a draft of the Space-based Communication Policy of India–2020 (Spacecom Policy–2020), as well as proposed standards, guidelines, and procedures for its implementation (Spacecom NGP–2020). It is expected to come into power soon. The SpaceCom Policy 2020 seeks to accomplish two goals. 1) the policy will govern the commercial use of satellites, orbital slots, and ground stations for communication purposes. 2) it discusses how private companies can obtain permission to launch new communication satellites and ground stations.[7]

In November 2020, the Department of Space of the Government of India proposed a draft Space-based Remote Sensing Policy of India (Space RS Policy 2020)" and draft "Norms, Guidelines and Procedures for implementation of Space RS Policy 2020 (Space RS NGP 2020). With the advent of technology and the shift in global trends resulting in higher demand for remote-sensing data for developmental and commercial activities, this policy aims to issue directions for space-based remote sensing for enhanced participation of Indian industry and 'ease of data access'[8]. This policy differs significantly from RSDP 2011 as under the 2011 policy only the National Remote Sensing Centre authorised by the ISRO could obtain and disseminate remote-sensing data.

Through this policy, the Government encourages commercialization of space technology as it promotes Indian Industries to carry out space based remote sensing activities within and outside India[9]. While private businesses contribute resources, expertise, and speed to the project, it is anticipated that Indian industry will use space-based remote sensing technologies to assume a prominent role in the world economy. It enables the commercial Indian industry to develop and operate space-based remote sensing systems in a responsive and flexible regulatory framework. Additionally, it facilitates easy dissemination of remote sensing data and services, with the exception of "sensitive data and information[10]," and it focuses on developing space-based remote sensing

5 Circular No. 164/20 /2021-GST, Ministry of Finance, Government of India (2021)

6 Explanatory note for the proposal for enactment of the Cape Town Convention Act, 2018 for implementation of the Cape Town Convention/Cape Town Protocol in India, https://www.civilaviation.gov.in/sites/default/files/Cape%20Town.pdf, last visited June 8, 2022.

7 Draft Spacecom Policy – 2020, https://www.isro.gov.in/sites/default/files/draft_spacecom_policy_2020.pdf, last visited June 8, 2022.

8 Draft Remote Sensing Policy 2020, https://mycoordinates.org/spacers_policy_ngp_2020_draft.pdf, last visited Dec 9, 2022.

9 Id.

10 Id.

systems to meet domestic needs, which commercial entities are unable to effectively, affordably, or consistently meet due to national security or economic considerations.

The policy norms promote Indian industries to carry out space-based remote sensing activities within and outside India. In order to meet the increasing demand for remote-sensing data, the Government encourages the participation of Indian industries in providing end-to-end space-based remote sensing data and services, including the building and operating of space assets, establishing ground stations, satellite data acquisition and dissemination.[11]

Enabling easy access of satellite based remote sensing data is another object. The Government allows any service provider to disseminate remote-sensing data and services to any user in the country. However, data classified as sensitive would be disseminated through a different mechanism and Government would have the right to restrict operations of the commercial systems and limit collection and/or dissemination of certain data and products.[12]

There is a provision of timely and responsive regulatory environment for the commercial Indian industry to establish and operate space based remote sensing systems. An appropriate regulatory system is necessary for private enterprises to participate in the development, management, and implementation of space-based remote sensing. The roles, eligibility, duties, and accountabilities of the players should be made plain to them. These aspects and the requisite authorizations are covered by SpaceRS NGP–2020. The Department of Space has the authority to authorize as well as bring out any policy reforms.

Concentrating on the realisation of space-based remote sensing systems to cater to the country's needs cannot be effectively, affordably and reliably satisfied by the commercial entities, either due to national security concerns or economic factor. Use of remote sensing data for initiatives such as sustainable development, climate change mitigation etc., do not have commercial benefits but play crucial role in country's development. Newer remote sensing technology for such activities should be facilitated by R&D and should be operated by the Government. Also, in view of sensitivities involved for strategic observations, the systems that needs to be developed with indigenous designs will be under the direct control of Government and shall be pursued by the Department of Space (DOS).[13]

11 Id.

12 Id.

13 Id.

Private Entities in the Space Sector

Private firms have primarily been involved in the Indian space sector through contractual relationships with the Department of Space via Antrix Corporation, which is the ISRO's commercial arm.

In September 1992, Antrix Corporation was established as a company under the administrative jurisdiction of the Indian government's Department of Space. ISRO's commercial arm, Antrix, promotes and distributes the products and services developed as part of the Indian space program. Antrix recognizes the importance of private sector engagement in the Indian space sector's growth and ability to capture a fair portion of the global market and is working to build better models for inclusion.

Antrix's current responsibilities includes that users are provided with communication satellite transponders.[1] Antrix provides satellite communications service providers with the required space segment capacity, focusing on the Indian subcontinent. Indian users have access to about 190 transponders in the INSAT/GSAT system and close to 100 transponders leased from international satellite operators for various services.[2] Antrix provides worldwide customers with data from a constellation of Indian Remote Sensing (IRS) satellites. Antrix sells IRS data and services from the satellites RESOURCESAT, CARTOSAT, and OCEANSAT. It has inked five reseller agreements to promote IRS products around the world, and it is currently looking for new distributors to expand IRS' reach.

Antrix is also focusing on value-added services and capacity building for worldwide customers in addition to data distribution. It plans to establish a foundation for space applications on the ground with design, system engineering, procurement, installation, commissioning, operationalization, hosting, and maintenance of state-of-the-art satellite earth stations/telemetry, tracking, and command (TTC) stations and associated support systems, safety and security systems, and integrated monitoring and control systems. Antrix supplies NavIC only SPS receiver modules, NavIC + GAGAN/ GPS receiver modules, and NavIC only passive antenna to various parties. In collaboration with the industry, the corporation developed the NavIC Messaging Receiver, and it is expected to be well received by the end-user community. Provide satellite mission support services: Antrix provides Telemetry, Tracking, Command (TTC), and other satellite operations services to notable customers worldwide. It has supported the Transfer Orbit Support Services (TOSS) for the Amazonas–5 and Viasat–2 satellites utilizing the Earth Stations at Master Control Facility under an arrangement with M/s Intelsat (MCF). It also assisted the Swedish Space Corporation and Norway's KSAT with TTC.[3]

In March 2019, the Department of Space established the New Space India Limited (NSIL) to handle ISRO's commercial activities. Its goal is to sell products and services generated by India's space program to clients worldwide and help the Indian economy flourish by taking on more technologically complex space-related jobs. It intends to use mechanisms like ToT to empower the Indian sector and serve the Indian and global markets in Small Satellite Launch Vehicles (SSLVs), satellites for numerous uses and harnessing space technology by-products for the greater good.

The Indian National Space Promotion and Authorisation Centre (IN-SPACe), was established in June 2020 by the government. This body acts as a regulator and facilitator for the private space industry in India, with the goal of assisting, promoting, and guiding it. For IN-SPACe to serve as a regulator under Article VI of the Outer Space Treaty, a licencing, authorisation, and oversight regime was established. It also serves as a facilitator for the commercial sector, assessing its needs in collaboration with the ISRO.

1 http://www.antrix.co.in/business/launch-services, last visited 1st June 2022.

2 http://www.antrix.co.in/business/transponder-provisioning-services, last visited 1st June 2022.

3 Indian National Space Promotion and Authorization Center (IN-SPACe), https://www.isro.gov.in/indian-national-space-promotion-and-authorization-center-space, last visited June 9, 2022.

FDI issues in Space Exploration

About 75 businesses with innovative ideas to further the Indian space industry have registered on the government as of 2022. These private companies will have the ability to build and launch space objects, establish a base at Department of Space facilities, utilize ISRO facilities and infrastructure, and create new space infrastructure for ISRO thanks to IN-SPACe, which will allow them to be more than just vendors.[1]

The next stage after allowing commercial operators into the Indian space business has been to allow foreign direct investment. In order to work with foreign companies and open the Indian space sector to both domestic and international businesses, ISRO officials have urged for the establishment of a new FDI policy.

Given the national security concerns, the foreign direct investment (FDI) in space is currently only permitted through the government route for satellite creation and operations. Additionally, the government approves FDI in space on a case-by-case basis, and such clearance can sometimes take years depending on the situation. However, international businesses have shown interest in making investments in this sector after observing the Indian government's shift in attitude regarding the engagement of private firms.

The Indian Minister of Space notified the Indian Parliament in February 2022 that the government intended to permit FDI in space. While FDI is now only permitted in satellite manufacturing operations, the new FDI policy is likely to encourage investment in other space-related sectors. According to ISRO officials, this new FDI strategy will allow foreign businesses to establish bases in India and use ISRO facilities for carrying out a variety of space operations. The areas that were previously blocked off to FDI would be opened up to create a mutually beneficial partnership between the Government and private actors, according to ISRO Chairman, albeit we have yet to see the specific sectoral guidelines that the Government will impose on FDI.[2]

As discussed earlier, India is now passing a Space Activities Bill in response to this, which would create a favourable climate for commercial engagement and provide a robust regulatory framework for controlling space activities. The Bill is expected to offer principles for enabling FDI and controlling private sector involvement. A license process is included in the 2017 draught of the Bill for conducting commercial space operations. According to the Bill, a license would be granted by the Indian Government in response to a request made by a body that specifies the intended commercial space activity. Based on this, both local and international private players are eligible to apply for a license and engage in business operations in space on ISRO's property.

1 https://www.scconline.com/blog/post/2022/03/16/fdi-in-space-india-opens-its-space-arena-to-foreign-investment.

2 https://www.business-standard.com/article/economy-policy/government-plans-to-open-fdi-in-space-sector-jitendra-singh-122020901539_1.html.

Dual–Use Technology in Space Exploration

Satellite technology is regarded as dual use since it has value from a technological standpoint for both military and civic purposes. An estimated 95% of space technology may be classified as a dual-use technology. [1]

The panoptic surveillance capabilities of satellite remote sensing and photography, for instance, can be optimized for civil usage through Earth resource surveys but can also be optimized for military intelligence purposes through reconnaissance systems. This technical entwining is demonstrated by the construction of the Israeli EROS — A Earth observation satellite, which was built on the designs of the Israeli spy satellite Ofeq–3.[2] With this in mind, whether a space asset's primary raison d'être is explicitly for civilian purposes can then be difficult to determine.

A strategic advantage is offered by the dual–use technology's military capabilities. The state does not want its rival to achieve technical parity or to gain the same advantage. Prima facie this looks like a zero-sum game where in the cutthroat space sector, one country's military gain is its enemy's loss. Dual–purpose technology is therefore regarded as sensitive technology. US in fact has strict export restrictions on dual–use technology that are regulated by the same export restrictions that oversee the sale of weapons in order to contain technical leakage and maintain its military edge.[3]

1 Johnson-Freese, 2013, pp.30.

2 Robert L. Pfaltzgraff, Space and U.S. Security: A Net Assessment, Jan 2009, The Institute for Foreign Policy Analysis, Pp.47.

3 https://britishpugwash.org/wp-content/uploads/2016/05/21-Maya-Pillai.pdf.

Intellectual Property Rights Issues

It has taken a while for intellectual property ("IP") concerns to start to be brought up in relation to extra-terrestrial activities, despite the fact that space technology has long been one of the most advanced technical fields in the world and that outer space activities are actually the result of intellectual creations. The fact that space operations are gradually moving from being state-owned to private and commercial activity is one of the causes of this. Additionally, a growing number of space operations are carried out in accordance with international cooperation agreements, which rely on a clear, consistent, and trustworthy international legal framework.

In India, like in other countries, the status of IP laws in space-related activity remains at a very nascent stage. There is no special significant national space legislation in India as discussed previously, even though India is a signatory of international conventions like the Moon Treaty of 1979, the Liability Convention of 1972, the Rescue Agreement of 1968, and the Outer Space Treaty of 1967.

National space law is required to enable the entire expansion of space operations in India, and the government will bring the Space Activities Bill, 2017, which has been forwarded to the Prime Minister. The proposed law that was discussed previously also, aims to promote private commercial organizations' engagement in space operations in India under the direction and approval of the government through the Department of Space while also promoting and regulating Indian space activities. The measures for the protection of IP rights developed during any space-related activity are covered in Section 25 of the proposed law. The provision's flaw, however, is that it suggests that any intellectual property developed on board a space object be treated as belonging to the Central Government. The measure does not address or defend the interests of the private entities, despite the government's intention to incorporate commercial participation in space operations. Additionally, the law ignores several crucial elements like flags of convenience and orbital patents.

The government's statement that private parties would be allowed to participate in space activities and the introduction of the Space Activities Bill 2017 demonstrate the government's willingness and unmistakable intention to safeguard space IP. Even if there are several difficulties and anomalies that need to be resolved, the government has shown its desire by providing notice and included a section regarding them.[1]

The largest problem plaguing the start-up community in the space industry, which the government opened up for private engagement approximately two years ago, according to Indian Space Association (ISpA) head Jayant Patil, is the question of intellectual property rights.[2] India has ratified every international space treaty that forms the basis of international space law. The Indian Parliament oversees creating a new space policy to control IP Rights in space. Indian space technology is developing at a faster rate than international standards, necessitating rules that can keep up. the potential for mining, research, testing, tourism, etc. Time is apt for providing incentives to support investment and other experiments while in space, given the possibility for the transfer of territory dependent IP Rights to radically shift attention towards space activities. Private business endeavours for profit must be held accountable in a standard and obvious manner. [3]

1 https://www.mondaq.com/india/patent/1038616/ip-laws-in-outer-space.

2 https://www.zeebiz.com/small-business/news-new-space-policy-clarity-on-intellectual-property-rights-key-for-success-of-startups-194126.

3 KP Abitha, Intellectual property and outer space: The need of international harmonized legal framework, 6, International Journal of Law 3 (2020).

Global Landscape

The United States of America ("US") holds cogent, authoritative and robust framework of space law and regulatory apparatus. Plethora of countries have modelled their laws after those of the US. The National Aeronautics and Space Act of 1958 legally instituted the NASA to show the entire world about American foray into the space exploration research paradigm.[1] The National Space Policy, 2010 aims to "energise competitive domestic industries to participate in global markets and enhance space launch development."[2] Further, the National Space Transportation Policy, 2013 aimed to boost a robust space industry for exploration, transportation.[3] The US ratified the Commercial Space Launch Competitiveness Act in 2015.[4] This 2015 Act, inter alia, posits process to mine celestial bodies of the space.

The United Kingdom Space Agency (UKSA) got established in 2010 to be the lead space exploration public organisation of England. The number of legislations governing the British space exploration are mainly two. The Outer Space Act, 1986, is an enactment of general global principles of space exploration as well as the treaties that UK ratified. This legislation of 1986 makes England govern exploration of outer space and other allied pursuits.[5] The Outer Space Act also establishes a list of norms that must be observed. One should apply for an OSA licence if you need to dispatch or work on a space project, space exploration. The Traffic Signal Framework (TLS) got established by the convention, through generating a specified tone namely red, golden, or green. These colours aid in tracking the status of application. The Space Industry Act, 2018 posits the means for space exploration and similar activities. It says that every offence that would be an offence in the ward (the United Kingdom) will be an offence in any space created from this country. This is like the arrangements in place for boats and planes.[6]

"On Space Activities" dated August 20, 1993 is the fundamental legislative act governing outer space activities in Russia. The Law on Space Activities establishes the goals and principles of Russian space activities, as well as the licencing process, space activity finance, certification of space equipment conformance, and security and international space cooperation.[7] The Russian Federation, i.e., the federal authorities, have jurisdiction over space activities, according to the Law on Space Activities. Licensing is required for space activities in Russia. It's worth noting that the licencing regime has recently undergone major revisions as a result of Russian Federation Government Decree No. 298 "On Licensing of Space Activities," which went into effect on April 20, 2020.[8] The Roscosmos Order No. 44 "On Adoption of the Federal Space Agency Administrative Procedure for Exercising the State Function of Maintaining the Registry of Space Objects Launched by the Russian Federation into Outer Space" dated March 22, 2010 governs the registration of space objects in Russia. The Registration Regulations define the steps involved in registering a launched space object in the appropriate register. The Registration

1 The National Aeronautics and Space Act of 1958, Pub.L. 85–568, 72 Stat. 426-2.

2 NASA, National Space Policy of the United States of America, https://history.nasa.gov/national_space_policy_6-28-10.pdf, last visited June 8, 2022.

3 Office of Space Commerce, National Space Transportation Policy, https://history.nasa.gov/national_space_policy_6-28-10.pdf, last visited June 9, 2022.

4 Space Act of 2015, Pub. L. 114-90, 129 Stat. 705.

5 Government of UK, Outer Space Act 1986, 1986 Chapter 38, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/295760/outer-space-act-1986.pdf, last visited June 9, 2022.

6 Government of UK, Understanding the Space Industry Act 2018, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/777686/190208_Understanding_the_SIA_-_Final_For_Publication_-_Legal_Cleared_-_Initial_Publication.pdf, last visited June 9, 2022.

7 Law of the Russian Federation, No. 5663-1, "Law on Space Activities", August 20, 1993.

8 United Nations Office for Outer Space Affairs, Selected Examples of National Laws Governing Space Activities: Russian Federation, https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/russian_federation/decree_5663-1_E.html, last visited June 10, 2022.

Regulations are based on the 1974 Registration Convention, to which Russia is a signatory.[9] As a result, the Registration Regulations outline the method for providing information on each space object registered in the Space Registry to the United Nations. Russia retains jurisdiction and control over all registered space objects launched into space and is hence accountable for each one.

After several setbacks and difficulties in developing its space programme, South Korea is planning to launch a lunar spacecraft in 2032 for exploring minerals on the moon. It also aims to launch a spacecraft to Mars by 2045. Through these missions, South Korea strives for extracting essential resources like titanium from space explorations and using these excavations for their economic growth. As the country is lagging compared to its technologically advanced neighbours like China and Japan, it wishes to partner with countries who are in the forefront in developing and launching their own spacecrafts like the USA. According to South Korea's Director-General of the Science Ministry's Space and Nuclear Bureau, the country would initially focus on the market for satellites in lower earth orbits[10] and this market would subsequently hold a pre-dominant share in the space industry. The reason behind South Korea's jumpstart in the global space sector is the belief that space exploration has the potential to boost the economic order of the world.

9 Ibid

10 Sam Kim, South Korea Sees Space Exploration as Shaping Global Economy, Bloomberg (2022), 6 December 2022 at 14:31 GMT+5:30. https://www.bloomberg.com/news/articles/2022-12-06/south-korea-sees-space-exploration-as-shaping-global-economy.

Conclusion

Space is a hostile and difficult environment for humans. Despite being antagonistic to human survival by nature, it has been the source of humanity's hopes and aspirations from the beginning of time. Science has been driven by the desire to explore and, eventually, inhabit space, and the accomplishments of humans in orbiting the Earth and then landing on the Moon have inspired future generations to use earth— and space-based technologies to explore the solar system and beyond. Presently, we are set to embark on the next grand adventure by launching brand-new missions to the Moon and then to Mars.

However, space is increasingly turning into a commercial place. In the 1970s and 1980s, communication satellites offered the first route for commercial space exploitation. As a result of the development of GPS, countless consumer platforms, including those for internet time, navigation, and entertainment, might be created. Commercial space access is now far more affordable thanks to the development of new materials, fuels, and technologies by companies like SpaceX, Blue Origin, United Launch Alliance, New Zealand-based Rocket Lab. Governments are increasingly purchasing space services rather than offering them. Even global launch market alone is expected to grow more than four times in the coming eight years from about $8 billion in 2022 to $35 billion in 2030.[1]

India has long envisioned having independent space capabilities. Currently, the nation creates, develops, manufactures, launches, and manages all classes of satellites for use in communication, remote sensing, and research purposes.

The Indian space policy is in the last stages of discussions and is anticipated to create a path for the private sector to contribute to technology transfer, remote sensing, and satellite communication. The space policy is anticipated to focus on ease of doing business in the burgeoning industry.

It can be expected to see the entry of various private players that will shape the Indian space sector in the coming decades with the approval of the proposed Space Activities Bill, which aims to provide a licencing and regulatory framework for the Indian space industry. However, one would have to wait and see what position the Indian government will take on specific provisions of the Bill. Even IP related issues apropos space exploration will be dependent upon Section 25 of the bill as it pertains to measures of IP protection during space exploration activities.

In addition, because the Bill provides a required insurance requirement, the government will need to determine capability of the market of insurance in India. There is uncertainty regarding government enabling foreign insurers or underwriters to get insurance. The Indian government's multiple measures in recent years promise a new beginning for the country's space sector. Even though several of these projects have yet to be tested, they primarily favour private sector participation. However, certain crucial concerns remain unsolved, such as the imposition of unlimited liability. Unless these concerns are addressed, private-sector participation will be severely hampered, and India will be unable to emerge in the space exploration industry. Quite certainly, with rise of space exploration in India, India will leap in its global standing! Let us hope the Indian Parliament will legislate adequate legal framework for space exploration activities by India.

1 Maidenberg, Micah, 2023, Space X Aims to Increase Launches as Rivals Prep New Rockets. The Wall Street Journal, 8 January, https://www.wsj.com/articles/spacex-aims-to-increase-launches-as-rivals-prep-new-rockets-11673132510, last visited 9 January 2023.

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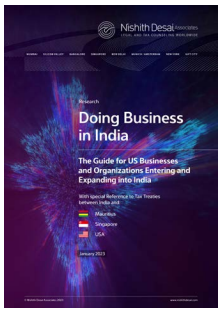

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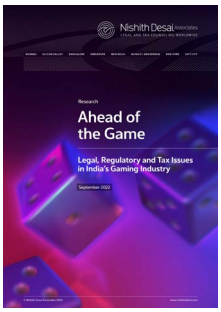

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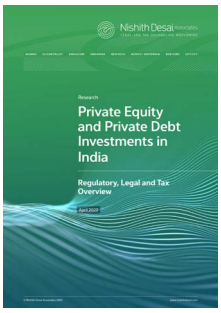

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