

INDIA'S ROLE IN LEVERAGING SPACE IT PARKS TO PROMOTE SPACE BASED CSR

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Abstract

The commercial space industry has the potential to have a substantial influence, notably the creation of a groundbreaking hyperspectral satellite array which can collect information at multiple wavelengths per every pixel, resulting in extremely precise images that help with the recognition of items and substances. Considering the planned second spaceport, India's intention of outsourcing space missions is likely to result in additional launcher agreements for ISRO and five times rise in worldwide space revenue. This piece delves to investigate whether the choice made by the government to let commercial firms access the Indian space environment is likely to stimulate space launching activity. Further it will also study the concept of space parks and the reforms brought by the Indian govt which can facilitate the Indian entrepreneurs to capitalise on the aerospace sector with new technology.

INTRODUCTION

A handful of nations interested in space exploration have the financial capacity or ideological determination to support a national space programme, so governments must use what they do have: the capacity to offer financial incentives, the influence to bring together major players within negotiations, and the foresight to integrate intellect and assets

to beneficial impact.¹ The European Space Agency, for instance, pools intellectual property and study facilities from throughout EU and promotes renowned, specialised enterprises and universities to form satellite clusters—collaborations on satellite-related research and development efforts.² The emergence of private businesses is going to assist the sector grow more profitable. Low-cost space launchers, along with large-scale manufacturing, are expected to drive global demand.

The “Make in India” and “Aatmanirbhar Bharat” projects envision a transformation predominantly within the government-led space system.³ To achieve the current objective of boosting India’s representation of the international space sector, commercial engagement and support for the nation’s space venture capitalist sector remain critical. Given a strong legal structure, additional initiatives aimed at fostering the simplified process of operating for spacetechnology enterprises, and avenues for foreign investment, India’s space sector has a chance to become a pathfinder in the international space industry.

According to the Indian Space Association (ISpA) idea document, the establishment of Space Technology Parks (STP) in the country would propel the industry to greater high places, much as the creation of IT park achieved for Indian commercial business.⁴ The key ISpA idea document, “Space Technology Parks to Energise Aatmanirbhar Bharat in Space Domain,” issued around the sidelines of Aero India 2023, addresses the changes and facilitators required to build an environment for STPs and to assist businesses in developing fresh aerospace technologies.⁵ The demand for the creation of STPs is motivated by the desire to provide an encouraging atmosphere for the expansion of the aerospace manufacturing sector, according to the report. This move follows after the Indian government implemented a spate of space changes commencing from 2020.⁶ India’s Prime Minister announced a three-pronged drive to strengthen its space industry.⁷ INSPACe was established to oversee and regulate space regulations, including national and unique regulations for imagery collection, exchanges, tracking satellites, human space flight, foreign direct investment, and modern technology transfer.⁸

At present, India has more than one hundred space-tech firms. 2021 marked a historic time-period for space-tech businesses, with funding totalling US\$68 million, representing a 196 percent rise year over year.⁹ In 2021, the country saw the launch of 47 unique space-tech businesses. The primary factors for investing within the Indian space market include:¹⁰

- Government's ambition to include commercial actors in the space section.
- Reduce satellite development and launch expenditures.
- Assurance of a large profit from capital.
- Increasing business interest for geospatial information.
- Advances in technology in the space business.

CONCEPT OF SPACE INDUSTRIAL PARKS

Space industrial parks are specialised locations where both public sector agencies and businesses can operate in space research, satellite production, along with other aerospace-related sectors. Space parks frequently include buildings, amenities, and aid operations to encourage joint ventures and creative thinking in the space industry. They are critical for a nation's advancement towards space exploration and expansion of the aerospace sector.¹¹ Further a Space Park can assist in modifying and revolutionising certain fields like communications, managing of assets, debris tracking, as well as HADR operations by creating robust satellite systems and facilitating space related geospatial intelligence. Although, globally, the notion of "Space IT Parks" is not frequently understood and still an evolving niche sector; the marriage between fusing critical IT systems with space-related functions is a continuous development. In fact with the help of technology, global space organisations and businesses have been leveraging operations like satellite transmission, image processing, and missions planning.

So why is there a growing impetus for Space Industrial Parks within the Indian subcontinent? India operates a robust space programme, which has been aided through the methodical realisation of indigenisation, infrastructure, frameworks, and programme deployment.¹² By privatising the space

sector, Indian economy plans to overcome the technological gap, ushering unconventional space-based solutions, and propel Delhi to emerge as the champion in space-tech competition.¹³

Key aspects and potential features of space industrial parks include:¹⁴

- **Manufacturing and Assembly:** Space industrial parks could house facilities for the manufacturing and assembly of spacecraft, satellites, and other space-related components. Such necessitates dedication between corporate and public sector space exploration organisations.
- **Research and Development:** These parks might provide spaces for research and development activities related to space technologies. This could involve collaborations between different entities to advance space-related innovations.
- **Launch Facilities:** Proximity to launch sites or the development of dedicated launch facilities within or near the space industrial park could be an essential component. This will help in efficient transportation of spacecraft and associated component.
- **Testing Facilities:** Testing facilities for space technologies are essential for ensuring the reliability and safety.
- **Education and Training:** Incorporating Educational and training facilities can impart training to the skilled workforce. Universities and vocational institutions could also collaborate.
- **Commercial Ventures:** Private companies should be given incentive in the fields of space tourism, asteroid mining and related commercial activities. These parks could provide a centralised location.
- **Infrastructure & Services:** Supporting infrastructure, such as transportation links, utilities, and other essential services, would be crucial for the success of a space industrial park.
- **International Collaboration:** Space industrial parks could encourage international collaboration, bringing together companies and organisations from different countries to work on common goals in space exploration and development.

HOW THE GLOBAL SPACE PARKS HAVE TAKEN A SHAPE?

Space parks are famous in many nations throughout the globe.

- In China, these took the shape of National High-Tech Industrial Development Zones (NHTIDZs), which displayed unique geographic and temporal traits throughout the last three decades. NHTIDZs, being exclusive places, exemplify the strong link among state power and urbanisation, and they have evolved into an organisational structure for growth in space.¹⁵ The evolving disparity across time and space exhibits a pair of key traits: a quick and unpredictable centralising tendency and a very unequal geographical spread. Any spatial organisation structure of urbanisation that is regulated through the authority of government. Due to their fast geographical growth and significant economic advantages, national-level space organisations have evolved into goals for administrations across all tiers.¹⁶ The nation's goal is to encourage urbanisation by establishing advanced technology areas across the country; as a result, urbanisation within China has evolved into a spatial method of manufacture. China's satellite industry has a diverse range of subjects, from huge state-owned enterprises to tiny, privately held startups. Some organisations, including CASC, CASIC, and its subsidiaries, participate in economic activities such as purchasing and selling items. Some commercial organisations, like CAS institutions, are not commercial firms.¹⁷ The majority of commercial space enterprises in China are concentrated in a few cities and provinces. Beijing has the highest concentration of businesses with firm locations. Other important locations include Shenzhen, Wuhan, Shanghai, and Changsha. While firm offices are often located in a few cities, we discovered that many have offices and affiliates in other locations. Xi'an, Nanjing, Guangzhou, Chengdu, and Changchun are other major industry hubs with many production or research sites. Access to providers, factories, talent, clients (including government agencies), and discounted or free real estate in city-sponsored aviation or high-tech manufacturing areas.

- In the US, NASA is using its assets to help accelerate the space IT parks.¹⁸ Its corporate personnel project, which promotes space goals at the Boeing Company, Space X, and Sierra Nevada Corp., is particularly successful. In anticipation seeking the following stage, named Commercial Crew Transportation Capability, the aerospace agency published an early demand for bids over every summers.¹⁹ Striking capabilities among private players like the NewSpace Age's Henry Ford's sought to create an inexpensive spacecraft, Bigelow Aerospace intends to construct a flexible, commercially controlled and run space facility. Lightweight inflatable objects work past rockets' restricted cargo capacity by fitting a large habitat into a small container. NASA considered the concept for years. In reality, Bigelow's voluminous condos are based on the aerospace agency's trademarked TransHab, a robust, inflatable housing designed for use on Mars or the moon's surface.
- The Russian space and satellite industry is mostly state oriented, although this is likely to shift in coming years. Beginning with modest satellites to an elaborate lunar community, the Russian commercial space IT park has ambitious desires that may be cost advantageous under Putin's leadership. Moscow's transition to a free-market system in 1992 had little impact regarding the Russian aerospace field because the majority of entities were part of government run initiatives. However, entrepreneurial spirit did emerge when a couple of players formed enterprises to take on tiny contracts from government space corporation. Private businesses are currently constructing mini and cube satellites, lightweight rockets, and potentially Lunar homes with unparalleled backing offered by the Russian nodal space agency, Roscosmos, on space R&D, infra and tech.²⁰

SPACE SECTOR REFORMS

The global space economy as per one estimate is currently valued at about USD 360 billion.²¹ Despite being one among a few space-faring nations in the world, India accounts for only about 2 percent of the global space economy. In addition to establishing itself as a pioneer in external launch

solutions, India is well-known for developing low-cost satellites and launch vehicles. With the documentation, made available to gather feedback from organisations and others, one of the key goals under PM Modi's leadership was to establish an industry-driven group that represents the sector's voice. This resulted to the founding of Indian Space Association (ISpA).²² The changes provided a rich foundation for the emergence of several space start-ups, yet it failed to resolve their financial requirements. Although FDI policies hold a chance to alleviate this issue, it is inadequate on their own. India's contribution to the international space market is \$8 billion, with government officials aiming for a five times growth by 2040.²³ To do this, the authorities will need to make greater investments. The new companies are split between both upstream and downstream activity. Upstream operations involve creating and maintaining different space-related assets.²⁴ These involve launchers, satellites, spacecrafts, and spaceports. These actions take some time and carry a possibility of disaster. They necessitate significant and persistent financial commitments.

Throughout the last twenty years, private industry has grown in importance across other space-faring nations as part of the international space market. Organisations such as SpaceX, Blue Origin, Virgin Galactic, and Arianespace have transformed the aerospace sector using breakthroughs and improved technology, lowering prices, and speeding up turnarounds. In India however, players within the private space industry have been limited to being vendors or suppliers to the government's space program. Thus, there was a need to provide opportunities for private industry for enhanced participation in Indian space programme and playing key roles to boost India's market share in global space economy.

Government of India took a major reform in June 2020 with announcement of opening of space sector to Non-Government Entities (NGEs). All parties involved have positively embraced these alterations, and India's space industry participants continues to thrive. Numerous Indian commercial enterprises and start-ups are exhibiting an intense fascination in space-related solutions and services. Thus, to provide a level playing field and favourable

regulatory environment for players within the Indian private sector and to allow them to become independent actors in the space sector instead of being solely vendors or suppliers to the government program, Indian National Space Promotion and Authorisation Centre (IN-SPACe) has been created as the single window agency for promoting the NGEs in the recently carried out space sector reforms.

IN-SPACe role includes promoting, enabling, authorizing, and supervising the NGEs' various space activities, such as developing launch vehicles and satellites and offering space-based services, sharing existing space infrastructure and facilities under Department of Space (DoS)/ISRO control, and enabling establishment of new space infrastructure and facilities.²⁵ The revision also intends to render the national space systems established over time accessible to be exploited by the commercial sector via a business-friendly framework. A framework had been developed in which enterprises can contact IN-SPACe to use ISRO resources. Space sector regulations would optimise the utilisation of space facilities including satellites and launch capability by establishing transparency among diverse players. Creation of new assets will be made contingent on confirmation of demand from user agencies.²⁶ In line of the proposed modifications, New Space India Limited (NSIL) would henceforth function as an authorised government-owned integrator for both the need and the production of commercial space-related resources and amenities like as image processing, connectivity, communications, transponder chips, launching solutions, and so on. Using its capacity as a market platform, NSIL will buy satellites, launch services, and additional assets created by ISRO or the business community. NSIL recently finished an exclusive commercial flight requiring controlled capacity to place 36 One Web satellites in LEO utilising the LMV3 rocket. IMS-1, an end-to-end satellite transportation system for generating 100 kilogramme class spacecraft is now accessible for adoption by NSIL. NSIL just revealed the planned launch of GSAT-20, a High Throughput Ka Band Satellite, aboard Star Link's recyclable Falcon-9 rocket in the second quarter of 2024. The choice was made in response to the tremendous demand

for high-speed internet in distant locations, as well as marine and onboard transmission. One of the major breakthroughs in commercialisation is, PSLV productionisation through industry. HAL and L&T is part of the consortium to produce 5 numbers of PSLVs. To capture the small satellite launching market ISRO has developed Small Satellite Launch Vehicle (SSLV) with a view to transfer the technology to the industry, which was successfully tested recently.²⁷ Private space firms are coming up and striving to make India a hub for small satellite launches. The launch segment is becoming a key area for start-ups and Small and Medium Enterprises (SMEs) as they have developed a significant amount of competence in orbit management for LEO, MEO, and GEO satellite launches. The major private players in this industry are Skyroot Aerospace, Agnikul Cosmos, etc.²⁸

ISRO has traditionally been catering to the growing demand for small satellites launches, but with opening of space sector, would offer great opportunity to private sector. Furthermore, the space parks will provide benefits to SMEs including start-ups by utilising common assets and amenities. Dhruva Space, Pixxel Space India Pvt Ltd, Bellatrix Aerospace, Manastu Space, and others are among the developing private sector firms. To foster the commercial usage of space tech, the “Space Remote Sensing Policy - 2020” seeks to encourage multiple stakeholders for actively engaging in satellite-based sensing activities. Accessible data and intel using space-based sensors will enable the development of knowledge-driven approaches to the country’s multi-faceted approach in strategy and surveillance requirements. The norms of the policy are as follows:

- An Indian space asset for remote sensing data collection.
- An Indian base facility for tracking and controlling satellites.
- Uses space assets to disseminate remote sensing information throughout India.
- Remote sensing data/services for Indian territory using satellite assets.
- Use space-based remote sensing technologies for social, calculated, and study and production purposes.
- Ensure prompt and flexible regulatory environments.

The Space Communication Policy - 2020 aims to meet the country's growing need for space-based telecommunications while also developing appropriate tools for self-sufficiency in the domains of commercial, security, and social communications. The strategy promotes Indian firms as partners in accomplishing these aims.²⁹

- Supervise and authorise the utilisation of space capabilities for transmission to and from Indian territory.
- Protect current space facilities and integrate new ones within operational supervision to enhance national space-based telecommunication capabilities.
- Increase industrial Indian market engagement in space-based interactions, both domestically and internationally.
- To develop and operate space-based communication equipment, the Indian corporate sector requires a rapid and adaptable legal structure.
- Expand space-based transmission solutions to address demands that Indian private enterprises cannot satisfy owing to national defence or financial constraints.

CHALLENGES FOR THE SPACE STARTUPS

The industrial sector's development presents technical problems and possible dangers to the outer space ecosystem. Massive clusters of orbiting satellites operate in an organised system and may have identical circular arrangements to competitors. MicroSats and CubeSats are increasingly being launched without propellers or successful monitoring capacities. Emerging uses, such as space assets improvement, on-orbit service, and corporate satellite terminals, may potentially fall under established legal systems. The space market is seeing an increase of freshly founded industrial and public organisations. New funding and talent supplied by the other businesses may challenge old procedures and practices. Requirement for preserving ecological priorities, including space junk removal and radio frequency cooperation. While some firms may engage in ethical business practices, their operations lack a consistent industry-wide pledge to uphold standards. To cope with the problems of shifting industries, legislation and market autonomy are

necessary. Sustainability has become widespread in non-space businesses and certain space enterprises, potentially supporting sovereign efforts.

APPLICATIONS OF CSR IN THE SPACE PARKS

Overall, the space sector has proved lagging to incorporate Sustainability. The SatCom Industry Association (SIA) advises caution while encouraging responsible space operations, emphasising the importance of considering commercial and technological constraints.³⁰ A few the variables which have influenced the development of sustainability in other sectors are less widespread in the aerospace/space industry. Businesses focused on selling to customers are more inclined to incorporate corporate social responsibility into the way they operate than those focused on business-to-enterprise or business-to-government transactions, such as the space market. Further iteration of CSR in case of Space Parks can be demonstrated through SWOT Analysis as shown below:

Figure 1: SWOT Analysis of CSR in Space Parks

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • Long term planning perspective that complements space industry timelines • In a traditionally risk adverse industry, CSR may enhance a risk mitigation approach • Increased public facing transparency 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Relationship to supply chain is clear but links to operations challenges is not • Short-term resource drain/diversion with potentially unclear operational impacts • Disconnect between large corporate CSR policies and space unit practices/ issues
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • In some geographic regions, CSR can be a vehicle for attracting and sustaining talent • Sets the stage for dialogue on new regulatory issues • Links between CSR, Sustainable Development Goals and the benefit of space development to society • Relatively small size of space industry may ease widespread adoption of CSR 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Culturally, structural and maturity differences in space companies complicate industry wide adaptation of CSR principles • Limited competition means brand differentiation is not as impactful • The space environment is not [yet] linked to environmental sustainability, challenging the connection to CSR

Source: Secure World Foundation, & Well³¹

Implementing CSR-based initiatives at headquarters fosters an organisational culture that drives partnerships to address sustainability issues. It promotes collaboration among opponents to overcome mutual difficulties. Yet, corporate social responsibility fails to function as a commercial or tactical necessity for establishing industry-wide ethical standards. Implementation of CSR techniques is mainly driven on company objectives and effect at the organisation stage. Developing standards that correspond across sustainability can promote acquisition by ensuring alignment with company values and performance.

The ISpA recommends the following factors when developing Space Parks with CSR elements:³²

- Fresh efforts ought to coincide with current SSA procedures and technology. They additionally ought to minimise cost obligations on satellite users.
- Future programmes ought to foster standards regarding the orbital protection instead of enforcing particular rules.
- Advocates for the integration of corporate objectives with innovation, as well as fostering a spirit of cooperation at the company scale through CSR techniques. The tenets of CSR will present an operational setting to encourage ethical conduct.

WAY FORWARD

Space-based connectivity is a key tool for bridging India's digital gap. Satellites' long range and speedy connection make them ideal for remote places where conventional connectivity is limited. As early July 2022, the nation's overall tele-density was 85.1 percent, with remote tele-density close to 58 percent. Using satellite connection in combination with a ground connection may dramatically increase connectivity. Excellent internet access is crucial for economic development and welfare worldwide, including in India. The use of satellites promotes digital inclusiveness by providing access to the internet. The Prime Minister's Office is developing a comprehensive strategy for satellite-based navigation systems in order to meet the growing

demand for position, speed, and timestamp solutions for different fields. Establishing space parks around the nation is expected to benefit industries in the aerospace sector, particularly industry. This would attract international companies in the rocket industry and foster Indian space-tech enterprises. Currently, establishing upstream/downstream missions in space requires administrative permission from multiple departments, including DoS, DoT, and MoIB. Organisations may have a variety of objectives. Implementing an integrated clearance procedure via an umbrella organisation dedicated to the space economy will simplify the procedure of obtaining necessary permissions, making it easier to do commerce. TRAI recommends that authorities disclose an inventory of licenced foreign satellites whereby purchasers may acquire bandwidth. This will assist speed up the licencing procedure.

Space parks will offer a perfect environment for SMBs and entrepreneurs focusing on rocket components and sub-components. Space parks may greatly enhance constellation makers' unit profitability through pooled assets and amenities. Space parks can attract enterprises interested in satellite uses, in addition to satellite production. This will aid in developing fresh company cases for the downstream section and identifying possibilities for profit. The choice made by the government to let commercial firms access the Indian space environment is likely to stimulate space launching activity. The emergence of private businesses is going to assist the sector grow more profitable. Low-cost space launchers, along with large-scale manufacturing, are expected to drive global demand. Indian entrepreneurs want to capitalise on the aerospace sector with new technology.

To conclude, till recently ISRO was catering to both the R&D requirements for indigenous capability in space technologies, as well as space-based services requirements for both strategic and commercial users with its meagre resources. As a result, there was a huge gap in meeting aspirations of both strategic and commercial users in space-based services, and small contribution in India's economic growth. Like the IT sector which has grown leaps and bounds in last few decades, space sector reforms will unlock the

potential of space in India's economic growth to become a developed country by 2050 as envisioned by our Honourable Prime Minister.

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NOTES

1. Ians. "Space Technology Parks Will Ensure 'Lift off' for the Indian Space Sector: ISpA." *Defence Monitor*, 15 February 2023. <https://defencemonitor.in/space-technology-parks-will-ensure-lift-off-for-the-indian-space-sector-isp/>.
2. The Hindu Bureau. "ISpA Releases Concept Paper Outlining Plans for Space Technology Parks." *The Hindu*, 16 February 2023. <https://www.thehindu.com/news/cities/bangalore/isp-a-releases-concept-paper-outlining-plans-for-space-technology-parks/article66511954.ece>.
3. "Atmanirbharata - Department of Space," n.d. <https://www.isro.gov.in/Atmanirbhar/>.
4. ET Bureau. "Indian Space Association Pitches for Incubation Centres in Space Technology Parks, Flags Challenges Faced." *The Economic Times*, 15 February 2023. <https://economictimes.indiatimes.com/tech/startups/indian-space-association-pitches-for-incubation-centres-in-space-technology-parks-flags-challenges-faced-by-startups/articleshow/97953502.cms?from=mdr>.
5. "Setting up of Space Technology Park and Museums," n.d. <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1558441>.
6. Dutta, Prabhash K. "India'S Nasa: Why Privatisation of Isro Is the Right Call." *India Today*, 25 June 2020. <https://www.indiatoday.in/news-analysis/story/india-s-nasa-why-privatisation-of-isro-is-the-right-call-1692576-2020-06-25>.
7. Correspondent, Special. "IN-SPACE to Be New Space Industry Regulator, Says ISRO Chief Sivan." *The Hindu*, June 25, 2020. <https://www.thehindu.com/sci-tech/science/new-space-industry-body-in-space-to-be-in-place-in-3-6-months-ksivan/article31911841.ece>.
8. Special Correspondent, "IN-SPACE to Be New Space Industry Regulator, Says ISRO Chief Sivan," *The Hindu*, 25 June 2020, <https://www.thehindu.com/sci-tech/science/new-space-industry-body-in-space-to-be-in-place-in-3-6-months-ksivan/article31911841.ece>.
9. Raju, Narasimha. "ISpA EY Report Highlights." *CXOToday.com*, 18 November, 2022. <https://cxotoday.com/press-release/isp-a-ey-report-highlights/>.
10. AIPPI. "Exploring the Opportunities in Indian Space Sector," n.d. <https://www.aippi.org/news/ascending-skies-exploring-the-opportunities-in-indian-space-sector/#:~:text=This%20rapid%20propulsion%20in%20investment,satellite%20components%2C%20launch%20facilitation%20services%2C>.
11. Vishal Kumar Singh, "Why The Indian Space Agency Needs Privatization? Part-1," *Medium*, 15 December 2021, <https://medium.com/@vishal.ks.iitg/why-the-indian-space-agency-needs-privatization-part-1-dc3b3a3bb9ca>.

12. Rajagopalan, Rajeswari Pillai, Observer Research Foundation, and K Kasturirangan. *Space India 2.0*. Edited by Narayan Prasad, 2017. https://www.orfonline.org/wp-content/uploads/2017/02/ORF_Space-India-2.0_NEW-21Nov.pdf.
13. India Brand Equity Foundation. "Opening up New Opportunities in the Indian Space Sector | IBEF," n.d. <https://www.ibef.org/blogs/opening-up-new-opportunities-in-the-indian-space-sector>.
14. India, Hans, and Hans India. "The Hans India." *The Hans India*, 15 February 2023. <https://www.thehansindia.com/technology/tech-news/space-technology-parks-will-ensure-lift-off-for-the-indian-space-sector-isp-783080>.
15. Singer, Jeffrey Lin and P.W. "China's Private Space Industry Prepares to Compete With SpaceX and Blue Origin." *Popular Science*, 07 October 2016. <https://www.popsci.com/chinas-private-space-industry-booms-prepares-to-compete-with-spacex-and-blue-origin/>.
16. Asean, China Report. "Commercial Aerospace: The Next Launchpad for the Chinese Economy." *PR Newswire*, 06 March 2024. <https://www.prnewswire.com/apac/news-releases/commercial-aerospace-the-next-launchpad-for-the-chinese-economy-302081190.html>.
17. CGTN. "China's Private Space Companies: A Race for the Universe," 24 December 2021. <https://news.cgtn.com/news/2021-12-24/China-s-private-space-companies-A-race-for-the-universe-16fCBj4ss9y/index.html>.
18. Johnson, Kaitlyn. "The Private Sector's Assessment of U.S. Space Policy and Law - Aerospace Security." *Aerospace Security*, 13 December 2022. <https://aerospace.csis.org/the-private-sectors-assessment-of-u-s-space-policy-and-law/>.
19. Tran, Lina. "These 3 Companies Are the Future of Space Tourism - AFAR." *AFAR Media*, 11 October 2022. <https://www.afar.com/magazine/these-companies-are-the-future-of-space-tourism>.
20. Room the Space Journal of Asgardia. "Russian Business: A Long Road to the Stars for Private Space Initiative - Room: The Space Journal," n.d. https://room.eu.com/article/Russian_business_a_long_road_to_the_stars_for_private_space_initiative.
21. Singhal, Prashant. "The Dawn of the Space Economy in India," 04 November 2022. https://www.ey.com/en_in/aerospace-defense/the-dawn-of-the-space-economy-in-india#:~:text=Setting%20Dup%20space%20parks%20across,incubate%20spacetech%20companies%20in%20India.
22. *Indian Space Association (ISpA): India on the Move in Space Domain*. (21 December 2021). Centre for Land Warfare Studies. https://indianstrategicknowledgeonline.com/web/IB-319_Indian-Space-Association-ISpA.pdf
23. Mukul, P., & Aryan, A. (2021, October 13). Explained: Public-private partnership breaches space frontier. *The Indian Express*. <https://indianexpress.com/article/explained/indian-space-association-narendra-modi-7565248/>
24. *India in space Domain - Pathbreaking developments*. (n.d.). Vivekananda International Foundation. <https://www.vifindia.org/brief/2021/october/29/India-in-Space-Domain-Pathbreaking-Developments>
25. Prime Minister. (2022). *Commitment towards a reformed space sector on the path to Atmanirbhar Bharat* [Report]. https://www.isro.gov.in/media_isro/pdf/Publications/Vispdf/Pdf2017/space_reform_booklet_E.pdf
26. *Roles and responsibilities*. (n.d.). <https://www.isro.gov.in/Responsibilities.html>
27. *IN-SPACE - Indian National Space Promotion and Authorisation Centre - IN-SPACE*. (n.d.). <https://www.inspace.gov.in/inspace>

28. Prime Minister. (2022). *Commitment towards a reformed space sector on the path to Atmanirbhar Bharat* [Report]. https://www.isro.gov.in/media_isro/pdf/Publications/Vispdf/Pdf2017/space_reform_booklet_E.pdf
29. Government of India. (2020). Draft Spacecom Policy - 2020. In *Department of Space*. <https://dipa.co.in/contentpdf/Department%20of%20Telecommunications/Spacecom%20Policy%202020%20and%20Spacecom%20NGP%202020-15-10-2020.pdf>
30. *Reports & Publications - SatCom Industry Association (SIA-India)*. (n.d.). <https://www.sia-india.com/category/reports-publications/>
31. Christensen, I. A., Secure World Foundation, & Wells, R. (2016). *Applying corporate social responsibility principles in the space sector* (By Reinventing Space Conference & BIS-RS-2016-45). https://swfound.org/media/205652/rinspace_applying_csr_principles_in_the_space_sector.pdf
32. *Mission DefSpace | ISPA Events*. (n.d.). ISPA Events. <https://www.ispaevents.space/mission-defspace>