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Pioneering the Future of Japan's Space Industry: Insights from the U.S. and India's Space Industry Ecosystems

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Summary

- The Space Strategy Fund established in March 2024 aims to support fundraising for space startup companies and foster the development of the space industry. With a planned investment of 1 trillion yen over ten years, combined with an increase in the defense budget, Japan's space industry is now poised for a new development opportunity. This change is expected to make it easier for startup companies to secure funding for technology development and market expansion, enhancing competitiveness. From the perspectives of national security and economic promotion, the importance of the space industry is also increasing, leading to new business opportunities alongside technological innovation. This report examines the space industry ecosystems of Japan, the U.S., and India, and proposes solutions to issues facing Japan's space industry.
- Japan's space industry is at the threshold of a significant growth opportunity. Over 100 space startup companies have emerged domestically, including internationally recognized companies such as Institute for Q-shu Pioneers of Space,Inc.(iQPS) Reductions in rocket launch costs are promoting the entry of startup companies and creating diversification in the space business. However, Japan's space industry tends to rely on limited government demand. While it is important to utilize government demand initially when creating businesses in this field, relying on it solely makes business scaling difficult. Also, the Space Strategy Fund's support is concentrated on the space equipment industry, and the commercialization paths for sectors outside this industry are unclear. With substantial initial investment and a long timeline until returns are generated, securing funding is a major challenge for startup companies in the space business. Expanding government support to the space utilization service and user industries and strengthening specific support measures aimed at companies pursuing commercialization are essential for sustainable growth.
- The U.S. space industry has advanced technological innovation and commercialization through government startup support programs, with Space X's success as the most notable example. Space X enhanced its competitiveness through agile development methods and reusable rocket technology. India has also achieved low-cost, high-efficiency space missions. It is building an ecosystem for nurturing private enterprises through technology provision, personnel introduction, launch services from ISRO[1], and attracting foreign capital. Japan needs a long-term strategy and the construction of its own ecosystem focused on commercialization.
- Continued reliance on limited government demand by Japan's space industry may stall cost reductions and technological innovation, increasing its dependence on foreign countries. To avoid this, the government and private companies must work together to stimulate private demand. Drawing on the U.S. commercialization support model and India's development support model, Japan should also advance commercialization and development support for startup companies. Specifically, it must strengthen public-private partnerships, promote the entry of startup companies, and encourage the use and integration of advanced technology. Improving rocket development and launch capabilities to transport satellites is also crucial and should be robustly supported by the government. This would likely lead to the construction of a space industry ecosystem that leverages Japan's strengths, fostering the sustainable development of its space industry.

[1] Indian Space Research Organisation (ISRO). Its primary operations include satellite launches, space exploration missions, and satellite operations.

1. Introduction

The launch of the Space Strategy Fund draws attention to private space businesses

The Space Strategy Fund, established in March 2024, is a policy that offers a substantial boost for space startup companies facing challenges with fundraising. It aims to support the development of the space industry by providing financial assistance to space-related projects and companies and is expected to invest 1 trillion yen over ten years. The increase in the space-related defense budget from approximately 300 billion yen to 1 trillion yen over five years is a sign that the Japanese space industry is seizing a new opportunity for development. This is expected to make it easier for space-related companies to secure funding for innovative technological developments and market expansion, thereby enhancing domestic and international competitiveness. Japan's space industry has the potential for significant future progress.

Space is a crucial industry from the perspectives of national security and economic promotion

The backdrop for Japan's increasing focus on the space industry is an increased emphasis on the field from both national security and economic promotion perspectives. The development of space-related technologies, such as improving satellite capabilities, contributes to national defense, information gathering, and enhanced telecommunications technology, directly tying into national security. The space industry is also becoming increasingly vital for economic promotion, as it is linked to new business opportunities and jobs.

Domestically, government demand is central, making financial issues a key topic

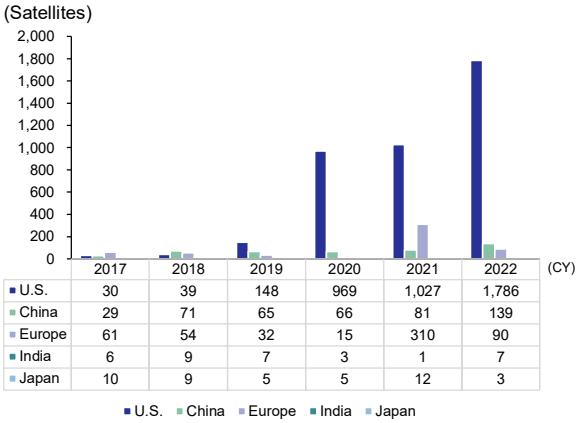
Japan's space industry is primarily centered on government demand, especially from the defense industry and deep space development[2]. This focus requires space-related companies to base their growth on government projects and contracts. However, many space-related companies are perceived to face challenges related to high initial investment costs and delayed generation of returns. Finding strategies to overcome these challenges is an important task.

Japan's presence in the space industry is declining

The space industry is rapidly expanding alongside technological innovation. It is projected to grow to about $1 trillion globally by 2040. However, Japan’s space industry has significantly lagged behind the U.S. and Europe in satellite production over the past few years ([Figure 1]), and the ratio of R&D expenses to sales of domestic space-related companies has also plummeted from a peak of 5% to around 1% ([Figure 2]). Japan's international presence in the field is declining, and current corporate activities are insufficient to bring about a recovery. This decline is due to advances in space development held by other countries and the emergence of competitive companies, presenting many challenges for Japanese space-related companies.

[2] This could include technology development and activities aimed at exploring and utilizing the Moon, Mars, asteroids, and even the outer reaches of the solar system.

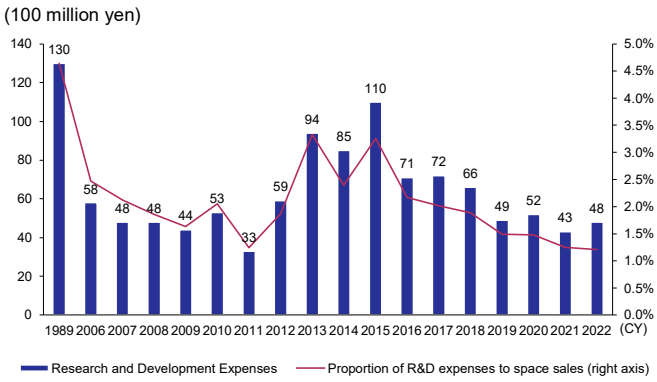
[Figure 1] Global Satellite Manufacturing Performance



	2017	2018	2019	2020	2021	2022
U.S.	30	39	148	969	1,027	1,786
China	29	71	65	66	81	139
Europe	61	54	32	15	310	90
India	6	9	7	3	1	7
Japan	10	9	5	5	12	3

Source: Compiled by Mizuho Bank Industry Research Department based on The Japan Society for Aeronautical and Space Sciences' "Global Space Industry Trends (2022 Edition)"

[Figure 2] Transitions in the R&D Expenses of Space-Related Companies



(Source) Compiled by Mizuho Bank Industry Research Department based on The Japan Society for Aeronautical and Space Sciences' "Aerospace Industry Database"

U.S. and Indian space policies provide hints for solving Japan's challenges

The U.S. has built a massive space industry, leading the global market and producing the leading company, Space X. India, through government-led initiatives, has advanced its technological development and is aiming to join the ranks of space-faring nations. These countries' initiatives contain many hints for solving the challenges of Japan's space industry.

Mizuho Bank's space reports have emphasized the opportunities and threats of the space business, particularly the importance of technology and capital

Mizuho Bank's Industry Research Department has previously published reports on space. In a November 2017 report on the impact of commercial space utilization on Japanese Industry (Mizuho Industry Focus Vol. 200), we argued that the rise of commercial utilization of satellite systems amid increasing development and launches of CubeSats and other microsatellites would impact sectors such as communications, broadcasting, automotive, and primary industries. Furthermore, our December 2021 report on trends in the private space business (Mizuho Short Industry Focus Vol.190) mentioned Virgin Galactic's realization of crewed commercial spaceflight and Space X's commencement of communication services using satellite constellations, highlighting the necessity of technology and capital for Japanese companies to succeed in the space business.

As of 2024, numerous space startup companies possessing technology have emerged in Japan, and never-before-seen governmental support measures are being proposed in terms of funding. It appears Japan's space business is at a significant turning point. This report provides recommendations for the further development of Japan's space industry. It also explores the Japanese space industry ecosystem and compares it with the U.S. and India, presenting solutions to various challenges faced by Japan's space industry.

2. The Current State of the Domestic Space Industry

Government support may produce growth and technological innovation in Japan's space industry

Japan’s space industry is at the threshold of a significant growth opportunity. The government is currently establishing a framework to support private companies through the Space Strategy Fund. This support promotes technological innovation in the space industry and enhances the competitiveness of Japanese companies. More than 100 space startup companies have emerged domestically; some with globally competitive technology have also surfaced. Here, we provide an overview of two companies, a satellite manufacturer and a satellite data service provider.

iQPS: Highly regarded for developing small SAR satellites, is seeing expansion after going public

iQPS is a Japanese satellite development and operation manufacturer. It has received particularly high praise for its development and operation of small satellites. Its strength lies in developing synthetic aperture radar (SAR) satellites[3], which can conduct detailed ground observations regardless of weather or time of day. Its ability to raise funds improved after going public in 2023, advancing its technological development and business expansion. iQPS utilizes its proprietary data analysis technology to provide high-precision quasi-real-time data, contributing to the development of the space industry through international partnerships.

Tenchijin: analyzes satellite data for use in agriculture, disaster prevention, and other fields, enhancing its accuracy with AI

Founded in 2019, Tenchijin primarily provides Earth observation services using satellite data. It aims to utilize satellite data in various fields, including agriculture, disaster prevention, and urban planning. It is particularly focused on using AI technology to enhance data accuracy, providing beneficial information to users. Its activities aim to realize a sustainable society. Additionally, Tenchijin receives investment from the Japan Aerospace Exploration Agency (JAXA) and advances its technological development through collaboration with the agency.

Reductions in rocket launch costs and the proliferation of CubeSat satellites have produced numerous startup companies in Japan

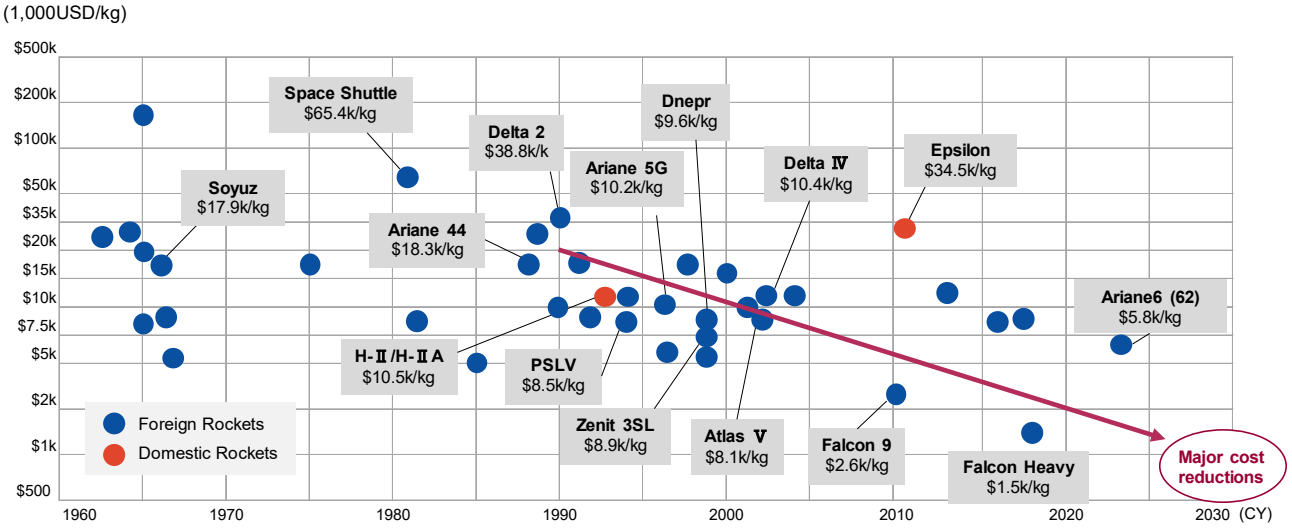
A key reason behind the emergence of many space startup companies is the significant reduction in rocket launch costs ([Figure 3]). Specifically, the advancement of reusable rocket technology, such as Space X's Falcon 9, has significantly cut the cost per launch. The development of new lightweight, high-strength materials and the evolution of 3D printing technology have also reduced rocket manufacturing costs. These factors together have reduced rocket launch costs, fostering a positive cycle with increased rocket launches due to growing satellite demand, leading to the emergence of many space startup companies. Previously, government agencies and large corporations led the industry, but cost reductions have made it easier for startup companies to enter the market. The cost reduction of CubeSat satellites[4] has also been a significant factor. CubeSats use a small, standardized module design, significantly reducing development costs. Due to their small size and light weight, they can be launched as part of a "rideshare" with other satellites, reducing launch costs. Services dedicated to launching small satellites have also become available, further advancing cost reduction.

The entry of non-space companies is diversifying the space business and expanding business opportunities

As a result, the barriers to entering the space business by non-space companies have been lowered, creating new business opportunities. CubeSats are used for everything from research and education to commercial purposes. They enable universities and research institutions to conduct space experiments easily while expanding commercial possibilities such as communication, Earth observation, and IoT (Internet of Things). As a result, Japan's space industry's supply-demand structure is diversifying, and new markets are anticipated to form.

[3] Its satellites scan the ground with electromagnetic waves (microwaves). The reflected waves are received and analyzed to visualize the ground's condition.
[4] CubeSats have standardized dimensions of 10cm x 10cm x 10cm per unit. They are low-cost and allow for rapid development, making their use ideal for education and technology demonstrations.

[Figure 3] Trends in Rocket Launch Costs to Low Earth Orbit

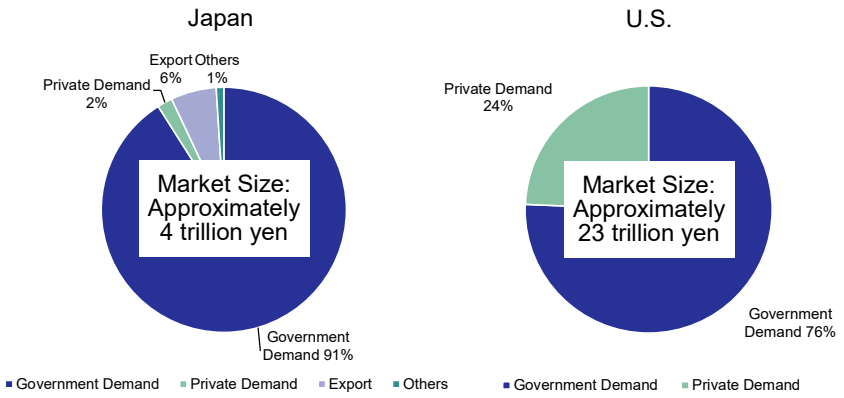


Note: Launch price per kilogram of payload (cargo transported by the rocket)
Source: Compiled by Mizuho Bank Industry Research Department based on the Committee on National Space Policy, Space Transportation Subcommittee (2nd Meeting) Material 2 “Understanding the Environment Surrounding Space Transportation and Future Prospects” and CSIS Aerospace Security Project (Nikkei Business Publications 'Space Business Creation and Entry Strategy')

The domestic space industry is primarily based on limited government demand

However, multiple challenges exist within Japan's space industry. Currently, Japan's space industry is structured around limited government demand. Compared to the U.S., Japan has a higher proportion of government demand; however, the overall market size is small, making it difficult to create a large space industry ([Figure 4]). Sizeable government-led space projects in the U.S. involve numerous private companies, including startups, energizing the industry. However, large-scale government demand in Japan is scarce, limiting growth opportunities for startup companies.

[Figure 4] Comparison of Proportion of Government Demand in Japan and U.S. Space Industries

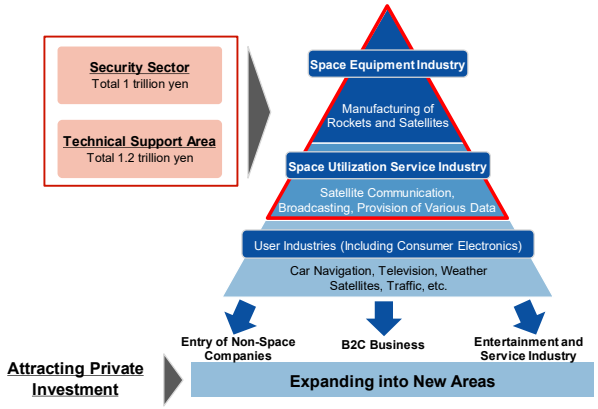


Note: Market size as of 2021
Source: Compiled by Mizuho Bank Industry Research Department based on Cabinet Office and U.S. Department of Commerce published materials

A challenge is that government support focuses on the space equipment industry, with insufficient support for commercialization

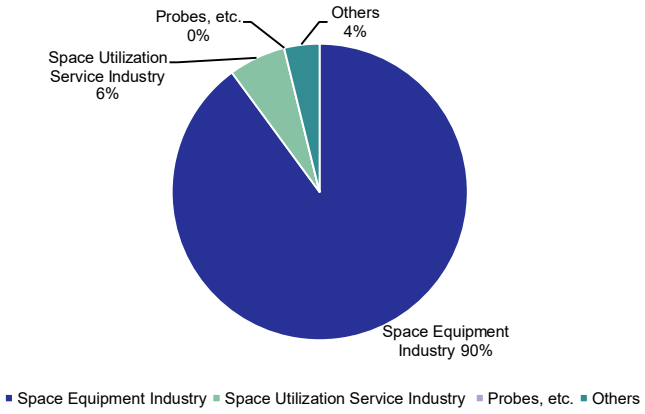
Another challenge is that government support packages, including the Space Strategy Fund, primarily focus on the space equipment industry ([Figure 5, 6]). Areas supported by the Space Strategy Fund include transportation, satellites, and exploration, suggesting that support is concentrated in the space equipment industry, which is directly linked to securing satellite transportation methods, satellite system construction, and exploring beyond the Moon and Mars. Japan's space industry has historically been based on government demand, with a strong perspective of "space business = research and development." Paths to commercialization remain unclear. Commercialization here refers to using space technology and data to deliver specific products or services to the market and generate revenue. However, since government demand has been so central in Japan thus far, private companies lack the support and infrastructure to freely enter the market and advance commercialization. As a result, the environment required for startup companies to construct new business models and succeed may not exist.

[Figure 5] Structure of Domestic Space Industry and Government Support Package



Note: Security sector = Budget for the space sector in the defense capability development plan
Source: Compiled by Mizuho Bank Industry Research Department

[Figure 6] Support Themes of the Space Strategy Fund



90% of the support themes of the Space Strategy Fund are directed toward the space equipment industry

Source: Compiled by Mizuho Bank Industry Research Department based on JAXA's website

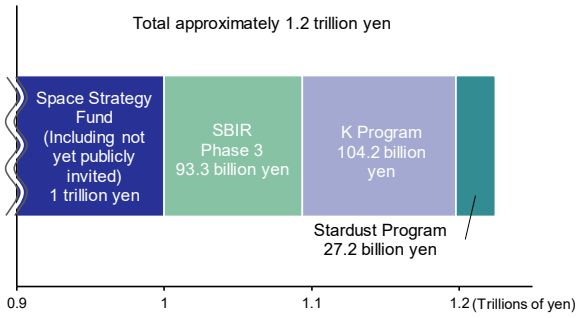
The required scale of initial investment serves as a hindrance, making fundraising difficult

The substantial initial investment required for space businesses and the time it takes to achieve results in the industry poses a critical financial issue for startup companies, which find stable fundraising challenging. It is also difficult for investors seeking short-term returns to make investment decisions in the space business.

Challenges in diversifying methods of fundraising

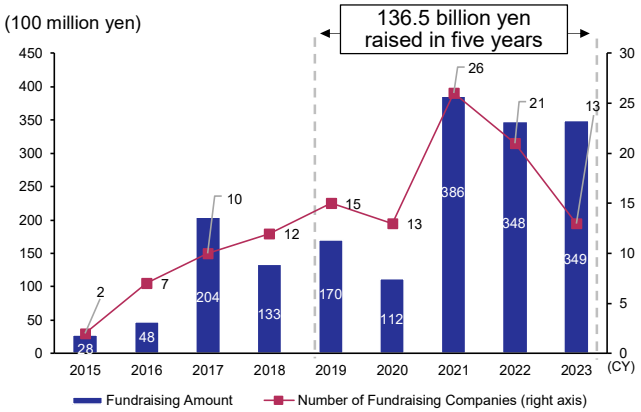
To commercialize the space business, stimulating private demand and attracting investment from private companies is pivotal. However, while the total budget of government support programs is approximately 1.2 trillion yen, the amount of fundraising by space startup companies from the private sector has been limited to 136.5 billion yen over the past five years, highlighting the challenge of diversifying fundraising methods moving forward ([Figure 7, 8]).

[Figure 7] Breakdown of Government Technical support Support Areas for the Space Industry



Note 1: SBIR: Small Business Innovation Research Fund
Note 2: K Program: Key and Advanced Technology R&D through Cross Community Collaboration Program
Note 3: Stardust Program: A strategy to accelerate space development and utilization
Note 4: Each support system's amount is as of October 2024
Source: Compiled by Mizuho Bank's Industry Research Department based on a variety of publicly available information

[Figure 8] Trends in Fundraising Amounts by Space-Related Startups



Source: Compiled by Mizuho Bank Industry Research Department based on SPACETIDE Foundation's "COMPASS Vol.10 (2024)"

To promote the growth of Japan's space industry, it is vital to expand government support and provide specific assistance to startup companies

Multiple strategic initiatives are required for Japan's space industry to achieve sustainable growth. It is firstly crucial to expand government support measures for the industry, transcending space equipment to also include space utilization services and users. This will promote the creation of new business models utilizing space technology. Enhancing specific support measures for space startup companies aiming for commercialization and establishing a consistent support system from technology development to commercialization is also necessary.

3. Insights from Overseas Space Industry Ecosystems

(1) U.S. Space Industry

The U.S. creates internationally competitive space-related companies through carrot-and-stick policies

The significant development seen in the U.S. space industry was largely influenced by its government's startup support programs. These programs aim to establish technology in the space industry, strengthen the commercial capabilities of private companies, and ultimately achieve international competitiveness for the U.S. Carrot-and-stick policies that incentivize private companies while demanding rigorous results promote technological innovation in the space industry, enhancing its overall technological level worldwide.

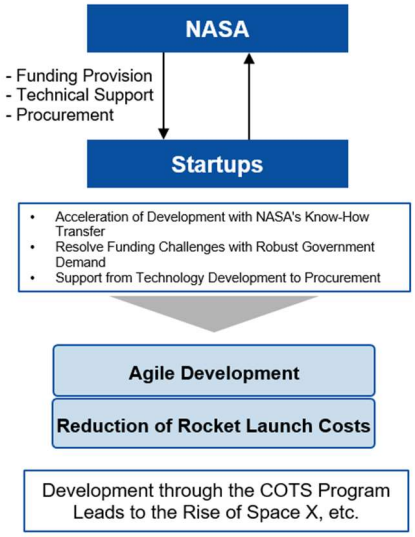
Space X achieved technological innovation through low-cost technologies and agile development

Particularly noteworthy is the success of Space X. While benefiting from these programs, Space X honed its low-cost technology for launch services. Unlike traditional space development projects, Space X adopted agile methodologies, allowing for rapid and flexible progress in technology development. This approach enabled the company to achieve numerous technological breakthroughs in a short period, culminating in its current position as a leading company in the space industry.

The U.S. government initiated several support programs in 2006, including COTS, to develop the space industry

In 2006, the U.S. government launched multiple support programs to advance the space industry. These programs promote early commercialization through financial aid, technical support, and regulatory easing for emerging companies ([Figure 9]). NASA's Commercial Orbital Transportation Services (COTS program) is a prime example of these efforts. COTs support private companies to develop technology to transport supplies to the International Space Station (ISS), with participants including Space X and Orbital ATK (now Northrop Grumman Innovation Systems).

[Figure 9] Overview of the U.S. COTS Program



Source: Compiled by Mizuho Bank Industry Research Department

COTS supports businesses' technology development through phased funding

The COTS program provides phased funding to companies, requiring the achievement of specific technical milestones at each stage. This results-oriented approach allows companies to efficiently and swiftly advance technology development. Additionally, NASA provides various forms of support, such as technical advice and access to testing facilities. This enables companies to achieve high technical capabilities while mitigating risks.

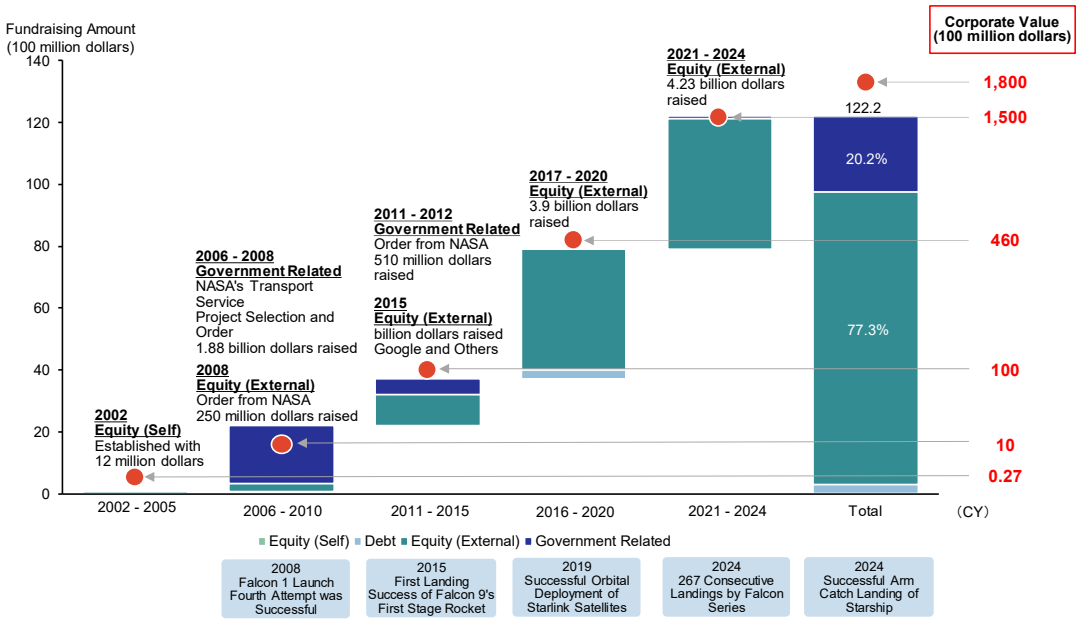
Space X succeeded in reducing launch costs through government support and reusable rocket technology

The success of Space X was influenced not only by government support programs but also by the company's unique strategy and technological prowess. Firstly, it focused on reducing launch service costs by developing reusable rocket technology. Rockets were traditionally discarded after a single launch; however, by reusing the Falcon 9's first-stage booster, Space X reduced launch costs. This technology significantly enhanced the company's competitive edge.

Space X accelerated innovation through agile development

Furthermore, Space X adopted agile development methods, allowing for rapid and flexible technological advancement. Agile development involves sprint cycles, each of which results in the creation, evaluation, and improvement of deliverables. This approach enabled Space X to respond to market needs and technical challenges swiftly, achieving numerous technological breakthroughs and significant growth in a short period ([Figure 10]).

[Figure 10] Evolution of Space X's Fundraising



Source: Compiled by Mizuho Bank Industry Research Department based on PitchBook Data, Inc. and information published by Space X

Elon Musk's vision leads Space X to success

The vision and leadership of Space X's founder, Elon Musk, are also critical elements of its success. Musk has set forth an ambitious vision of colonizing Mars and is fully committed to realizing it. This vision is a powerful motivation for employees and investors, driving the company's technological developments and business expansion.

Development of the space industry revitalizes other industries

The space industry's growth is also generating ripple effects in other related sectors. For example, satellite manufacturing, data analysis, and communications technology are diverse space-related technologies and services that produce new business opportunities in their fields. The combination of government support programs, private companies' efforts, and strong demand means the U.S. space industry is expected to continue to develop further.

(2) India's Space Industry

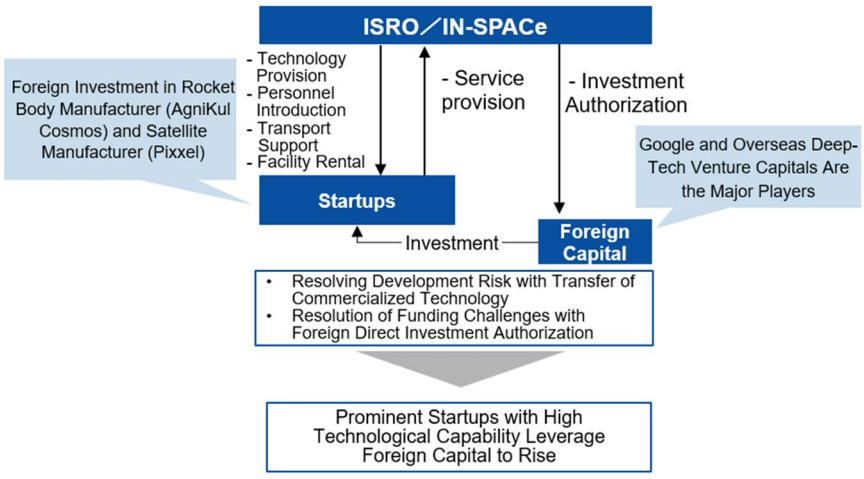
India attracts international attention with low-cost, high-efficiency space missions, promoting industrial growth

India has built its own space industry ecosystem to establish itself as a major space power and is focusing on domestically developing space technology. It is notable for its rapid growth and innovation. India has attracted international attention by achieving low-cost, high-efficiency space missions, with ISRO seeing particularly prominent success. Examples include the 2013 launch of the Mangalyaan Mars probe and the successful landing of the Chandrayaan-3 unmanned lunar probe at the lunar south pole in 2023, a world first. The Indian government also promotes the development of the space industry as part of economic growth, encouraging private sector participation irrespective of company size. This enhances its competitiveness in the global market and advances technological innovation. This section provides a detailed view of India's space industry ecosystem from the perspectives of technology provision, personnel introduction, launch service provision, and foreign investment inflow.

IN-SPACe's technology provision enables startups to achieve cost reduction and rapid market entry

From a technology provision perspective, the Indian National Space Promotion and Authorization Center (IN-SPACe) was established in 2020 to advance technology transfer to local industries. IN-SPACe promotes public-private collaboration by transferring the space development technology accumulated by ISRO to private companies, producing a strategy to reduce the cash burn period for startups. In addition to technology transfer, it also offers training programs for acquiring specialized knowledge ([Figure 11]).

[Figure 11] Overview of Support for India's Private Companies



Source: Compiled by Mizuho Bank Industry Research Department

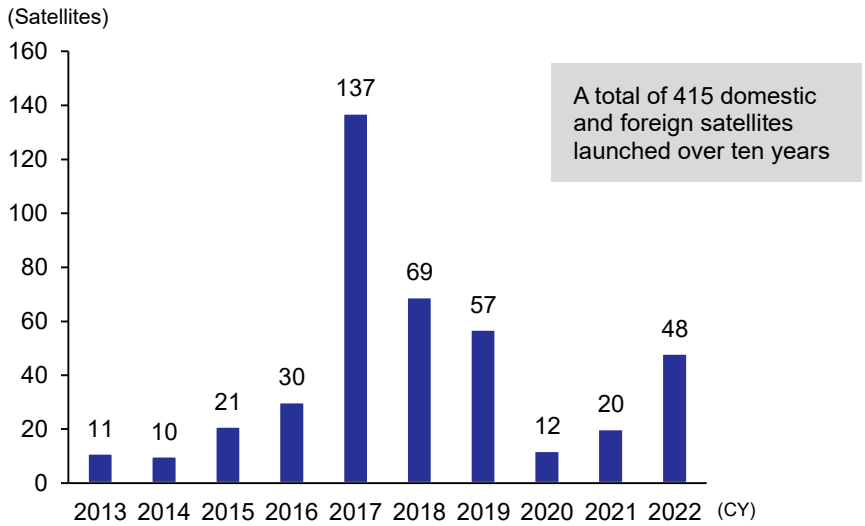
Introducing retired ISRO experts to startups and supporting them through a mentoring system

Securing skilled personnel is also a crucial element in building India's space industry ecosystem. Through publishing a list of retired experts from ISRO and introducing these professionals to startup companies, India has established a system where these experienced personnel support businesses. Furthermore, its mentoring system sees experts continuously advising startups through lectures and other means, helping resolve technical challenges and management issues.

Enhancing competitiveness through ISRO's launch services and promoting the space industry

India offers competitive launch transportation services to domestic and international satellite operators by utilizing ISRO's rockets ([Figure 12]). This maximizes the use of India's rocket technology, promoting the development of the space industry. ISRO's reliable launch services are known for their cost-effectiveness, and many operators seek to use them.

[Figure 12] India's Satellite Launch Performance



Source: Compiled by Mizuho Bank Industry Research Department based on materials published by ISRO

Easing FDI regulations allows up to 100% foreign investment in space-related startups

India has eased regulations on foreign direct investment (FDI) to promote foreign investment in the space industry. In particular, a policy allowing up to 100% foreign investment in space startup companies has been implemented. This allows startups to procure the necessary funds from abroad to supplement the limited government demand, solving the capital shortage many startups face.

The number of space industry startups is expected to increase from 7 to about 200

India's approach to building a space industry ecosystem has shown remarkable results. Space-related startups are expected to grow from just 7 in 2019 to about 200 by 2024. Some startup companies, such as Pixxel—which successfully raised funds from Google—have effectively utilized Indian government policy support and attracted foreign direct investment through their technological capabilities.

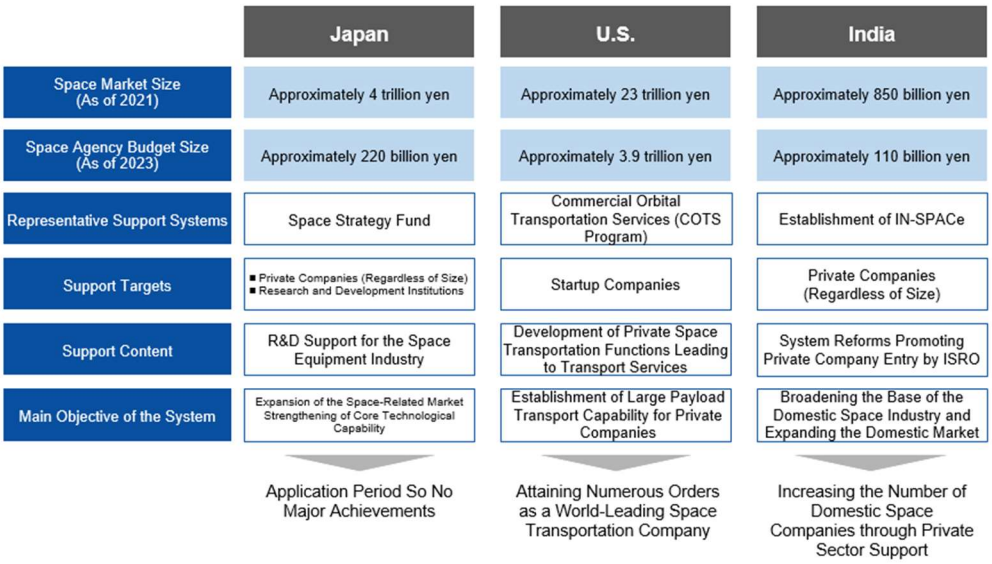
India's space industry advances through the technological strength of prominent startups and foreign investment

The Indian government has identified rocket development, remote sensing, and communications as key areas of focus in space. This focus has led to the emergence of promising startups such as AgniKul Cosmos, which develops rocket engines, and Pixxel, which manufactures small satellites equipped with hyperspectral cameras. The key to these successes lies in the high level of technology and the attraction of foreign investment, and India's space industry is expected to continue developing through the active involvement of startup companies.

India aims for growth by deploying a multifaceted ecosystem in the space industry

Intending to become a major space power, India is building a multifaceted ecosystem, deploying strategies in areas such as technology provision, personnel introduction, launch services, and foreign investment inflow. This has created an environment where startup companies within India are rapidly growing and evolving into internationally competitive enterprises. India's space industry is expected to develop further through these strategies ([Figure 13]).

[Figure 13] Comparison of Private Company Support Systems in Japan, the U.S., and India



Source: Compiled by Mizuho Bank's Industry Research Department based on a variety of publicly available information

(3) Lessons Japan Should Learn from the U.S. and India's Space Industries

Nurturing the space industry requires the promotion of government-private collaboration and support for companies

As previously mentioned, both the U.S. and India have development strategies for startups that align with the growth of their space industries. They strengthen government-private collaboration to pave the way for startups to build competitively advantageous business models and enter the market. While their stages of development differ due to disparities in the maturity of space development in both countries, their efforts to reform traditional space development methods contribute to building a sustainable space economy, serving as an important element supporting the industry's overall growth.

Providing a specific national vision for commercializati on is crucial

The Japanese space industry can further develop by learning from other countries' approaches. A more proactive commitment may accelerate the development of Japan's industry, particularly in nurturing space startup companies. Providing subsidies as research and development funds alone may lack a commercialization perspective, posing a risk that space startups might fail to grow. Therefore, after establishing a development policy, Japan needs to present a specific vision leading up to the goal of commercialization, creating an environment where private companies can approach the space business with a certain predictability.

Due to limited domestic demand, Japan needs its own ecosystem and niche market strategy

Given limited domestic demand and other factors, creating a major unicorn like Space X might be difficult in Japan. This means that reducing gaps using the same technology development or business model approaches as other space-leading countries could be challenging, thus necessitating Japan to develop its own ecosystem. Specifically, it is important to target niche markets that leverage Japan's strengths, build oligopolistic markets, and advance technology cooperation with other countries to complement Japanese technological strengths and incorporate advanced technologies and know-how. For example, Japan could explore niche market development in areas such as component manufacturing, on-orbit services, and satellite data services, where Japan has particular expertise. In addition, collaboration among educational institutions, private companies, and the government, along with advancing technological cooperation with other

countries, is vital for Japan's space industry to hone internationally competitive technologies.

The space industry should be strengthened by leveraging niche strategies

Overall, Japan should take cues from other countries' space industry ecosystems, emphasizing a long-term strategy with an eye on commercialization and building an ecosystem that leverages its unique strengths to potentially dominate niche markets.

4. What Measures are Required to Develop Japan's Space Industry?

If the domestic space industry relies on government demand, there is a concern that cost reduction and technological innovation will lag, leading to increased dependence on foreign countries

If the domestic space industry continues to rely on government demand in the future, crucial aspects necessary for commercialization, such as cost reduction and technological innovation, may continue to be overlooked. For example, if relying on overseas companies with lower launch costs and more frequent launch schedules becomes the norm, it is easy to imagine that the satellites themselves would be developed and manufactured overseas, considering the costs of transporting them from Japan to foreign launch sites ([Figure 14]). A situation where the satellite value chain shifts from Japan to overseas must be avoided from both national security and economic promotion perspectives.

[Figure 14] Number of Satellites Manufactured Domestically in Japan, Launched Domestically and Internationally (FY2016-FY2021)

	Domestic Launches	International Launches	Subtotal
Geostationary Large	6	2	**8**
Low Earth Orbit Large	12	0	**12**
Low Earth Orbit Medium to Small	9	19	**28**
Subtotal	27	21	**48**

Source: Compiled by Mizuho Bank Industry Research Department based on The Japan Society for Aeronautical and Space Sciences ' "The Current Situation and Future of Japan's Space Industry"

Stimulating private demand through public-private collaboration is essential for nurturing startups

To avoid this situation and continuously develop Japan's space industry, it's vital not to rely solely on government demand but to stimulate private demand through joint efforts between the government and private companies. Innovative solutions from startup companies are indispensable for this, and nurturing startups is crucial for market expansion. The U.S.'s commercialization support and India's nurturing support could provide significant hints for developing Japan's space industry.

(1) Image of a Commercialization Support Model Inspired by the U.S.

Supporting startup commercialization through anchor tenancy-type orders

The U.S.'s COTS program serves as an example of commercialization support. COT aims to discover innovative ideas from startup companies and promote inter-company competition to improve cost efficiency in space transportation while nurturing multiple companies to reduce dependency risks on specific enterprises. Unlike traditional order methods, the COTS program allows companies to independently develop technologies related to the contract requirements in a problem-solving way, featuring anchor tenancy-style support where the high-burn-rate development phase until commercialization is covered by continuous orders from the government, thus functioning as commercialization support for startups.

Hopes for future anchor tenancy support in Japan

In Japan, full-fledged commercialization support is about to start through the Space Technology Strategy[5] formulated in 2024, and the Space Strategy Fund established in the same year. These supports focus on strengthening technical advantages and securing the autonomy of the supply chain across fields such as communications, satellites, transportation, and space science and exploration. These initiatives are expected to eventually lead to anchor tenancy support in Japan, where government ministries purchase space-related services from private companies in areas such as meteorology and agriculture once private companies, including startup enterprises, achieve a certain level of technology establishment.

New support system construction involving Established Space companies

Additionally, a more diverse support system involving not just the government could be established through the involvement of Established Space[6] companies, which can leverage their accumulated expertise from the space business. To complement limited government demand, collaborative support programs between the government and Established Space companies could provide continuous financial aid and necessary resources for business development in the manufacturing and development of rockets and satellite hardware, which tend to have high burn rates, establishing a uniquely Japanese support system. There is also potential for utilizing the technologies and solutions of space startup companies in the business of Established Space companies, offering mutual benefits. This approach should aim to be an evolved model of the Space Strategy Fund and is crucial for building a sustainable foundation for the Japanese space industry.

[5] Development areas specified by Japan, considering global technology development trends, from the perspectives of both security and civilian use.

[6] Traditional leading space industry companies. These firms have developed and operated large satellites and rockets to meet government needs over many years.

(2) Image of a Nurturing Support Model Inspired by India

Supporting market entry through space-specialized incubation

The Indian model provides a reference for nurturing support. The National Institution for Transforming India[7] established the Atal Innovation Mission in 2016, aiming to promote technological innovation. As part of this program, Atal Incubation Centres (AIC) have been set up across India to support startup growth. At AICs, experts in each technological field are invited to provide diverse support to startups, ranging from technology development to business management. Some participating companies have received hands-on support from business model formulation onwards during the seed stage. The space industry is also positioned as a target technological field for support, with AICs vigorously aiding private companies entering the space business, a sector with high entry barriers. This support enhances India's space industry's overall competitiveness and technological capability. Japan has abundant support for space-related startups, such as financial assistance through government support packages and leveraging JAXA's intellectual property. However, India's advanced hands-on nurturing support style seems valuable in broadening Japan's space industry's base.

While the support stages differ due to the disparity in the maturity of core technologies like rockets and satellites in both countries, Japan should aim for domestic space industry development by further promoting nurturing and commercialization support based on these insights from both nations.

(3) A Space Industry Ecosystem that Enhances Japan's Strengths is Needed

There are over 100 space startup companies in Japan. As of October 2024, four space-related companies have been listed on the Tokyo Stock Exchange Growth Market.

Support for space startups in the seed stage is crucial for commercialization

The measures discussed in this document target space startup companies, particularly those in the seed stage aiming to establish a business model through research and development and companies in early stages working on initial marketing. Naturally, suitable support and fundraising methods vary for each company’s growth stage, and this document merely provides examples. However, a commercialization perspective is the most crucial aspect for startups aiming for market entry during the early stage, which will produce opportunities for the Japanese space industry to develop as more startups emerge.

The government supports semiconductor manufacturing from the perspectives of industrial promotion and economic security. Similar robust support is necessary for the space sector

Regarding industrial nurturing, it is worthwhile to mention the government's support for Rapidus Corporation(Rapidus), which aims to produce next-generation semiconductors in Japan. Rapidus is constructing a factory in Chitose, Hokkaido, aiming to mass produce 2-nanometer semiconductors by 2027, having already received approximately 920 billion yen in government support. However, mass production will require a total of 5 trillion yen, and securing future funding remains a challenge. So far, support has been provided in the form of research contracts from the New Energy and Industrial Technology Development Organization (NEDO) for the company, which has not yet been operational. For upcoming fundraising efforts, there has also been a proposal to provide government guarantees for loans. The government is focusing on domestic investment support for semiconductors, including Rapidus, from the perspectives of strengthening industrial competitiveness and economic security. Such support is also considered

[7] A policy thinktank of the Indian government established in 2015 to draft and promote economic policies.

critical for the space industry in terms of industrial competitiveness and economic security.

Developing and operating domestic rockets is indispensable for the space business

While there are domestic companies with competitive advantages in satellite development and manufacturing, the importance of transport businesses, namely rockets, which are the infrastructure of the space business, is significant. No matter how many satellites are developed, they cannot be demonstrated or commercialized without a means of transport to space. Moreover, relying on other countries for satellite launches entails risks from a national security standpoint. Thus, transport means are exceptionally important in the space business's value chain. The development and operation of domestic rockets are just as indispensable as domestic semiconductors.

Based on these considerations, we propose the following three strategies to build a Japan-style space industry ecosystem, leveraging Japan's strengths.

Strengthen public-private collaboration to distribute risk and promote large-scale projects and technology development

Strengthening public-private collaboration and encouraging the entry of startup companies: A long-term strategy focusing on commercialization is crucial in Japan's space business. To achieve this, it is essential to strengthen public-private collaboration and promote the entry of startup companies. By jointly undertaking initiatives, the government and private firms can distribute risks and realize larger-scale projects. For example, the government can ensure initial demand, fostering an environment where companies can confidently engage in technology development, with the results being utilized in private-sector businesses. Furthermore, government-led promotion of open access to satellite data will facilitate innovation among private companies, including startups aiming for business expansion through data utilization.

Promoting the entry of startups is hoped to enhance competitiveness and encourage the formation of industrial clusters and innovation

The space industry offers numerous business opportunities not just for large enterprises but also for startup companies. Leveraging startup companies' unique technologies and know-how to enhance competitiveness across the entire supply chain is crucial. This includes having support programs for startups and forming industrial clusters. The promotion of innovation across the entire industry is anticipated as the number of startups specializing in satellite data analysis and utilization increases. These startups are capable of rapid technology development and flexible thinking, which has been challenging for large corporations, creating the potential to continually generate new solutions and services. Additionally, satellite data is usable across various fields such as agriculture, weather forecasting, environmental monitoring, logistics, and communications, contributing to efficiency improvements and creating new business models in these areas. The activation of startup activities is also expected to promote cooperation and competition with large corporations and research institutions, resulting in accelerated technological innovation across the industry. Thus, developing Japan's space business requires a long-term strategy focusing on commercialization and close collaboration between the public and private sectors. Growth and innovation in the entire space industry can be achieved by promoting the entry of startup companies and maximizing the utilization of technology and ideas.

Rockets have high importance as a means of transportation for securing satellite demand

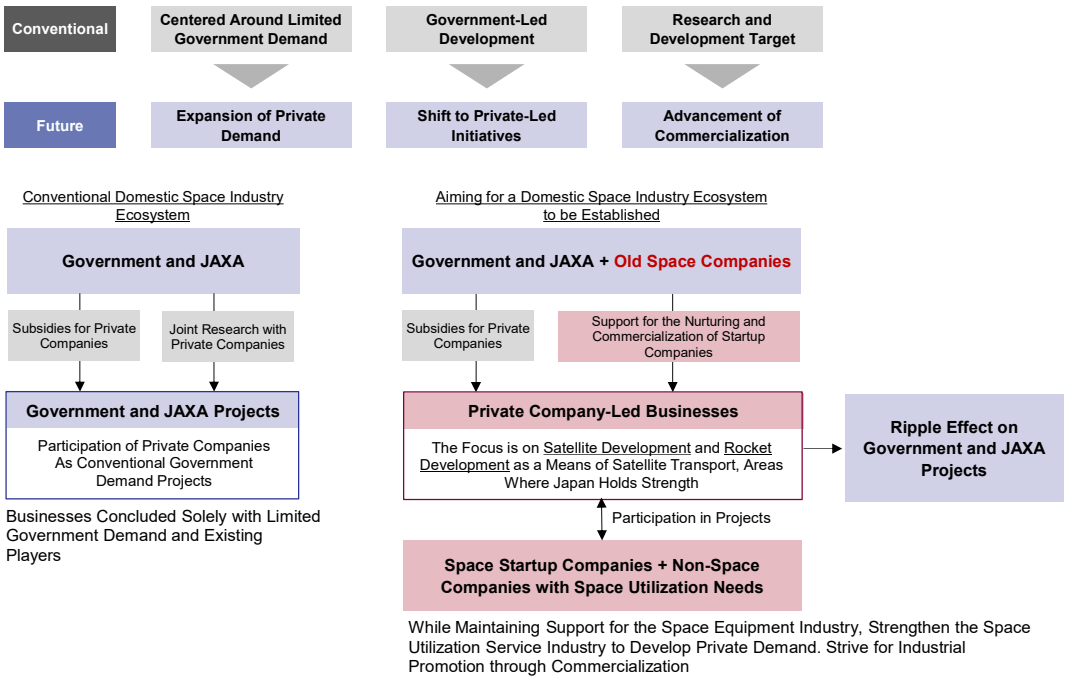
Enhancement of transportation means such as rockets: Establishing transportation means through rockets is essential for developing the space industry. Improving Japan's rocket development and launch capabilities is crucial for space startup companies, enabling cost reduction and swift service provision. By collaborating in the research and development of rocket technology, the government and private companies can respond to domestic and international satellite launch demand, enhancing international competitiveness.

Leveraging AI and robotics in the space industry to produce international competitiveness and new business opportunities

Utilization and integration of advanced technologies: To enhance Japan's international competitiveness in the space industry, it is important to capitalize on the country's unique strengths and actively utilize advanced technologies like AI and robotics to provide innovative solutions. For example, satellite data analysis using AI technologies (deep learning) is expected to be applied in diverse fields such as agriculture, disaster response, and environmental monitoring. An initiative where JAXA and JICA (Japan International Cooperation Agency) collaborate to use satellite data for disaster recovery in Southeast Asia demonstrates the potential for business expansion in overseas markets through technological cooperation. Moreover, space exploration missions require precise control in zero-gravity environments, necessitating advanced control systems. These robotic technologies are also anticipated to see use in autonomous vehicle control and production line automation. This will contribute to efficiency and quality improvements in fields other than the space industry, likely producing new business opportunities. By utilizing and integrating these advanced technologies, Japan's space industry can aim to build an ecosystem that dominates niche markets, enhancing competitiveness domestically and internationally.

Through strengthening public-private collaboration, promoting startup company entry, enhancing transportation means, and utilizing and integrating advanced technologies, it is hoped that a space industry ecosystem that maximizes Japan's strengths will be established, leading to its further development ([Figure 15]).

[Figure 15] Image of the Japan-Style Space Industry Ecosystem



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