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THE INDEPENDENT VOICE IN ASIA

Japan's budding space program grounded by persistent setbacks

Desire to compete in the satellite-launching business and shore up security could be hindered by historical failures



Japan's flagship H3 rocket lifts off from Kagoshima Prefecture on March 7. The rocket was later ordered to self-destruct after an engine failed to ignite. | KYODO

The failure of Japan's cutting-edge H3 rocket on March 7 calls into question Japan's status as a space power, impacting its technological competitiveness and future policy above terra firma for years to come.

The government had hoped the next-generation rocket would allow Japan to break into the global satellite-launching business as well as use it to bolster the country's defenses.

However, officials ordered the H3 to self-destruct shortly after liftoff at the Tanegashima Space Center in Kagoshima Prefecture upon confirming that the rocket's second-stage engine had failed to ignite.

It's not the first time Japan has encountered setbacks in its space program.

Twenty-five years ago, plenty of fanfare surrounded the launch of Nozomi (Hope), an orbiter that was sent to Mars to study the red planet's upper atmosphere.

Although the orbiter blasted off successfully from Uchinoura Space Center in Kagoshima Prefecture on July 23, 1998, the start of the mission didn't bode well, however. Malfunctions early in the mission forced space agency officials to engineer "an ingenious series of lunar and Earth-gravity assists," according to the winter 2003 issue of [Lunar and Planetary Information Bulletin](#) (<https://www.lpi.usra.edu/publications/newsletters/lpib/archive/lpib96.pdf>), that eventually slingshotted Nozomi on its journey.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_216325.jpeg)

An orbiter bound for Mars blasts off successfully from Kagoshima Prefecture on July 23, 1998. | KYODO

At the time, Nozomi was part of a small fleet of vehicles making its way to the red planet: NASA's twin rovers Spirit and Opportunity, the European Space Agency's Mars Express orbiter and Britain's Beagle 2 lander, which was also launched by the Europeans.

The British mission failed and Beagle 2 was spotted inoperative on the surface of Mars more than 11 years later. The Nozomi mission was also a failure, with Japan's space agency abandoning the orbiter after losing communication with it.

Japan had launched dozens of satellites prior to this — the first, Ohsumi, in 1970, made the country the fourth in the world to do so after the USSR, United States and France — and it has since launched [dozens more](https://global.jaxa.jp/projects/result.html) (<https://global.jaxa.jp/projects/result.html>).

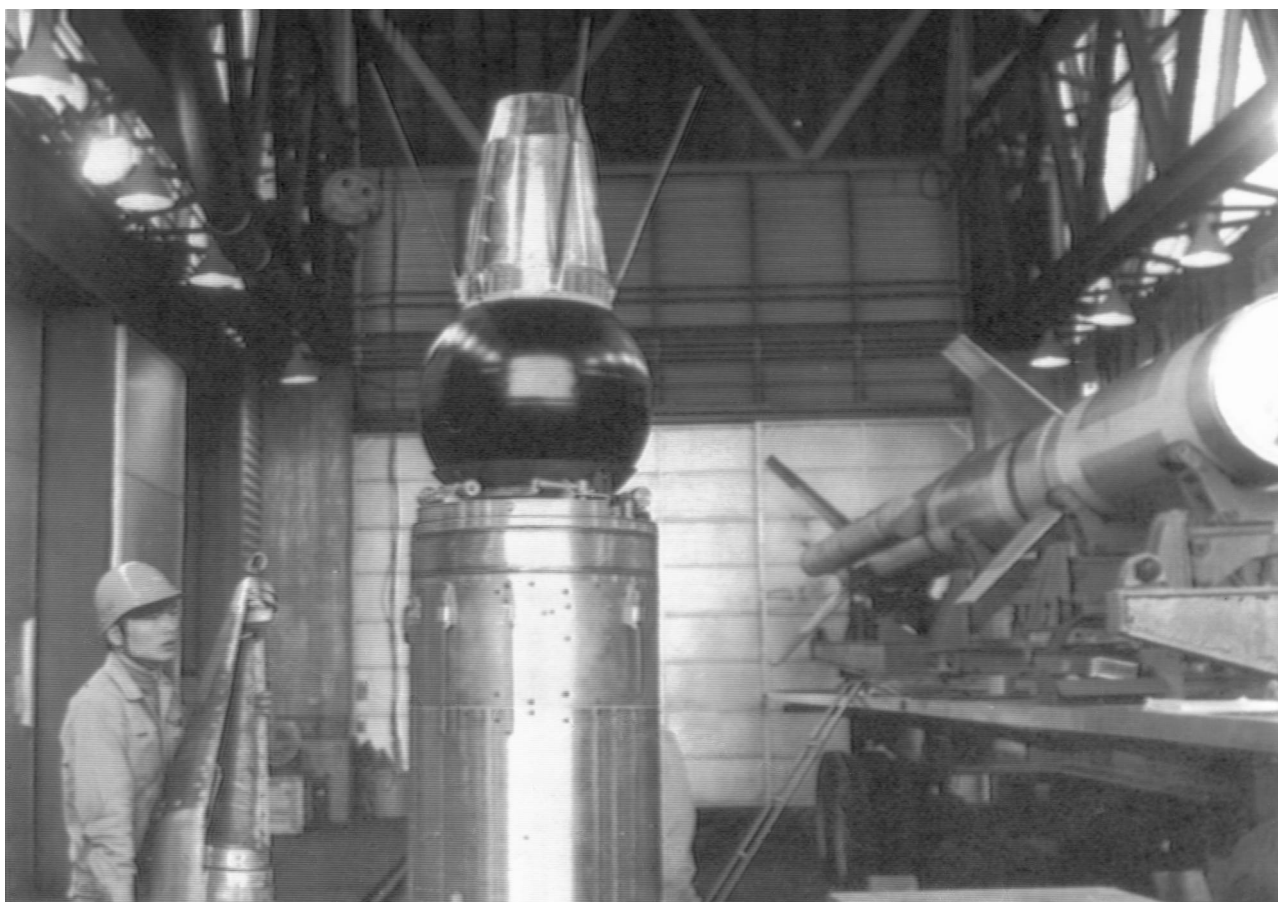
According to [The Japan Times' Sustainable Japan Magazine last year](https://sustainable.japantimes.com/magazine/vol08/08-01) (<https://sustainable.japantimes.com/magazine/vol08/08-01>), Japan ranks second in the world in terms of public and private investment in space ventures.

The private sector in particular is booming, with 60 or so companies now pursuing space programs when a decade ago there was just a handful. One of the newest is [CrossU](https://www.crossu.org/) (<https://www.crossu.org/>), a business enterprise from property giant Mitsui Fudosan

that was launched last month and will work with the Japan Aerospace Exploration Agency (JAXA).

There's a lot of catching up to do. As of April 2022, [more than 5,465 satellites are in orbit](https://www.ucsusa.org/resources/satellite-database) (<https://www.ucsusa.org/resources/satellite-database>): 3,433 from the United States, 541 from China and 172 from Russia.

Japan has put almost 100 satellites into orbit, but is gaining ground quickly. Nine were launched at the end of 2021, and there are plans to [put another 50 into orbit](https://www.asahi.com/ajw/articles/14759571) (<https://www.asahi.com/ajw/articles/14759571>) to track next-generation hypersonic missiles from this year through 2027. Even [a wooden satellite](https://www.japantimes.co.jp/news/2021/12/31/national/japan-wooden-satellite/) (<https://www.japantimes.co.jp/news/2021/12/31/national/japan-wooden-satellite/>), a world first, is reportedly in the works.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_215949.jpeg)

Japan launched its first satellite – Ohsumi – in 1970. | KYODO

‘Greatly hindered’

However, the H3's recent failure heralds potential hurdles in realizing Japan's dreams of laying claim to a bigger portion of space.

The failed launch on March 7 follows an attempt last month that was aborted shortly before takeoff due to malfunctioning electrical equipment.

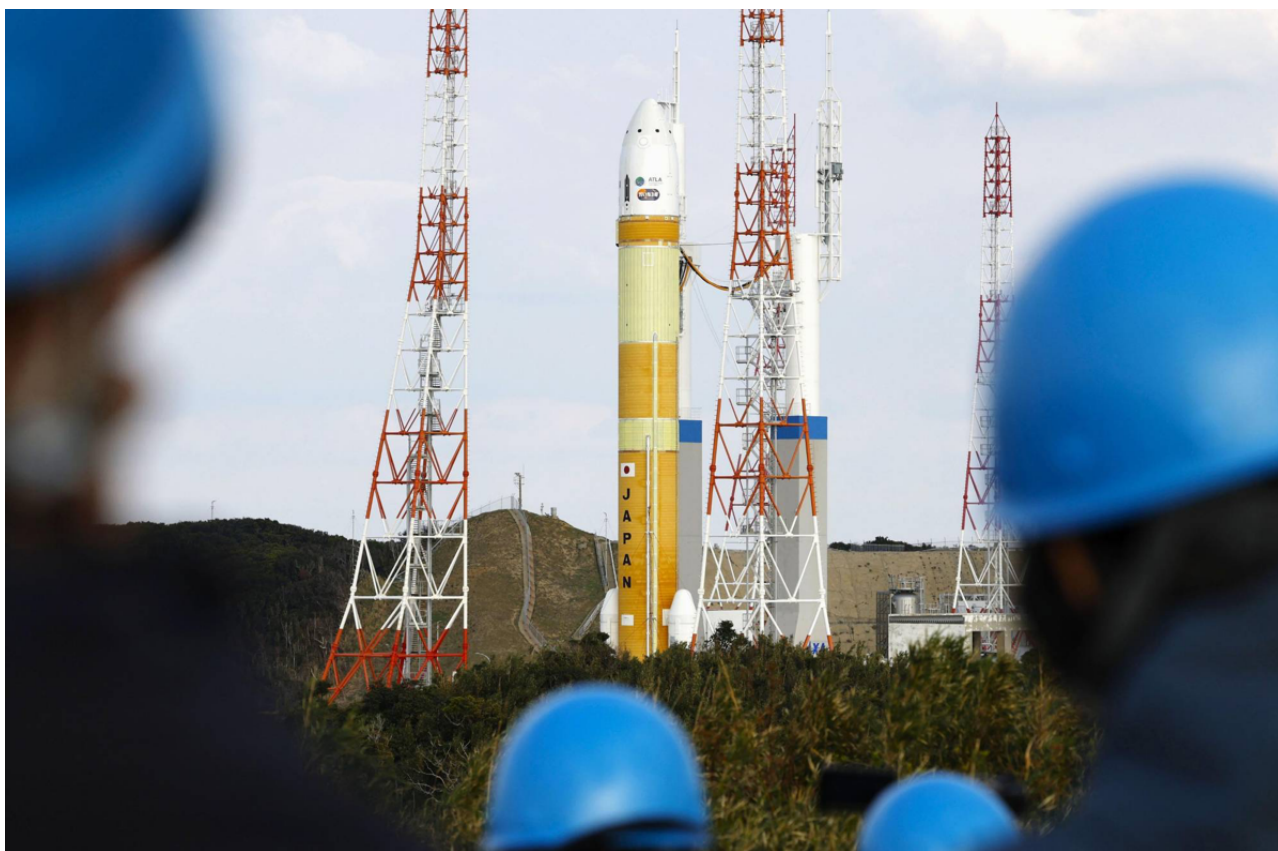
Five minutes into its latest launch, the rocket's speed started dropping rapidly, falling from 12,000 kph to below 10,000 kph in less than two minutes. The launch was [abandoned seven minutes after takeoff](https://www.youtube.com/watch?v=5RWCnKbys00) (<https://www.youtube.com/watch?v=5RWCnKbys00>) when officials confirmed the second-stage engine had not ignited.

“Officials decided that the rocket could not complete its mission, so a self-destruct command was issued,” said Kotomi Mimura, a public information officer for Tanegashima Space Center during a live broadcast of the launch. The remains of the ¥200 billion rocket fell into the sea east of the Philippines.

Speaking before the launch, Hiroaki Akiyama, an executive adviser to the National Space Policy Committee under the Cabinet Office, was initially positive.

“(H3 will) demonstrate to the world that Japan has the ability to launch the satellites it needs at any time — in other words, that it has the ability to freely engage in space activities,” Akiyama says, calling it “a rocket that must succeed.”

Akiyama also sounds a note of caution, explaining that the country's space program would be “greatly hindered” if the rocket exploded or if a self-destruct order was issued.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_215944.jpeg)

Japan's next-generation H3 rocket is moved into launch position on March 6. | KYODO

The rocket's failure joins other recent flops in JAXA's space program.

The 26-meter [Epsilon-6 rocket also failed to get into orbit in October](https://www.japantimes.co.jp/news/2022/10/12/national/epsilon-rocket-launch-failure/) (<https://www.japantimes.co.jp/news/2022/10/12/national/epsilon-rocket-launch-failure/>), while the space agency reportedly lost communications with Omotenashi, a moon lander tasked with measuring lunar radiation, in November. Akiyama believes that the lander's loss "wasn't that serious."

"It was the first mission in many years undertaken without undue fear of failure," he says. "That it ended in failure was within our scope of expectations."

News was better at the start of the year, however, with the successful launch of an H-IIA rocket carrying an [IGS-7 radar reconnaissance satellite](https://www.nasaspaceflight.com/2023/01/h-ii-a-igs-r7/) (<https://www.nasaspaceflight.com/2023/01/h-ii-a-igs-r7/>) into orbit in January.

Meanwhile, [a record number of space launches were conducted worldwide in 2022](https://www.nature.com/articles/d41586-023-00048-7) (<https://www.nature.com/articles/d41586-023-00048-7>), according to science journal Nature. There were 180 in total, with SpaceX's 78 launches putting the United States at the top of the table. China, which recorded 62 successful launches, almost tripled Russia's achievements, while European launches numbered just five. New Zealand managed nine launches from its private spaceport courtesy of U.S. company Rocket Lab, while India's space program expanded considerably in 2022 with five launches.

By comparison, 2022 was not a bumper year for Japan insofar as its official space program was concerned.

Hiding in plain sight?

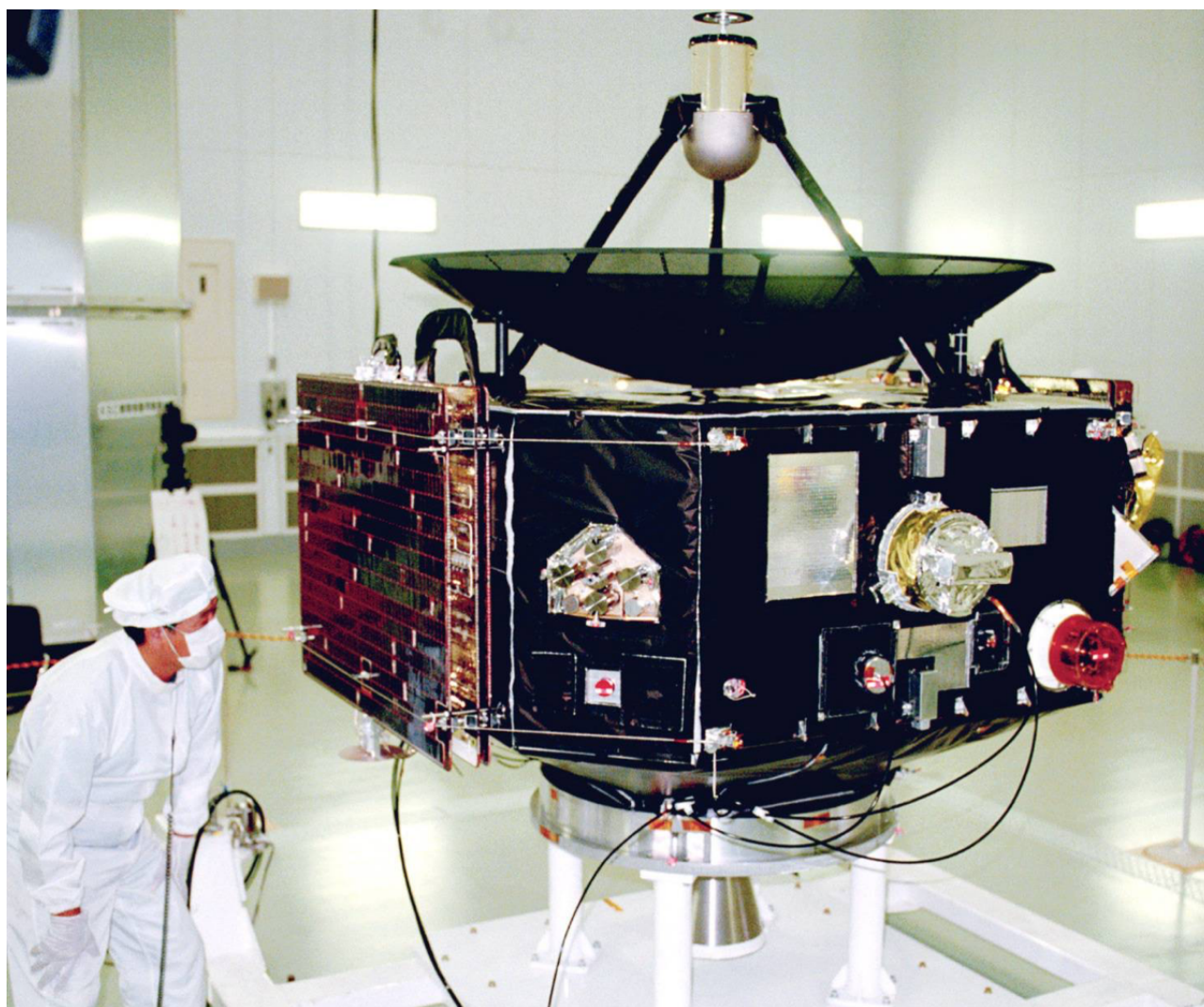
Private companies have been showing promise.

Startup [Space One unveiled its new Space Port Kii](https://asia.nikkei.com/Business/Startups/Japanese-startup-Space-One-plans-first-rocket-launch-in-February) (<https://asia.nikkei.com/Business/Startups/Japanese-startup-Space-One-plans-first-rocket-launch-in-February>) in Wakayama Prefecture late last year, with a launch originally scheduled for the start of the year [postponed until summer](https://sorabatake.jp/30777/) (<https://sorabatake.jp/30777/>).

Elsewhere, private venture Ispace piggybacked on a SpaceX Falcon 9 rocket in December to put its HAKUTO-R lunar lander [on course for the moon](https://ispace-inc.com/news-en/?p=4225) (<https://ispace-inc.com/news-en/?p=4225>). The lander is also carrying Rashid, the United Arab Emirates' first moon rover, and SORA-Q, a transformable robot.

Developed as a result of a partnership between JAXA and toymaker Takara Tomy, SORA-Q was designed by 37-year-old Kenta Hashiba, who reportedly created a baseball-size robot that can morph into a movement mode to get around after being [inspired by "Transformers."](#) (<https://mainichi.jp/english/articles/20220415/p2a/00m/0sc/013000c>)

However, SORA-Q is not the first robot to be employed in space. In 2010, NASA delivered its humanoid Robonaut2 to the International Space Station. Three years later, Japan deployed a much-smaller robot named Kirobo to accompany Koichi Wakata, the first Japanese commander of the space station.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_216326.jpeg)

Space agency officials inspect Japan's first Mars probe named Nozomi at the Kagoshima Space Center in June prior to its launch. | KYODO

The deployment of Kirobo is a classic example of soft power — part of a space policy that is “paraded as a paragon of self-imposed restraints on remilitarization,” according to a 2019 essay titled “Hiding in plain sight? Japan’s militarization of space and challenges to the Yoshida doctrine,” published in the Asian Security journal.

One of the essay's authors, Christopher Hughes, a professor of international politics and Japanese studies at the University of Warwick, England, calls Kirobo "one example on the more civilian end of the spectrum of Japan's space programs that helps to build the perception of everything Japan does in space as unthreatening, for the good of humankind, and even 'cute.'"

"(This) spills over into forming similar impressions of all space programs even if actually more dual-use oriented," he tells The Japan Times.

Another example of this can be seen in the launches of Japan's ETS-VII satellites of the 1990s. These objects were "quite military in nature," says Hughes, who notes that they primarily demonstrated Japan's anti-satellite capabilities.

"The Basic Space Law of 2008 abandoned the 1969 Peaceful Purposes Resolution for the use of space that had notionally prevented the military use of space," he says.

Akiyama, who is also a professor of the Institute for Education on Space at Wakayama University, says the Basic Space Law helped to bolster the industry.

"The enactment of the law and subsequent changes in the structure of the Advisory Council led to market reactions, and the working population in space-related industries began to increase," he says.

However, the militarization of space — essentially the use of space in order to aid military efforts on the ground — is certainly nothing new.

'Star Wars' reboot?

Initiated by the United States and the Soviet Union, the space race has more recently attracted other nations such as China and India.

Space is increasingly seen as a potential sphere of conflict, Hughes says, especially since China tested an anti-satellite weapon in 2007.

"(This) enhanced anxieties of moves by states to disable each other's satellite capabilities and de facto 'blind' each other in a conflict," he says.

Indeed, a similar test conducted by Russia at the end of 2021 prompted Japan to [release a statement condemning the move](https://www.mofa.go.jp/press/release/press3e_000270.html) (https://www.mofa.go.jp/press/release/press3e_000270.html), saying it "undermines sustainable and stable use of outer space."

“As the importance of outer space is increasing, the government is concerned about the destruction also from the perspective of peaceful use of outer space and security,” the statement said.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_215943.jpeg)

A computer graphic shows the Japan Aerospace Exploration Agency's Hayabusa 2 approaching the asteroid Ryugu. | COURTESY OF JAXA / VIA KYODO

Akiyama points to the ongoing war in Ukraine as proof that “efforts to maintain the ability to freely operate in space were extremely important for security.”

He cites the canceled launch and subsequent [confiscation of 36 OneWeb satellites](https://www.bloomberg.com/news/articles/2022-09-02/oneweb-takes-230-million-hit-after-russia-seized-its-satellites) (<https://www.bloomberg.com/news/articles/2022-09-02/oneweb-takes-230-million-hit-after-russia-seized-its-satellites>) by Russian authorities in March last year; Japanese communications giant SoftBank has a 12% stake in the U.K.-based company. With no signs of the war abating, the space race — now more of a battle royale than a duel between giants — is well underway.

A recent review by Reuters of articles published in Chinese defense journals revealed that “China needs the capability to shoot down low-Earth-orbit Starlink satellites” — the SpaceX “constellation” that has proved “very valuable to support Ukraine’s military forces’ use of drones.”

Closer to home, China has stepped up its military activities around Taiwan in recent years, raising tensions in the region and prodding governments to look skyward to shore up surveillance defenses from above.

“The shift to the military use of space is, of course, part of the broader shift in Japan’s self-declared intent to ‘fundamentally strengthen its defense capabilities’ in response to the perceived deterioration of its security environment,” Hughes says.

The rise of China, North Korea’s missile programs and Russia’s invasion of Ukraine all play their part. Cutting-edge space technology, Hughes adds, enable the country’s Self-Defense Forces to supplement U.S. space capabilities, making Japan “a more useful and ‘seamless’ alliance partner.”

Although Japan has fostered its own homegrown space program, beginning with the Pencil Rocket developed and first launched in 1955, it, “like other policies,” says Akiyama, “cannot easily deviate from the category of following the United States.” By comparison, he says, China and India have been promoting their own space programs unchecked from the beginning.

Private companies are also supplying potential security solutions, Astroscale being one example. The Tokyo-based company provides [space debris removal services](https://www.japantimes.co.jp/news/2023/03/04/world/space-junk-us-companies/) (https://www.japantimes.co.jp/news/2023/03/04/world/space-junk-us-companies/). “that could be turned to the purpose of disrupting the satellite networks of others,” Hughes says.

✂ [A new round of funding for Astroscale](https://astroscale.com/astroscale-raises-u-s-76-million-continuing-to-lead-the-growing-on-orbit-servicing-sector/) (https://astroscale.com/astroscale-raises-u-s-76-million-continuing-to-lead-the-growing-on-orbit-servicing-sector/) in February saw investment from Mitsubishi Electric, which is “working to promote the use of space in the security sector,” said Masahiko Arai, general manager of the defense systems division of Mitsubishi Electric, in a statement.

Elevator to space

The technological setback that is bound to follow the H3 rocket failure is likely to haunt Japan’s space program for some time.

In February, Japan unveiled plans to buy hundreds of [Tomahawk cruise missiles from the U.S](https://www.japantimes.co.jp/news/2023/02/14/national/japan-tomohawk-missiles/) (https://www.japantimes.co.jp/news/2023/02/14/national/japan-tomohawk-missiles/). due to unease over the country’s ability to repel an attack from China or North Korea. The deal is reportedly worth around ¥211.3 billion.

However, Hughes says, Japan needs more effective intelligence and surveillance provided by strategic satellites in order to make counterstrike capabilities a reality.

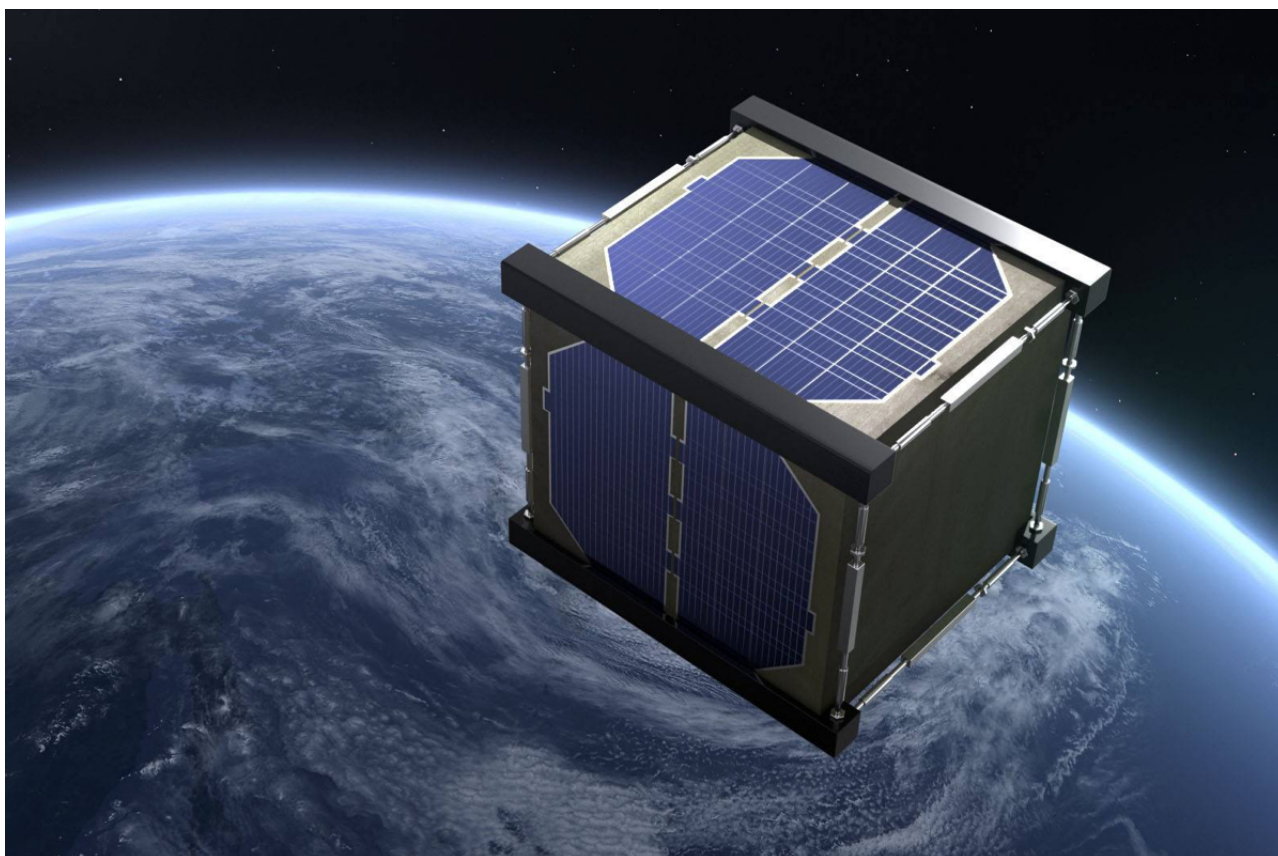
Indeed, space is certainly big business for all involved.

Instead of repurposing a portion of the national budget for its own space program, Akiyama believes Japanese companies need to figure out how to attract investors from overseas.

“In 2050, the space industry will generate nearly ¥100 trillion for rockets, satellites and ground equipment alone,” Akiyama says. “It’s predicted that the sector could reach ¥200 trillion if other ripple industries such as space travel are included.”

“Japan’s space ambitions should be structured to capture not only the national budget but also private investors,” Akiyama says. “Unfortunately, however, it doesn’t work that way.”

As an example, Akiyama points to the creation of the Space Development Study Group at the end of last year to help funnel overseas investment into Japan’s space program.



(https://www.japantimes.co.jp/wp-content/uploads/2023/03/np_file_215948.jpeg)

An artist’s impression of a wooden satellite that Kyoto University and Sumitomo Forestry Co. are hoping to launch in 2023. | COURTESY OF KYOTO UNIVERSITY / VIA KYODO

Japan has excelled at missions in space in the past, especially in terms of voyages that explore new landscapes.

In 2005, Japan became the first nation to land on an asteroid successfully and extract samples, returning them safely to Earth in 2010. The second-generation Hayabusa rocket then landed a rover on an asteroid for the first time before collecting the samples

and returning them to Earth in 2020.

“We have strengths in solid planetary science and astronomy,” Akiyama says, noting also that Japan was the first country in the world to realize the potential minefield of meteorites that lay undiscovered in Antarctica, following the Japanese Antarctic Research Expedition in 1969 to the Yamato Mountains of the icy continent.

Akiyama also mentions space elevators. This predominantly hypothetical advancement (a supertall elevator reaching from the Earth’s surface into space) would remove the barrier of having to use fuel-guzzling rockets to break through Earth’s atmosphere, allowing for easier space travel. A similar concept lay behind [China’s successful rocket launch from a high-altitude balloon last year](#)

(<https://www.scmp.com/news/china/science/article/3175466/chinese-rocket-balloon-launch-lifts-near-space-scientific>).

“(The idea is) well-received in Japan,” he says. “Their realization is a matter of technical theory — whether or not it is possible to create sufficiently light and strong carbon fiber.”

Another issue, he says, is that a country with space elevator capability would have to restrict launches by other means (i.e. rockets).

“Then, it will be possible to distinguish between countries that have space elevators and those that do not, whether they can operate freely in space or not,” Akiyama says. The phrase “outer space shall be free for exploration and use by all states” appears in the Outer Space Treaty, which was signed in 1967.

Space elevators were originally conceived by Konstantin Tsiolkovsky, a pioneering, eccentric Russian scientist who was inspired by the newly built Eiffel Tower in 1895. Now the company behind another tower, Tokyo Skytree, is attempting to realize Tsiolkovsky’s vision.

Obayashi, one of Japan’s leading construction companies, has also [floated the idea of a space elevator](#) (https://www.obayashi.co.jp/kikan_obayashi/detail/kikan_53_idea.html), promising to complete construction by 2050 provided the necessary materials can be sourced.

In 2018, a team from Shizuoka University [tested the motion of elevators in space](#) (<https://www.smithsonianmag.com/smart-news/researchers-take-tiny-first-step-toward-space-elevator-180970212/>) with the help of two separate satellites. At the time, Yoji Inshikawa, its lead researcher, called the space elevator “highly plausible.”

However, we’re not there yet. It’s a vision that lies not only in engineering prowess, but also in the maturity of the international community.

Conflicting global interests are a reality, something driven home by the brutality of the Ukraine war.

As Akiyama says, the construction of space elevators (and pretty much anything else) depends on an “indispensable global social system.”



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