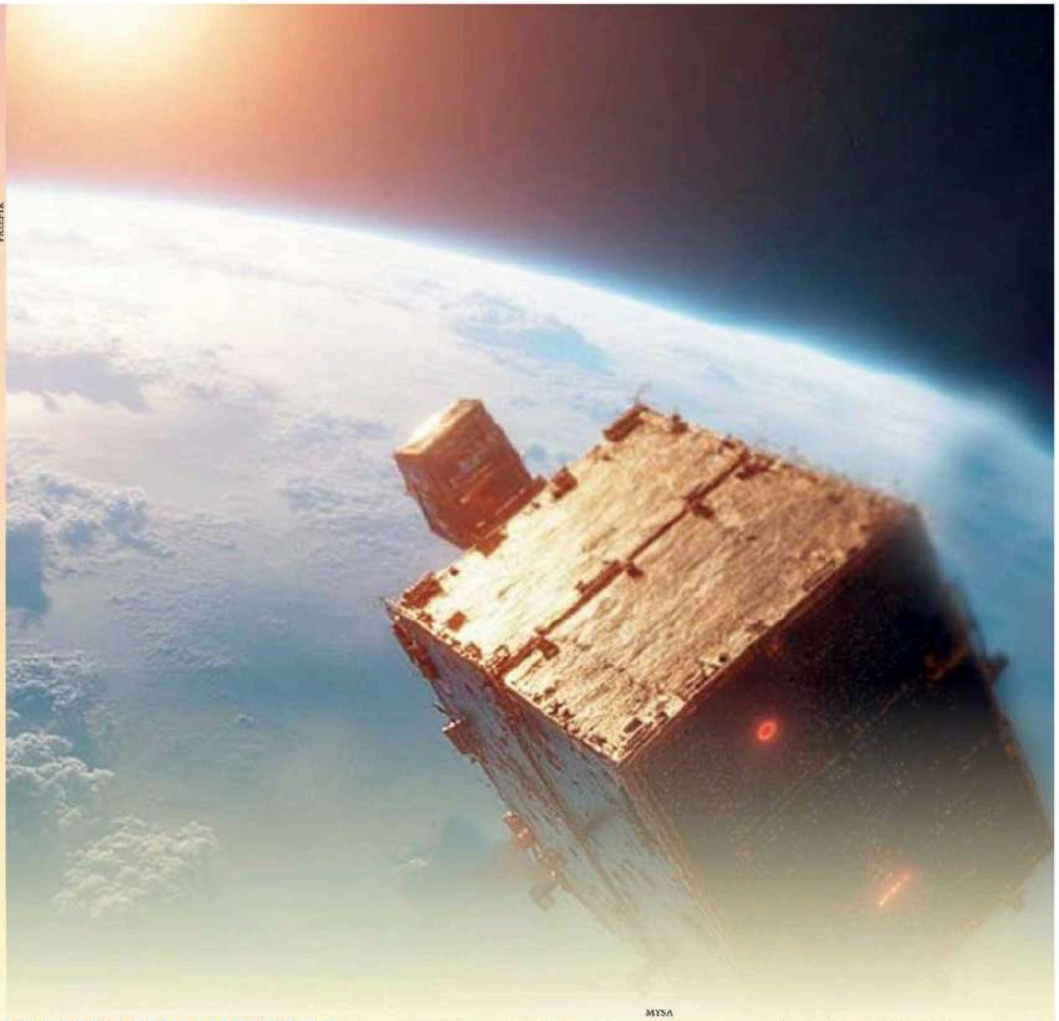
COVER STORY



FREEPIK

When Malaysia's first satellite, Measat-1, was launched in 1996, the country made headlines for its space aspirations. But today, participating in this area is less about national pride than tapping into a rapidly growing economy powered by data, connectivity and satellite-based services.

From high-speed internet via satellite constellations to real-time earth observation (EO) for disaster response, the modern space race is changing how nations plan for the future. The value of the industry is expected to soar to US$1.8 trillion by 2035, according to the World Economic Forum, with much of that growth driven by satellite-enabled services.

Recognising this, Malaysia is positioning its space industry as a strategic growth engine and an essential part of its digital transformation agenda.

"Malaysia must establish a sustainable space ecosystem that is supported by clear government policies, a strategic road map and effective regulation to achieve this goal," says Datuk Azlikamil Napiah, director-general of the Malaysian Space Agency (MYSA), which sits under the Ministry of Science, Technology and Innovation (Mosti).

The aim is to have the space sector contribute at least 1% — or RM10 billion — to the country's gross domestic product by 2030. And, along the way, create 5,000 jobs, achieve 50% self-reliance in space technology, and generate an annual market of RM40 million for space-based data services, states the Malaysia Space Exploration (MSE) 2030 action plan, which is part of the National Space Policy (NSP) 2030.

The NSP 2030, launched in 2017, is the nation's blueprint to develop local space technology capabilities, drive new economic growth, strengthen national sovereignty, advance knowledge for national development.

To turn this ambition into reality, industry experts are calling for a national space programme with well-defined long-term goals, funding mechanisms and strategic priorities.

"The government is the primary consumer of satellite data for applications such as national security, disaster management, environmental monitoring and communications. Without government-backed programmes, it is difficult for local companies to sustain long-term investments in satellite development due to high costs, limited commercial demand and reliance on foreign providers," says Rushdi Abdul Rahim, president and CEO of the Malaysian Industry-Government Group for High Technology (Might).

Malaysia can learn from countries such as the Netherlands, which have established robust national frameworks, supportive legislation and strong public-private partnerships, says Azlikamil. Encouraging private sector participation through national programmes and projects will be crucial to unlocking innovation and bolstering industry engagement.

The NSP 2030 and MSE 2030 — which outlines 15 strategies and 27 initiatives — set the direction, but their succes hinges on clear roadmaps such as a national space programme to provide long-term direction and funding, says Rushdi.

"A structured plan with specific milestones and actionable initiatives will provide clarity, encourage private sector participation and support sustained progress in the space sector," he says.

"Without this clear direction, businesses may hesitate to invest due to uncertainty about long-term viability."

Such a road map should pinpoint priority areas — satellite manufacturing, downstream applications and launch capabilities — alongside measurable milestones to track progress, he adds.

"A structured approach to project execution, whether in the form of satellite development programmes, space infrastructure investments or technology transfer initiatives, will provide industry players with clear opportunities to participate, innovate and contribute to the space economy. Importantly, Malaysia must recognise that not all projects will succeed and should allow for calculated risks, ensuring that setbacks do not derail long-term objectives," says Rushdi.

WHERE DO SATELLITES FIT IN?

The global shift towards low earth orbit (LEO) and very low earth orbit (VLEO) satellites has played a transformative role in democratising access to space. Operating between 160km and 2,000km above the earth, these satellites are quicker to launch and better suited for high-speed data applications such as broadband internet and EO.

This evolution has lowered the barriers to entry, allowing more nations and private firms to participate in the global space economy.

Malaysia has been active in the satellite space since 1996 and has launched 13 satellites to date — six for communication, three for remote sensing and four for research — in both LEO and traditional geostationary earth orbit (GEO). GEO satellites operate much higher, at around 35,786km, and remain fixed relative to a point on Earth, according to the European Space Agency.

The country's most recent additions to orbit is *Uzma SAT-1*, an EO satellite developed by local energy company Uzma Bhd and launched into LEO. The satellite forms part of a constellation operated by Satellogic, giving Malaysia frequent revisit rates and near real-time monitoring, says Uzma managing director and group CEO Datuk Kamarul Redzuan Muhamed.

DIGITIONARY

Revisit rates

Revisit rates refer to the frequency a satellite passes over a specific area. A higher revisit rate is required for frequent data collection, which is necessary for application such as disaster response and crop monitoring.

LEO satellites' proximity to Earth means lower signal delay and better bandwidth, making them ideal for services like satellite broadband, says Yau Chyong Lim, chief operating officer of Measat Satellite Systems Sdn Bhd.

They also have more spectrum availability, which is important as demand for data continues to rise, adds Yau.

LEO satellites also offer several cost advantages over medium earth orbit (MEO) and GEO systems, says Venkat Pillay, founder and CEO of LatConnect 60 (LC60 AI). LEO satellites require smaller, less expensive sensors and can be built using miniaturised electronics because they are closer to Earth. LC60 AI is an Australian artificial intelligence (AI) firm that delivers insights from satellite EO data.

However, GEO satellites still play an important role, says Yau. A single GEO satellite can cover one-third of the globe, which makes it ideal for broadcasting and point-to-multipoint communication. Industries such as oil and gas, which require very reliable connections, still prefer GEO systems.

MYSA

"Malaysia must establish a sustainable space ecosystem that is supported by clear government policies, a strategic road map and effective regulation to achieve this goal."
Azlikamil, MYSA

MIGHT

"Without government-backed programmes, it is difficult for local companies to sustain long-term investments in satellite development due to high costs, limited commercial demand and reliance on foreign providers."
Rushdi, Might

Measat operates a fleet of GEO satellites. The company's active satellites include *Measat-3a*, *Measat-3b* and *Measat-3d*.

Investing in LEO satellites for EO makes sense from a national perspective, Venkat believes. This is because one or two satellites can provide important data for border monitoring, disaster response and environmental tracking.

"Every country should have its own satellite and the reason why each country needs to have a national satellite is because you can [protect] your sovereignty. Meaning you can monitor your own waterways for military purposes [or] for intelligence gathering. You do not want to be reliant on any third-party satellite for that data because tomorrow, for whatever reason that country switches off access to that satellite, you are blind," he says.

LC60 AI is working on building a LEO satellite in Australia to collect high-resolution data on carbon emissions. The satellite, which has received funding from the Australian government, is scheduled to launch from India in December 2026.

The company aims to address gaps in the satellite data market, particularly in shortwave infrared data, which is crucial for monitoring carbon emissions to meet net zero targets.

"In fact, the only reason we are launching our own satellites in 2026 is because that particular data set is not available in the market. But when we see that there's already a data set available from a third-party vendor, we use that first. Because for us, it's more about the end-user insight," says Venkat.

Reaching for the FINAL FRONTIER

BY KIRAN JACOB AND TAN EE JJ

He adds, however, that establishing a LEO-based communications infrastructure is far more capital-intensive. To achieve real-time global coverage comparable to that by providers such as Starlink, an operator would need to deploy and maintain a constellation of hundreds or even thousands of satellites. The total cost for building and operating such a system can range from US$500 million (RM2.2 billion) to US$3 billion.

These systems require reinvestment every five to seven years, says Yau. Starlink currently operates the world's largest satellite constellation, with over 6,750 satellites in orbit.

But Malaysia lacks the large customer base necessary to make LEO-based connectivity models commercially viable, says Kamarul. Instead, he suggests that LEO satellites serve national priorities by supporting real-world applications in sectors such as agriculture, energy and regulatory compliance.

For instance, LEO satellites can help improve paddy yields and food security by supplying data on irrigation patterns, disease outbreaks and soil nutrients. Satellites can also support compliance with the EU Deforestation Regulation (EUDR), ensuring that Malaysian commodities such as palm oil meet sustainability standards.

"There is no way for you to comply with [the EUDR] unless you use satellite data to know whether the plantation holders have complied with it," says Kamarul.

MEASAT

Yau of Measat believes the country should position itself as Asean's space hub to ensure a sufficient volume of satellite launches and long-term operational viability

LATCONNECT 60

"Every country should have its own satellite and the reason why each country needs to have a national satellite is because you can [protect] your sovereignty."
Venkat, LatConnect 60

In addition, LEO satellites can be used to monitor border incursions, track encroachment into utility rights of way, and detect millimetre-scale land shifts that may indicate potential landslides or pipeline failures.

LEO satellites are constantly in motion, points out Venkat. Travelling at speeds of up to 7km per second, they complete one orbit around Earth approximately every 90 minutes.

This allows them to cover the entire globe in a day, though not the same locations in every pass.

For applications requiring consistent monitoring — such as crop health or daily emissions — adding more LEO satellites to a network can reduce revisit times.

"[LEO satellites] are cheaper [and] smaller, but they have some disadvantages as well because they are moving all the time. So you need a lot of satellites to make sure that you have continuous data. That's why [for] *Uzma SAT-1*, we joined a constellation that belongs to Satellogic," says Kamarul. He explains that this means it is joining another 30-odd satellites, ensuring that there are plenty of revisits in Malaysia.

Meanwhile, Measat collaborates with global LEO satellite service providers such as Starlink. It is an authorised reseller of Starlink hardware and services, integrating Starlink's capabilities into its infrastructure to deliver high-speed internet to Malaysian users. The company currently has no plans to launch its own LEO network due to the high costs involved, says Yau.

Measat has also signed a memorandum of understanding with Shanghai Spacesail Technologies, a Chinese firm developing a large LEO network called "Thousand Sails".

The two companies plan to explore collaboration in LEO broadband, direct-to-device communications, satellite-based Internet of Things and EO. They will also conduct a joint study on high-frequency satellite transmission.

Measat supports a multi-orbit strategy that integrates LEO services from partners such as Spacesail with its existing GEO satellites. This approach aims to expand coverage, particularly in remote areas, and introduce new satellite services to the region.

Spacesail has already launched 72 satellites, and has plans to expand its Thousand Sails network to more than 15,000 in the coming years.

SPACE: WHAT ARE ITS BENEFITS?

The space industry can be categorised into three segments: upstream for satellite manufacturing and launch, midstream for satellite operations and downstream for application and data services (see Image 1). Each segment requires distinct skill sets. For example, operating satellites demands a very different expertise from manufacturing them, says Measat's Yau.

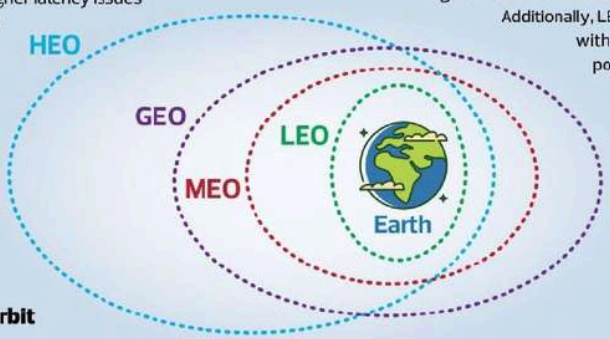
Might's Rushdi stresses that Malaysia already has notable capabilities, including expertise in small satellite technology, a well-developed semiconductor industry supporting space-grade electronics, and an assembly, integration and testing (AIT) facility in Banting capable of satellite assembly and testing. However, the industry continues to face challenges, such as limited private sector involvement, insufficient research and development (R&D) capacity, a shortage of skilled professionals and inadequate funding.

CONTINUES NEXT PAGE

Types of satellites by orbit

Geostationary Earth Orbit (GEO)
GEO satellites offer persistent, wide-area coverage with high capacity and reliability, requiring only a few satellites to cover the entire globe. This makes them efficient for large-scale communication networks. However, they come with certain limitations, such as higher latency issues and limited availability of orbital slots. GEO satellites are commonly used for telecommunications, weather forecasting and satellite radio services.

Low Earth Orbit (LEO)
LEO satellites provide high-speed internet with low latency and offer near-global coverage, which makes them ideal for real-time applications. However, they face several challenges such as space debris, traffic management and the need for large constellations to ensure continuous coverage. Additionally, LEO systems must contend with spectrum congestion and potential signal interference. These satellites are commonly used for Earth observation and connectivity services, which includes satellite broadband and Internet of Things applications.



Medium Earth Orbit (MEO)
MEO satellites serve as a compromise between GEO's broad coverage and LEO's low latency, offering a balance of performance and coverage area. MEO satellites provide lower latency than GEO and require fewer satellites than LEO for global reach. They are commonly used for global navigation systems.

Highly Elliptical Orbit (HEO)
HEO satellites provide extended periods of observation or communication over specific regions. HEO satellites are suitable for communications, remote sensing and satellite radio, especially in regions where traditional GEO or LEO coverage may be limited.

Creating solid foundation in downstream applications

FROM PREVIOUS PAGE

This is why the government and local businesses should take a pragmatic approach and focus on areas where it can achieve high-impact value, says Rushdi. There is significant growth potential in downstream applications and services, such as satellite data analytics for environmental monitoring, disaster management, precision agriculture and urban planning, he says.

The country can further expand its downstream focus to address broader Asean-wide challenges, including climate change and rapid urbanisation, adds Rushdi.

"We acknowledge the global shift towards LEO and VLEO satellites and the increasing role of emerging technologies in shaping the future of space operations. While in-orbit servicing and in-space assembly and manufacturing are significant advancements, Malaysia's immediate focus is on technologies that align with its current strengths to build a solid foundation for future capabilities," he says.

For example, MYSA's downstream space activities are focused on developing and utilising remote sensing applications to improve management in areas such as agriculture, forestry, environmental conservation, disaster response and national security, states Azlikamil.

The real value of satellites is in effectively interpreting and applying the data they generate. Venkat says the future lies in transforming raw Earth observation data into actionable insights using AI.

LC60 AI does this by ingesting diverse data sources and converting them into usable insights. The process involves cleaning and correcting raw satellite imagery, aligning datasets and layering them geographically into a "data cube" — a software-based structure that stacks different data types for the same area. Once this is done, machine learning algorithms can identify patterns or statistical relationships.

According to Uzma's Kamarul, Malaysia can stimulate demand for upstream satellite infrastructure by empowering downstream applications grows, so too does the need for data, thereby justifying investments in new satellites and sensors.

The Malaysia Space Exploration (MSE) 2030 initiative has identified upstream activities, including the development of home-grown satellites under the National Remote Sensing Satellite Development Programme (PSPJN), and enhancing national research infrastructure for global navigation satellite system (GNSS) signal monitoring and testing.

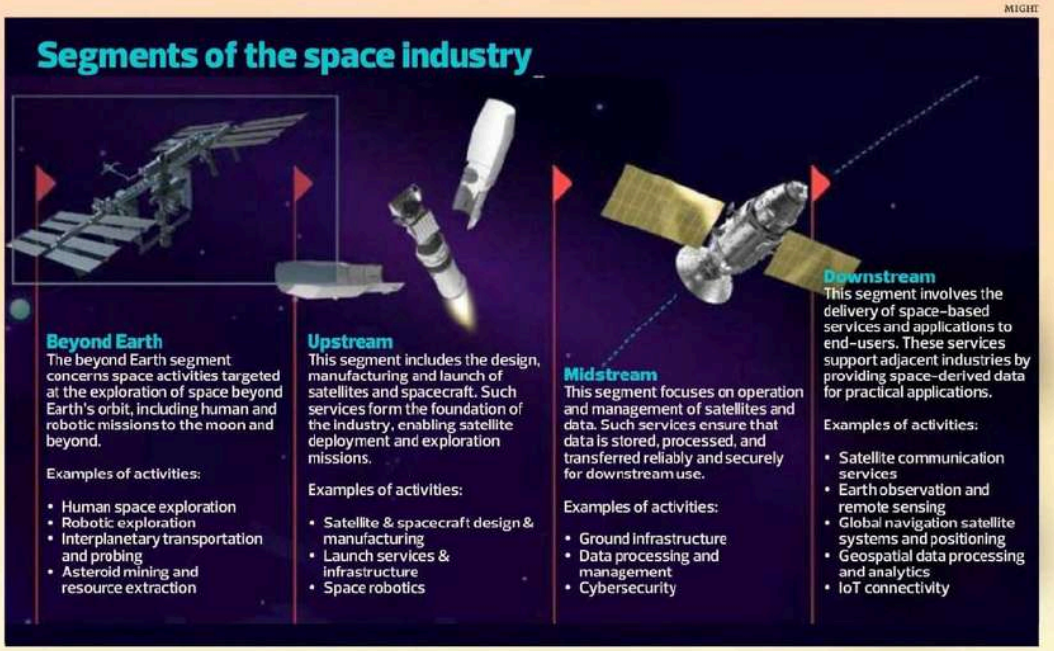
The country also wants to strengthen its position in the global space supply chain by developing space-grade printed circuit boards (PCBs) and high-quality components, says Rushdi. This would enable local manufacturers to participate in international space programmes by supplying critical components for satellites, communications networks and space exploration missions.

"Malaysia holds a significant advantage in this effort as the country has long been a hub in the electrical and electronics industry, providing a solid foundation for the development of advanced technologies in the space sector. Malaysia also has a mature and experienced maintenance, repair and overhaul industry in the aerospace sector, which can provide technical support and expertise for the implementation of future space projects," he elaborates.

The country already possesses upstream capabilities. In the private sector, companies such as Uzma have in-house satellite manufacturing capacity, says Kamarul. Uzma's space division operates across three verticals: analytics, data sales and satellite manufacturing.

He believes Malaysia can carve out a niche in microsatellites and CubeSats, and should also focus on space-grade chip manufacturing and satellite subcomponents such as optics and payloads — areas where the country already has promising research and infrastructure.

Kamarul also advocates for the greater use of the AIT facility in Banting for future satellite programmes instead of outsourcing to foreign providers. He says the facility is accessible and valuable to local companies such as Uzma, significantly reducing barriers to entry for satellite builders and start-ups.



MIGHT

UZMA

Kamarul of Uzma says Malaysia can stimulate demand for upstream satellite infrastructure by empowering downstream applications and start-ups

INDEPENDENCE-X AEROSPACE

Izmir of Independence-X Aerospace says redirecting some contracts given to foreign satellite service providers to Malaysian companies would enable them to reinvest earnings into local satellite development and operations

CARVING OUT A NICHE IN SPACE ECOSYSTEM

Local companies and start-ups have the potential to develop satellites in the CubeSat and small satellite segments, says Rushdi. However, there are significant barriers to launching these satellites domestically, such as the lack of a launch facility, high investment costs and regulatory considerations.

Additionally, these start-ups often face a mismatch between promising technologies and viable business models, observes Kamarul. Some possess strong technical foundations but weak commercialisation strategies, while others have compelling business visions without ready technology.

Moreover, Malaysia's manufacturing capabilities remain nascent, says Norilmi Amilia Ismail, founder and CEO of SpaceIn Sdn Bhd — a Universiti Sains Malaysia (USM) spin-off established in August 2020. Most local companies focus on integrating components rather than manufacturing full subsystems from scratch. However, there are efforts within universities to develop specific subsystems, such as communication and computing modules, particularly for CubeSats.

For example, SpaceIn designed and integrated its own PCBs but sourced key components, such as space-grade solar panels, from Europe due to regional shortages.

She notes that very few upstream space start-ups have emerged in Malaysia due to the high capital requirements. While downstream start-ups are on the rise, sustaining demand for satellite applications remains difficult.

The development of a local satellite ecosystem is closely tied to market demand. For domestic companies to scale, they require regular contracts or interest from local clients.

"I think the challenge is in how you create demand for satellite applications and for the market itself [in order to] sustain in this industry. If you don't have customers, you can't sustain the business. The most important [aspect] for start-ups [is] to look at the

DIGITIONARY

CubeSats

CubeSats are a category of nano satellites that are built up from standard cubic units (1U), each measuring 10cm x 10cm x 10cm. These satellites, which are typically 1kg to 10 kg, have a fraction of mass and cost of traditional satellites and are often used for educational purposes and research. CubeSats are also quick to be developed, easy to launch and typically used in low earth orbit.

SHAHRIN FAHYA/THE EDGE

market itself, how they go to the market and also how to do the business using satellite technology," says Norilmi.

Izmir Yamin, CEO of Independence-X Aerospace Sdn Bhd, points out that a conducive environment does not necessarily require direct government investment in R&D. Instead, it should support local providers through contracts. He says the government currently subscribes heavily to foreign satellite services for fisheries, agriculture, land surveys, border control and national security.

Redirecting these contracts to Malaysian companies would enable them to reinvest earnings into local satellite development and operations, thereby strengthening the domestic space industry. For instance, allocating just 20% of current government satellite contracts to local firms could help them build both credibility and capability, says Izmir.

Nevertheless, investment incentives, grants and funding mechanisms must be promoted to support local space projects, asserts Rushdi. In addition, domestic players should connect with global companies to access technical expertise and launch opportunities.

The essential pillars for developing the space economy are funding, infrastructure, regulation, skills and technology, and a centralised space programme would help integrate these disparate elements into a coordinated national push, he reiterates.

Meanwhile, public-private partnerships (PPPs) are critical for stimulating the sector, minimising government expenditure and reducing technological risk, says Azlikamil. This model opens new opportunities for the private sector to explore areas such as satellite manufacturing and launching.

For example, the PSPJN, which involves the country's third remote sensing satellite, is being implemented through the PPP model. The satellite, expected to commence operations in 2028, aims to enhance the effectiveness of 60 space technology-based applications developed by MYSA.

These applications are currently utilised by more than 90 government agencies in various sectors, including agriculture, fisheries, land monitoring, disaster management and national security.

"This, in turn, provides the government with greater flexibility to explore additional opportunities through private investments, which have the potential to drive innovation, commercialise satellite outcomes and encourage broader private sector involvement in the space sector," explains Azlikamil.

The PSPJN will strengthen Malaysia's ownership of strategic data through the self-management of a national satellite, thereby reducing dependence on foreign satellite data and technologies, he believes.

SPACEIN

> ***"I think the challenge is in how you create demand for satellite applications and for the market itself [in order to] sustain in this industry."***
> *Norilmi, SpaceIn*

APADILANGIT

> ***Hafez of Apadilangit says stronger infrastructure, sustained talent development and well-defined national missions are needed to inspire both youth and professionals to participate in the global space race***

The PSPJN is currently in the negotiation phase with successful bidders and is expected to commence soon, according to Rushdi.

THREE, TWO, ONE: BLAST OFF

The Malaysian Space Agency is actively exploring the development of its own space launch capabilities, with increasing interest in establishing a national launch facility. Azlikamil says the country's strategic location along the equator provides a unique advantage for participating in the global space industry.

"Should we own such infrastructure, the country will have the opportunity to lead the launch services industry in the region," he says.

Sabah has emerged as a potential regional hub for satellite assembly and space launches. If successfully developed, the state's spaceport would be the 16th space launch facility in the world, says Rushdi. This would make Malaysia the ninth country with its own launch site.

Sabah Chief Minister Datuk Seri Hajiji Noor says the proposed space hub could generate annual revenue of RM200 million and create 5,000 jobs.

Given these developments, Kamarul urges the federal government to attract established launch companies to set up operations locally. In doing so, the country could benefit from foreign investment without bearing the full technological and regulatory burdens of launch activities.

Mosti, through MYSA, has developed feasibility study guidelines for launch facility development. According to Azlikamil, the guidelines provide a comprehensive framework covering eight key areas: site analysis, technical considerations, risk assessment, environmental impact, cost and finance, market and economic factors, legislation and stakeholder engagement.

"So far, MYSA has received two preliminary reports. The full feasibility reports from both submissions will be evaluated in detail by the government before it can be finalised. Technical evaluation by MYSA is expected to be completed within two weeks after a full complete final feasibility report is received. The government will finalise selecting the potential launching facility sites by 2026, [with a proposed] two years of development activities, and is expected to start operations by 2029," says Azlikamil.

He adds that any such development must comply with the stringent requirements specified in the Malaysian Space Board Act 2022 (Act 834).

"Act 834 came into full force on Jan 1 this year. Under this Act, a licence is required to develop and operate a facility. Companies must apply for a licence from the Malaysian Space Board through the Space Regulatory Division at Mosti. They also require a launch permit for each launch activity that launches from the facility located in Malaysia and must possess insurance. The safety and security of space activities are important, as launch activity is high-risk and involves third-party liability," says Azlikamil.

Yau cautions, however, that Malaysia's advantageous location near the equator alone is not sufficient. Building a spaceport requires massive infrastructure and long-term economic sustainability. A launch site that only launches one satellite per year would not be commercially viable.

This is why Malaysia must adopt a regional and international perspective, stresses Yau. He believes the country should position itself as Asean's space hub to ensure a sufficient volume of satellite launches and long-term operational viability.

In line with this vision, Mosti has announced an initiative to lead the Asean space economy through a proposed moonshot programme, according to news reports. "This large-scale project will involve multiple sectors, agencies and divisions within the ministry, aiming to drive development in key industries such as agriculture, communications, transport and education. Among the possibilities is the establishment of a joint space programme within Asean, including co-funding research in space-related fields," says Rushdi.

Building a sustainable space industry also requires substantial investment in talent development and technological expertise, he adds. Malaysia must prioritise workforce training in space engineering, satellite technology and science, techonology, engineering and mathematics (STEM) education to cultivate local capability.

Hafez Murtza, CEO and founder of Apadilangit — a Malaysian company that aims to popularise astronomy and space education — says stronger infrastructure, sustained talent development and well-defined national missions are needed to inspire both youth and professionals to participate in the global space race.

This means nurturing a workforce capable not only of building satellites, but also of optimising payloads, integrating complex subsystems and coordinating launches with global partners, he says.

A major hurdle, according to Hafez, is the disconnect between university training and industry expectations. Many students, after learning about satellites and space systems, feel unprepared for the workforce because academic curricula are not fully aligned with the demands of the commercial space sector.

To address this, Apadilangit Academy facilitates industry visits, international collaborations and practical exposure to real-world projects — helping students realise that careers in space are not only possible but viable.

For example, Apadilangit's EarthQuest programme introduces students to Earth observation data, allowing them to work with real satellite datasets.

The company aims to mentor 500,000 students over five years. "500,000 students. That's going to be our target within five years. We know there's going to be a funnel. Some of them will be dropping out. Some of them will go to another industry. [But] at least from 500,000, if we get 1% from that, there'll be 5,000," says Hafez.

Measat's satellite ground station in Cyberjaya supports its fleet of geostationary satellites that deliver broadband, broadcast and telecommunications services across the region