



Equatorial Space chief executive officer Simon Gwozdz (far right) and his colleagues launched their technology demonstrator rocket (background) over Perak, Malaysia, in 2020. The company develops rockets to send satellites and other space vehicles into orbit. PHOTO: EQUATORIAL SPACE

Primer

S'pore's space sector is on a mission for funds and talent

This is the eighth of 12 primers on current affairs issues under the news outreach programme by The Straits Times and the Ministry of Education

Shabana Begum

Mr Shanmugam Surya's fascination for the cosmos started in polytechnic, when he watched a documentary about the space race between the United States and the Soviet Union.

He was inspired by German-American rocket engineer Werner von Braun, who led the National Aeronautics and Space Administration (Nasa) in its mission to land on the moon.

"I adopted von Braun's calling as my own, and committed to it," says Mr Surya, 24, who is now reading electrical engineering at the National University of Singapore (NUS).

He went on to become a two-time champion at space challenges here, where he and his team designed a spacecraft and proposed a way to clear space junk, such as dead satellites.

After graduating, he is looking to tap his electrical engineering know-how to build processors and chips for satellites, rovers and probes.

Singapore's niche in microelectronics, aerospace, aviation and deep tech provides a good launchpad for its expansion into space – the final frontier. The leap makes sense as revenue from the global space industry is expected to be worth US\$1 trillion (S\$1.4 trillion) by 2040.

The local budding space scene comprises more than 50 space companies with over 1,800 employees. And over the past five years, more than 10 space and satellite-related start-ups have sprouted here.

Singapore did not enter the space scene to compete with the larger space-faring nations. Instead, its focus is mainly on building components for satellites, telecommunications and analysing data captured by satellites.

Its national space office, the Office for Space Technology and Industry (OSTIn), focuses on harnessing technologies, including satellite communications and remote sensing, to serve national needs in areas such as aviation, maritime, sustainability and climate action, says its executive director David Tan.

To support those needs and create disruptive technologies, the Government announced this year a \$150 million investment in research and development of space capabilities.

To Ms Lynette Tan, chief executive of Singapore Space and Technology Limited (SSTL), Asia-Pacific's leading space organisation, the space industry is an engine – one that will take Singapore's tech hub status "to a different stratosphere".

GAME-CHANGING SATELLITES

Since 2011, Singapore has sent up 16 satellites, the majority built by universities for research and demonstration of new technology.

The nation's first commercial satellite, called TeLEOS-1 and built by ST Engineering, was launched in 2015. The 400kg machine captures images of places near and at the equator.

Singapore wants to become a leader in a relatively new area, of flying satellites very close to earth. At very low earth orbit of up to 450km above the earth, as compared with the usual height of between 500km and 2,000km, satellites can capture images and data at a higher resolution. Telecommunication also improves, as a closer satellite will reduce network delays.

But those machines run the risk of veering off or being pulled back to earth from atmospheric drag. To solve this, local company Aliena develops low-powered engines that will maintain the satellites' low orbit by producing stronger propulsion.

In 2025, Singapore will launch a refrigerator-sized satellite at a 250km orbit, to test new technologies, including Aliena's engine and a locally designed space camera.

"(Singapore is) a technology front runner in being able to explore this domain of space rapidly... and we can position ourselves as solution providers globally," says Dr Mark Lim, Aliena's co-founder.

Singapore also leverages space technology to keep a watch on security and disasters in the region. Nanyang Technological University's (NTU) Earth Observatory of Singapore adds value to satellite data and images



TeLEOS-1 is Singapore's first commercial earth observation satellite. It was built by ST Engineering and launched in 2015. The 400kg machine captures images of places near and at the equator. PHOTO: ST ENGINEERING

About The Straits Times-Ministry of Education News Outreach Programme

For 12 Mondays between March 21 and Aug 8, this paper's journalists will address burning questions and offer Singaporean perspectives on complex issues in the Opinion section.

The primer articles are part of The Straits Times-Ministry of Education News Outreach Programme, which aims to promote an understanding of local and global issues among pre-university students.

The primers will broach contemporary topics, such as competition and collaboration in

healthcare, and economic growth in South-east Asia.

Other issues in the series include reimagining ageing in Singapore and the relationship between food and culture.

Each primer topic will give a local perspective to help students draw links to the issues' implications for Singaporeans.

This programme is jointly organised by The Straits Times and the Ministry of Education. This series takes a break over the school holiday and will resume on July 18.

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by creating damage proxy maps of disaster-hit regions, to help with relief operations.

Emerging satellite tech can also be used to study and combat climate change, by measuring changes to sea-surface temperature and ice melt, or the amount of carbon dioxide in the atmosphere.

Another domain Singapore can venture into is space life sciences, which looks into how humans, animals and even microorganisms from earth respond to the harsh and hostile environments of space.

It is an important research area as human space missions are looking more probable by the day. Then there is also growing food

on space, which could build on Singapore's advances in novel foods.

FUNDING CHALLENGE

Since 2007, Singapore space organisation SSTL has been laying the groundwork for the local space industry by bringing in multinationals that have space divisions, and creating opportunities for start-ups.

It also runs an accelerator programme that provides local and international start-ups with access to experts and fund-raising support.

What works in Singapore's favour is its neutrality, which matters for commercial space activities that require international collaboration.

That was a finding in a 2020 report by the Singapore chapter of the Students for Exploration and Development of Space (Seds Singapore), a non-profit run by university students.

But funding remains a major challenge, since the space business is highly capital-intensive, and deep tech needs longer incubation and development before results are seen.

"The investment and venture capital community is not very familiar with space tech. They find it a little mystical almost," says Mr Simon Gwozdz, chief executive of Equatorial Space, which develops rockets to send satellites and other space vehicles into orbit.

For broadband satellite operator