



INTRODUCING



OFFICE FOR **S**PACE **T**ECHNOLOGY & **I**NDUSTRY



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As a small and open economy, Singapore has always recognised the need to stay ahead of global trends and developments, to adapt and position ourselves for future growth...

Singapore's effort to develop our space industry is an example of how we are doing so.

”

- Mr S Iswaran, then Minister for Trade and Industry (Industry),
Global Space and Technology Convention (GSTC) 2017

Singapore's Leap into the Space Industry

Space is a growing industry filled with exciting potential.

To capture the economic opportunities and build a thriving space industry for Singapore, the Singapore Economic Development Board (EDB), together with other participating ministries and agencies, established the Office for Space Technology and Industry (OSTIn) in 2013.

OSTIn serves as a national office to grow a globally competitive space industry in Singapore. We collaborate closely with local and international satellite industry players to realise their business and innovation initiatives for the Asian markets. With a strong focus on driving innovation, OSTIn

also works closely with partners within and beyond the Singapore's space ecosystem to develop key research capabilities and talent to enable sustainable growth of the satellite industry in Singapore.

In addition, OSTIn operates as the national focal point to plan for all civil space matters in Singapore. As a responsible actor in space, Singapore is committed to the peaceful and sustainable use of space resources, and is currently registering its membership for the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS).

WHO IS OSTIN

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To better support innovation in our space industry, we will refine our approach to ensure greater alignment with industry as well as deepen capabilities within public sector research performers.

For the past 3 years, EDB's Office for Space Technology and Industry (OSTIn) ran open thematic grant calls to select and award research proposals on satellite-related technologies ranging from software and algorithms, to various satellite subsystems.

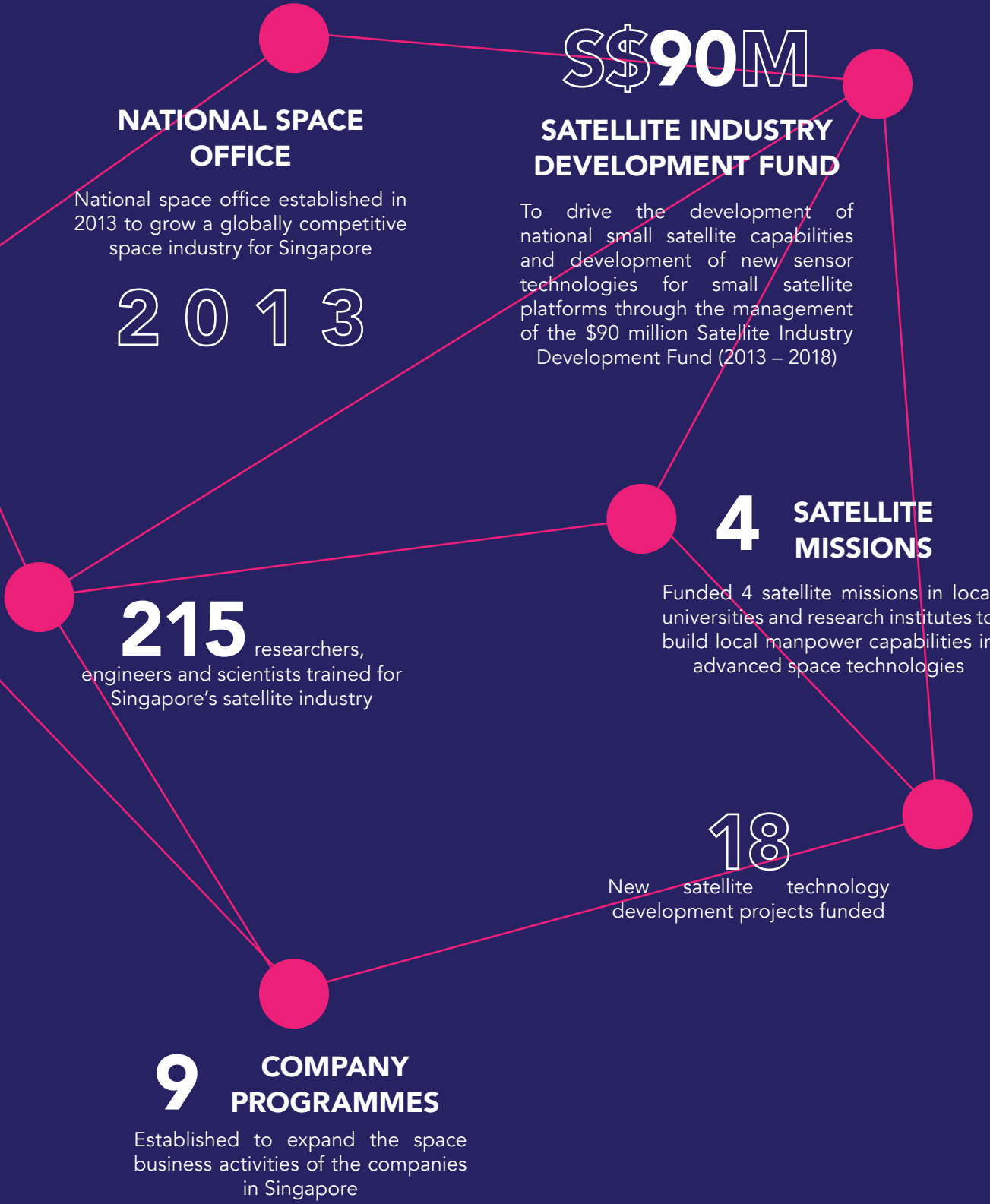
”

- Mr S Iswaran, then Minister for Trade and Industry (Industry), GSTC 2017

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Spearheading the Exciting Growth of Singapore's Space Industry



3 The Singapore Space Ecosystem

Our journey began in 1992.

With the concerted efforts and support from industry players, academia and government agencies, the Singapore space ecosystem has grown significantly and is now home to space companies across the satellite value chain. This includes new and upcoming players like Addvalue Technologies and ST GeoInsights, and established space companies such as iDirect, Thales and Eutelsat. The Singapore Space and Technology Association (SSTA) has also been playing a active role by organising the annual Global Space and Technology Convention (GSTC) that brings together local and foreign space industry players from across the world to exchange ideas and establish partnerships to further develop innovative ideas and solutions.

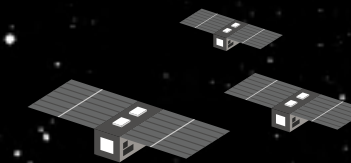


Satellite image of Poás Volcano Lake in Botos, Costa Rica from TeLEOS-1
Courtesy of ST Engineering



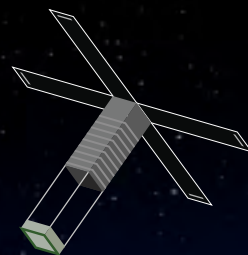
4 Singapore Satellite Missions

**Formation Flying
Nanosatellite Mission**
Built by NUS and to be
launched in 2021



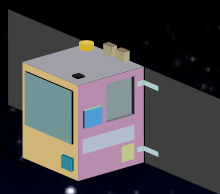
VELOX-I

Demonstration satellite for
inter-satellite communications
built by NTU



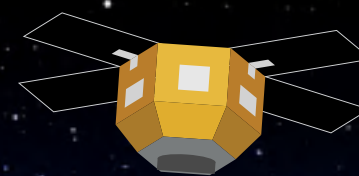
VELOX-CI

Tropical environment
monitoring satellite built by
NTU



TeLEOS-1

High-resolution commercial EO
satellite built by ST Engineering



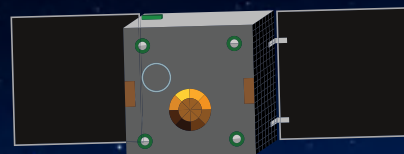
TeLEOS-2

SAR mini-satellite built by ST
Engineering and to be launched
in 2021/2022



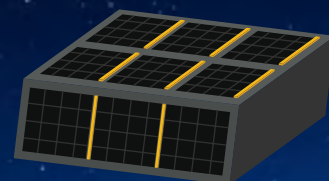
X-SAT

High-resolution imaging
satellite built by NTU



VELOX-PIII

Satellite to test components
built by NTU



GALASSIA

Demonstration satellite
for quantum encryption
technologies built by NUS



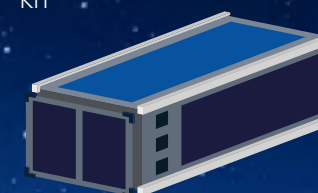
KENT-RIDGE 1

Hyperspectral imaging satellite
built by NUS



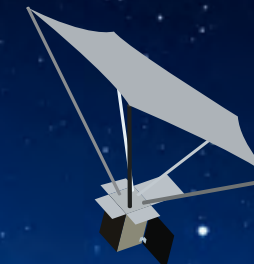
AOBA VELOX-III

Demonstration satellite
for pulsed plasma thruster
technologies built by NTU and
KIT



NeuSAR

SAR microsatellite built by DSO
National Laboratories and to be
launched in 2021/2022



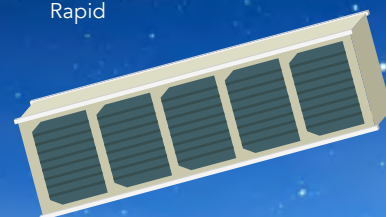
VELOX-PII

Satellite to space-qualify new
satellite components built by
NTU



POPSAT-HIP 1

High-resolution imaging
satellite built by Microspace
Rapid



VELOX-II

Demonstration satellite for
inter-satellite data relay system
built by NTU in collaboration
with Addvalue Technologies



ATHENOXAT-1

Night-vision optical-imaging
satellite built by Microspace
Rapid



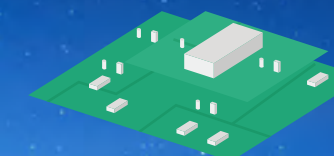
AOBA VELOX-IV

Demonstration satellite to
observe lunar horizon glow built
by NTU and KIT



QKD Qubesat

Demonstration satellite for
quantum key distribution
(QKD), built by NUS CQT and
RAL Space and targeted to be
operational in late 2021



2011 - 2013

2014

2015

2016 - 2017

Ongoing

NTU: Nanyang Technological University
KIT: Kyushu Institute of Technology

NUS: National University of Singapore
CQT: Centre for Quantum Technologies

5 Key Highlights



TeLEOS-1

Launched on 16 December 2015, TeLEOS-1 is Singapore's first commercial Near Equatorial Orbit (NEqO) Earth Observation satellite.

Designed and developed locally, it operates at an altitude of 550km, and offer 1m high resolution satellite imagery. With an orbital period of 96 minutes in a near-equatorial orbit, it provides greater imaging opportunities throughout the day with up to 6 daylight passes per day. This allows convenient access to high temporal imagery and geospatial solutions to respond to time sensitive events. Apart from reliable and rapid collection, TeLEOS-1 also offers direct tasking, imaging and downloading throughout the day.

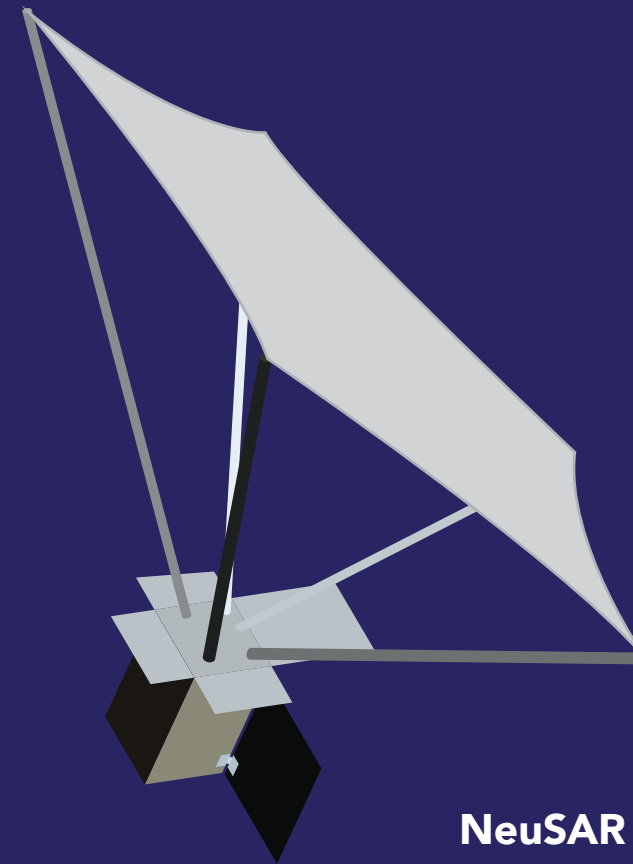
Satellite image of surface mining in Kolwezi, Democratic Republic of Congo from TeLEOS-1. Courtesy of ST Engineering



VELOX-II

Designed and developed by Nanyang Technological University (NTU), in collaboration with Singaporean company Addvalue Innovation Pte Ltd, VELOX-II is an advanced 6U nano-satellite carrying Addvalue's experimental payload for inter-satellite communications.

Launched in 2015, this satellite enabled Addvalue to test its proprietary LEO-GEO data relay system in space. With this system, LEO satellites are able to communicate with other satellites in higher geostationary orbits, thus providing near real-time connectivity between the LEO satellites and ground stations. Following the success of this experimental payload, Addvalue was able to formalise a worldwide agreement with Inmarsat in 2017 to jointly offer the world's first commercial on-demand communications service for LEO satellites.



NeuSAR

In pursuing the next frontier in space, NeuSAR will be Singapore's first small satellite Pathfinder developed for commercial constellation deployment due for launch in 2022.

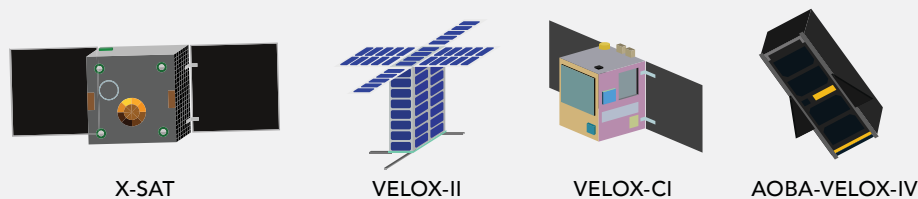
It is fully polarimetric (Synthetic Aperture Radar), capable of land and maritime applications, and incorporates a unique capability that detects minute changes in the scene between two passes. Designed to achieve a revisit time of less than 60 minutes for six satellites in constellation, NeuSAR is also able to provide day and night, all weather and through-cloud imaging possibilities.

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While our space industry has made progress, it is important that we continue to innovate and chart new frontiers.

- Mr S Iswaran,
then Minister for Trade and
Industry (Industry), GSTC 2017

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Satellite Research Centre (SaRC)

The “Birthplace” of Singapore’s first satellite programme, NTU’s SaRC is a centre of excellence that provides an exciting and dynamic research environment for aspiring satellite and space enthusiasts.

Over the past two decades, NTU SaRC has launched 9 satellites successfully. This includes Singapore’s first locally designed and developed micro-satellite, X-SAT. Its VELOX series of satellites also demonstrated the centre’s capabilities in the design and operation of pico and nano satellites. VELOX-II is one of the world’s first LEO-GEO satellite communication on a 6U nanosatellite, and VELOX-CI was able to demonstrate radio occultation using a COT GNSS receiver. Its latest satellite, AOBA-VELOX-IV, a collaboration with the Kyushu Institute of Technology, was also launched earlier this year to demonstrate propulsion and low light camera capabilities for small satellites to carry out future lunar missions.



Satellite Technology and Research Centre (STAR)

Established in 2018, the STAR@National University of Singapore (NUS) is a state-of-the-art centre that aims to be a leader in advanced distributed small satellite systems with a focus on flying multiple small satellites in formation or constellation.

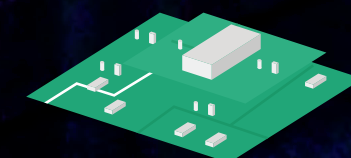
It comprises a state-of-the-art clean room facility for satellite testing and assembly works, electrostatic discharge controlled laboratories for research and student projects, as well as environmental testing facilities such as a thermal chamber and a vacuum chamber. Through its satellite mission programme, STAR will develop scalable small satellites of various sizes and weights for different applications. It aims to develop a fleet of 20kg satellites that can be deployed in space by 2022, for applications such as maritime and aerospace security. The small satellites can also be equipped with other instruments for remote sensing to monitor environmental change and detect forest fires.



Exploiting Disruptive Space Technologies

Satellite-based Quantum Key Distribution (QKD) is emerging as an unbreakable encryption technology, and is more secure than any existing encryption techniques.

NUS Centre for Quantum Technologies (CQT) and its spin-off company, SpeQtral, have been leveraging quantum cryptography to explore commercial applications of QKD in secure communications of sensitive data for telecoms and financial industries. They also aim to provide QKD hardware and other quantum-safe solutions, and are collaborating with telecommunications companies to bring QKD communication technologies into market. CQT is also partnering UK’s RAL Space to co-develop a ‘QKD Qubesat’, a Cubesat-standard satellite carrying QKD technology. Expected to be operational in 2021, the satellite will use a pioneering QKD technology from CQT to test the secure distribution of cryptographic keys over globe-spanning distances.



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Join Singapore's Space Journey

Innovation lies at the heart of the space industry. Today, the industry is witnessing new technological developments that are opening up new possibilities and opportunities that will transform and grow the industry even further.

OSTIn will continue to play a central role and take a whole of nation approach to develop a robust Singapore space ecosystem. If you would like to partner Singapore in growing your space business in the region, or would like to partner us in any other way, please feel free to reach out to us.

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Moving forward, Singapore will continue to invest in small satellite R&D, but channel our resources to build deep and differentiated capabilities in a few selected areas.

Under this new approach, OSTIn will work with various technology stakeholders to identify technology areas and establish national satellite R&D programmes.”

- Mr S Iswaran, then Minister for Trade and Industry (Industry), GSTC 2017

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Contact Us



www.edb.gov.sg



Satellite image of Changi Airport, Singapore from TeLEOS-1
Courtesy of ST Engineering