Singapore Country Report 2019

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The 26th Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-26), Nagoya, Japan, November 26-29, 2019
Satellite Data currently received at CRISP:
1. TERRA MODIS (USA, Mar 2001)
2. AQUA MODIS (USA, Jul 2002)
3. Worldview I, II & III (Nov 09) – 0.47m resolution
4. XSAT – May 2011
5. Suomi-NPP – July 2012
6. CBERS-04 – June 2015
7. TeLEOS-1 – December 2015
8. NOAA 20 – 2018
Singapore’s venture into space are mainly led by

- Commercial companies – Singapore Technologies Satellite Systems Ltd
- Universities – NUS and NTU
DSTA-ST Partnership

Programmes

- DSTA, on behalf of Government Of Singapore, has entered into partnership ST Electronics
- To Provide high revisit EO data to meet government and commercial needs through acquired and locally developed satellites.

- NEO Electro-Optical (EO) Satellites
- NEO Synthetic Aperture Radar (SAR) Satellites
TeLEOS-1

- Launch Date: 16 December 2015
- Designed Life: 5 years
- Orbit: Near Equatorial Orbit (10° to 15° Inclination)
- Orbital height: 550km
- Mass: About 400kg

Imaging & Collection Specifications
- Mean Revisit Time: 12 to 16 hours
- Resolution: 1m nominal at nadir
- Swath width: 12km
- Dynamic Range: 10bits per pixel
- Slew Rate: 2.5 deg/sec

Image Reception and Processing System
- In-house development of CRISP

TeLEOS-1 image data is marketed by ST Electronics (Satcom and Sensors) Pte Ltd
TeLEOS-1 NEqO Coverage
TeLEOS-2

- Payload: Synthetic Aperture Radar
- Resolution: 1m
- Mass: About 750kg
- On Board Storage: 500 Gbytes
- Downlink Rate: >800 mbps
Universities
Programmes

Nanyang Technology University (SaRC)
National University of Singapore (STAR)
## Nanyang Technology University (SaRC)

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<th>Satellites</th>
<th>Size</th>
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<th>Launched</th>
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<td>X-SAT</td>
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<td>VELOX-CI</td>
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<td>VELOX-II</td>
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<td>AOBA VELOX-III</td>
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National University of Singapore

NUS previous satellites:
• KR-1 – 80kg launched in 2015
• Galassia – 2kg 3-U cubesat launched in 2015

NUS Centre for Quantum Technology
• SpooQy 1 – 3U cubesat to be launched with J-SSOD on 17 June 2019

In 2017 NUS has form the Satellite Technology and Research (STAR) centre.
Current projects:
• Three 12 U satellites flying in formation (prec1se control and navigation)
• Galassia 2 – 3U satellite with multispectral camera
Singapore Space and Technology Association
GSTC is a C-suite convention attended by ministers, leaders of government agencies and key industry players. A neutral and conducive platform for dialogues on partnerships and commercial discussions between businesses, government agencies, as well as research institutes within the space industry.

- Cybersecurity for Satcom Systems
- IoT in Space
- Smallsat Innovation
- Satellite Life Extension Missions
- Space Debris
- Space Applications for Smart Cities
- 3D Printing in Space
- New Missions, New Breakthroughs
- Quantum Key Distribution in Space
- Used Case Study of Satellite in Disaster Risk Management
- Artificial Intelligence to Create Value

Almost 800 delegates
Close to 300 companies
Over 60 speakers

GUEST OF HONOUR
Mr Teo Chee Hean, Senior Minister and Coordinating Minister for National Security
Advanced Space Incubator

To spur and cultivate innovation in the space tech startup ecosystem

An SSTA project that will be announced at GSTC 2020.

- Access to subject matter experts
- Marketing B-B platform
- Bridging funds across Asia and US
- Technical consultancy on products
- Regional domain expertise
- Smart manufacturing solutions
- Sketch-to-Scale support
- Made-in-Singapore branding & quality

Start-up Transcelestial Technologies with SSTA President Jonathan Hung, SM Teo Chee Hean, and DPM & Minister for Finance Heng Swee Keat

Start-up pitching at GSTC 2019
Small Satellite Orbital Deployer

SSTA collaborates with JAXA to provide launch services for small satellites through JAXA’s Small Satellite Orbital Deployer (J-SSOD) onboard the ISS’s KIBO module.

- Cost competitive
- Allows access to perform testing of materials in real space environment
- Convenient for Singapore-based companies, as launches are usually in the Asian region
- Provides a healthy launch frequency via various ISS resupply vessels
- Places less stress on payload compared to satellites launched directly from rockets
SpooQy-1 successfully deployed from the ISS on 17 June 2019

“It will demonstrate – in a world first for a nanosatellite – a physical phenomenon known as ‘quantum entanglement’ in outer space”
Overview

- **An annual design competition** that challenges student teams (ages between 15 – 25 years old) to design and develop realistic Space-related projects.
- To promote technical and industrial research in Science and Technology and at the same time, challenge the thinking processes and creativity of students.
- **Strong participation from both local and foreign institutions** with the number of teams growing steadily year on year.

**SSC 2020**

**Topic: Space Debris**

**Challenge Statement:**

Design a satellite concept of not more than 5 satellites (Servicer) that can be used to deorbit space debris.

**Activities**

- Industry Visits to ST Engineering
- STK Workshops
- Meet experts such as Ms. Simonetta di Pippo, Director of UNOOSA
- Mentor Sessions
Asia is regularly hit by Typhoons (also known as Hurricanes or Tropical Cyclones) during the monsoon season. These storms often result in flooding, the deaths of thousands and the destruction of homes, roads and other basic infrastructure. This year’s challenge statement is to

Develop an AI empowered application that can assist response teams in efficiently analysing satellite images of areas affected by Typhoons
Thank You