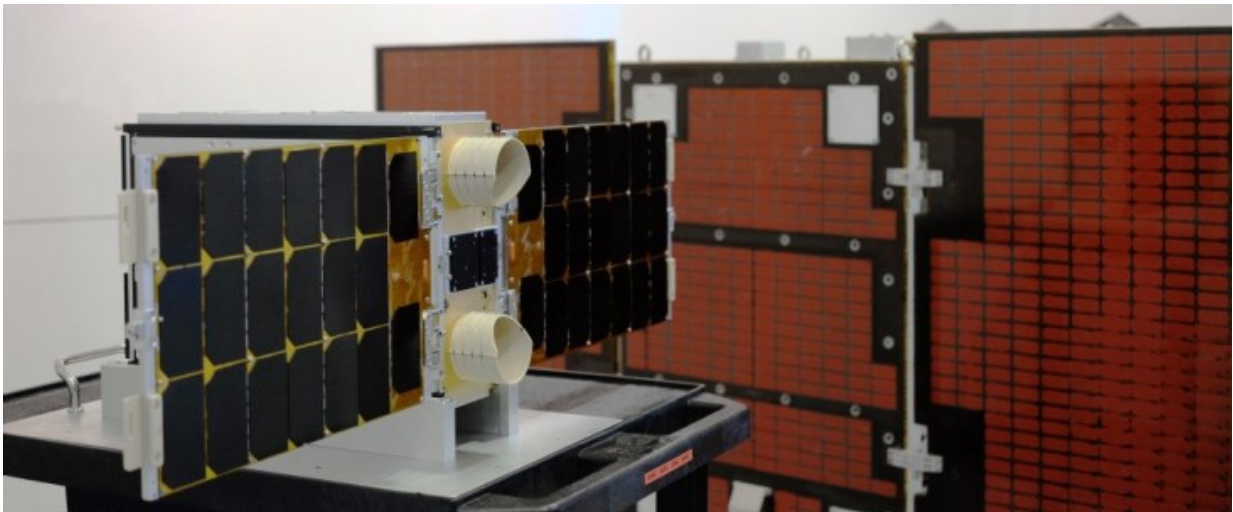


New made-in-NTU satellite technologies pass space tests

February 4 2016



Credit: NTU Singapore

The two new satellites launched by Nanyang Technological University, Singapore (NTU Singapore) two months ago have successfully completed their first space missions.

Experiments in [space](#) conducted by the two new satellites have proven the commercial viability of several new made-in-Singapore satellite technologies.

These new technologies include a space navigation system, precise and

fast-locking GPS receivers and radiation resistant hardware.

The two newest NTU satellites are the VELOX-CI - Singapore's first climate monitoring satellite; and VELOX-II, the world's first small satellite which carries a "communication-on-demand" technology which can send data back to NTU anytime and anywhere in space.

With the two successful satellites completing their primary missions, NTU now has six satellites out in space, demonstrating the University's ability to design, build and operate small satellite systems.

The NTU team is now ready to take on more commercial satellite payloads from companies and industry partners.

NTU Provost Professor Freddy Boey said the continued success of NTU's satellite programme reinforces the university's reputation for having strong multi-disciplinary research capabilities and applied engineering expertise.

"NTU's expertise in satellite technology has grown rapidly since we built and launched X-SAT, Singapore's first locally built satellite in 2011. In just a few years we have proven that NTU has what it takes to play a major role in supporting Singapore's leap into the space industry," said Prof Boey.

"We are among the very few universities in the world to have designed and successfully operated six satellites in space. With this track record, we can now offer our satellite building expertise to international and Singapore companies that are hoping to develop innovative space products for the global market."

One such successful industry partnership is by VELOX-II, which carries a communication payload built by Singapore company Addvalue

Innovation Pte Ltd.

Director of NTU's Satellite Research Centre Associate Professor Low Kay Soon said that the success of its latest satellites shows that Singapore has highly competent manpower and can sustain a local satellite industry.

"Our satellite research team has worked very hard over the last few weeks to ensure that our new satellites are operationally optimised and on track to complete the objectives of their mission," Prof Low explained.

"This success is a result of rigorous testing of the satellites conducted before launch and the excellent team we have trained over the years. Our next challenge now is to design future satellites that can carry advanced custom-built payloads."

New satellite technologies tested

VELOX-CI

The 123-kg microsatellite VELOX-CI, supported by Singapore's Economic Development Board, is designed to evaluate a new precise navigation system and to measure atmospheric parameters for studying the tropical climate.

Since its launch on 16 December, it has flown over Singapore more than 750 times in the last 50 days and successfully tested different NTU-designed technologies, including:

- 1) Precision GPS (Global Positioning System): NTU's GPS receiver can receive dual GPS frequency signals, giving it an accuracy of 20cm.
- 2) Ionosphere measurements: Using the GPS receiver, algorithms have

been developed to study the ionosphere (a region of Earth's upper atmosphere) so scientists can predict how much impact space weather can have on ground-to-satellite communication and satellite navigation.

3) Radio Occultation: an advanced technique used for climate study. VELOX-CI can detect GPS signals even without a direct line-of-sight to the GPS satellites. By measuring the bending of GPS signals through the atmosphere, data on atmospheric temperature, humidity and pressure used in long term climate studies can be obtained. Preliminary data shows that it is possible to obtain atmospheric data ranging from a few kilometres up to a few hundred kilometres.

4) Star tracker navigation software: the satellite can determine its orientation just by looking at the stars in space. The NTU team has collected hundreds of star images and constellations and added them into their database, which will be used to validate newer advanced algorithms.

VELOX-II

A 12-kg nanosatellite, the VELOX-II is designed and built by NTU to test three unique technologies for small satellite systems, including:

1) Fast GPS tracking algorithm: it can determine VELOX-II's position accurately within a minute.

2) On-demand-communication: the main mission of VELOX-II is to send data back to NTU, relayed via a higher orbiting satellite while flying on the other part of Earth. This proprietary technology, known as the Inter-Satellite Data Relay System (IDRS), is owned by Addvalue Innovation Pte Ltd and was integrated into the satellite by NTU.

3) Radiation resistant chip: the VELOX-II has a chip specially designed

to resist the impact of radiation in space. This chip manages and protects the critical data stored in the satellite's memory.

In addition, VELOX-II has been broadcasting a beacon signal every minute while orbiting in space. This unique beacon contains the satellite name and its status, such as the operating mode, battery levels, temperature, etc. This signal can be received by any amateur radio operator within the line of sight of the [satellite](#).

To mark the end of SG50, VELOX-II has been sending SG50 in text as its header after the second week in space.

Provided by Nanyang Technological University

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