

NTU undergraduates build nano and pico satellites

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They weigh just 3.5 kg and 1.5 kg but they will punch above their weight when NTU's latest two satellites are launched into space in 2013.

These satellites are designed, built and operated by NTU mark another milestone in NTU's [satellite technology](#) and research.

Called the VELOX-I, it is the first milestone project of NTU's Undergraduate [Satellite](#) Programme (USP). The VELOX-I satellite consists of two satellites - a nano satellite that weighs 3.5 kg called N-Sat and its tiny sibling, the P-Sat, a pico satellite that tips the scales at a mere 1.5 kg.

In comparison, the pico satellite weighs less than three iPads (601 grammes each) and measuring 10 cm on each side of the cube, it is still shorter than the height of the iPad (18.5 cm).

The nano satellite is just over half a kilogramme heavier than a 17-inch Macbook Pro (299 grammes) and at 20 cm long, it is 12.5 cm shorter than the laptop.

NTU's latest satellites will be ready to be launched into orbit in the first quarter of 2013 where it will validate the satellite-building skills of the engineering undergraduates. Having undergraduates trained in such sophisticated research and technology development augurs well for the future of Singapore's aerospace and [space industry](#).

For Mr Charlie Soon Jing Jun, who worked on the power management system of VELOX-I for his Final Year Project before he graduated with first class honours in Electrical & Electronic Engineering in 2010, the building of the two satellites from scratch has proved to be a challenge but one that can be surmounted.

Mr Soon said: "The main challenges in building a satellite are to design reliable subsystems that are able to survive in the harsh conditions in [space](#). The [students](#) also had to ensure that all the subsystems are to be integrated into a complete satellite within a given time schedule."

But Mr Soon, who has since returned to NTU as a PhD student to work on solar energy research and has mentored the undergraduates working on the VELOX-I, added that the project is richly satisfying and encouraged students to join the programme, saying: "Students who are involved in the USP will gain valuable knowledge in building satellites that are useful for both space and aerospace industries for their future careers.

"It also gives them experience in working on large-scale multi-disciplinary projects. Although the project is challenging, it will be most rewarding when the satellite is launched into the space. All the USP students can point to the sky and say he or she was involved in building a satellite which is making a full orbit of the Earth every 100 minutes."

During the first six months after launch, the N-Sat will deploy its solar panels, extend its optics mechanism to capture images of the Earth with an NTU-designed camera and communicate with the ground station for its primary mission. It will also test some of the sensors and actuators designed and built in-house at NTU. Furthermore, the satellite will conduct experiments to study quantum physics through a scientific payload.

After half a year in orbit, the P-Sat will detach from VELOX-I where, for the next 18 months, the two satellites will carry out tests on inter-satellite radio link and attitude control algorithms.

VELOX-I is the first space mission conducted under the USP. Fifty students in their 2nd to 4th year are participating in the project each year, with the support of research students and staff. The project officially started in April 2010. The ground station for mission control has since been set up and operated by a student team in the NTU campus. The students are from the School of Electrical & Electronic Engineering, School of Mechanical & Aerospace Engineering and School of Computer Engineering

Professor Freddy Boey, NTU Deputy President and Provost, said: "Space is one of the final frontiers in science and I am delighted that NTU students are building a pair of satellites that will be orbiting Earth to conduct scientific experiments. This is a clear demonstration of how far NTU has come.

"The creation of the VELOX-I satellites is also significant as it showcases NTU's capabilities in satellite technology and we can be a talent source that can ultimately serve Singapore's growing aerospace and space industry."

Associate Professor Low Kay Soon, the Director of NTU's Satellite Research Centre, added: "NTU has entered another exciting phase in our space programme with the creation of VELOX-I.

"The VELOX-I shows that NTU engineering students are capable of building something as sophisticated as a satellite and I hope that our success will inspire more students to join the Undergraduate Satellite Programme.

"Through this USP, we will nurture creativity and imagination in our [undergraduates](#) by providing them with a challenging multi-disciplinary and team-based project like the VELOX-I. These projects will also train them for a career in the aerospace industry as well as support Singapore's future ventures in the space industry."

On 20 April 2011, X-SAT, the first made-in-Singapore satellite, was launched into space. It was wholly designed and built by NTU in collaboration with the DSO National Laboratories. X-SAT is a micro satellite weighing 105 kg.

Provided by Nanyang Technological University

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