Source: *The Straits Times,* pA13
Date: 19 June 2019

Singapore nanosatellite goes into orbit

It will conduct tests that may help unlock quantum communications market worth $20b in next decade

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A nanosatellite, developed by a team of Singapore researchers looking for a breakthrough in cyber security and data encryption, has been put into orbit.

Slightly smaller than a shoebox, SpooQy-1 was launched by the Japan Aerospace Exploration Agency (Jaxa) to the International Space Station (ISS) in April, and then deployed into orbit on Monday.

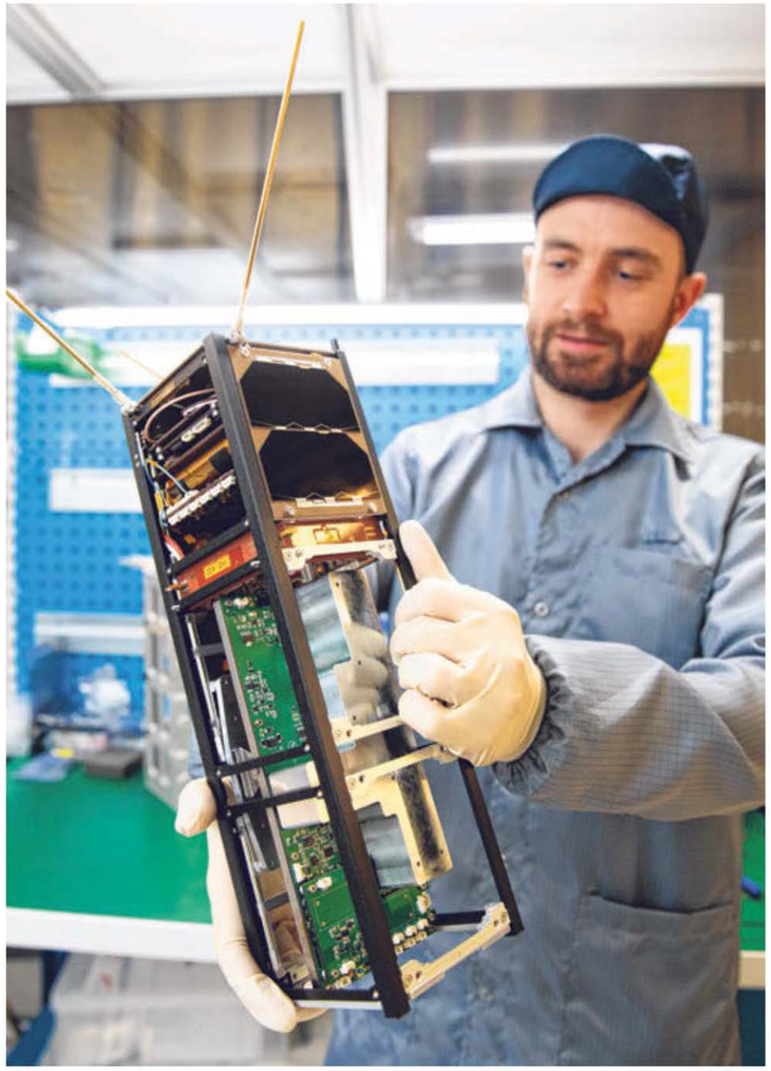
The deployment was done with the support of Jaxa's Flight Support Team, which was liaising with American astronaut Nick Hague on board the ISS, and witnessed by former Japanese astronauts Koichi Wakata and Norishige Kanai in Tsukuba, Ibaraki prefecture, Japan.

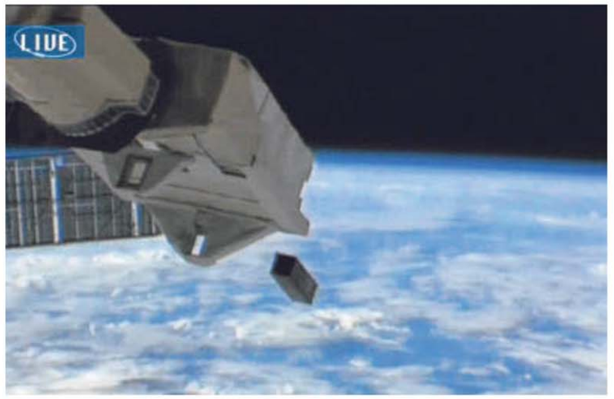
SpooQy-1, which measures 30cm by 10cm by 10cm and weighs 2.6kg, is the brainchild of the Centre for Quantum Technologies (CQT) at the National University of Singapore. It is the first Singapore satellite to be deployed into low-Earth orbit by the ISS.

It will demonstrate – in a world first for a nanosatellite – a physical phenomenon known as "quantum entanglement" in outer space that, if proven, will unlock a "quantum communications" market that is estimated to be worth $20 billion over the next decade.

Ms Lynette Tan, executive director of the Singapore Space and Technology Association, called it a significant moment in Singapore's space research.

"We are now part of the greater space community in the collaborative work done on board the ISS," she said, adding that the work by the CQT has the potential of putting Singapore on the world map in quantum and space technologies, given the new ground it is breaking.





Left: Dr Robert Bedington with a partially assembled SpooQy-1 at the Centre for Quantum Technologies. Above: A live feed from the International Space Station, beamed to the Japan Aerospace Exploration Agency, of SpooQy-1 being deployed into orbit this week. PHOTOS: CENTRE FOR QUANTUM TECHNOLOGIES AT THE NATIONAL UNIVERSITY OF SINGAPORE, JAPAN AEROSPACE EXPLORATION AGENCY

SpooQy-1, which may have a lifespan of between six and 18 months, builds on a previous mission in 2015 and will demonstrate the concept of the "monogamy of entanglement".

What this means is that, like in a monogamous relationship, each pair of photons, or light particles – carrying encoded bits of information – is so intimately correlated, regardless of distance, that no third party can interfere, CQT director Artur Ekert told The Straits Times.

"When the two are so close to each other, there's no third party that can be also equally close," he said.

Dr Robert Bedington, who co-founded SpeQtral, a spin-off space start-up from the CQT that recently announced seed funding from United States and Singapore investors totalling US$1.9 million (S$2.6m), said the technology will advance research in the encryption of data channels.

In theory, the entangled photons can be used to generate data encryption keys, he said. These keys can then be shared between two different remote locations in the most secure way possible.

He said the highly secure quantum communications channel is meant to complement existing networks, rather than replace them. This will be much more secure than conventional data encryption methods that rely on complex permutations of mathematical sequences, he said.

"Theoretically, this is much more secure than what is deemed secure right now, which is based on mathematical problems that are only assumed to be difficult," he said.

"We know that quantum computers of the future will be able to solve these problems, just that such machines do not exist yet. But when they do, that assumption of difficulty will no longer be true and then you will need other systems."

A third mission, slated for launch in 2022, will build on the results of SpooQy-1 by demonstrating that it can securely transmit the encryption keys to ground stations.

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