

# Republic to build advanced small satellite that will orbit close to earth

Shabana Begum

Singapore will build an advanced small satellite – the size of a mini-refrigerator and weighing 100kg – that will orbit very close to earth to trial new technologies and test the emerging space of flying satellites at low altitudes.

Unlike conventional satellites that soar between 500km and 800km high, the micro satellite will orbit some 250km above the earth, making it the first satellite in Singapore to do so.

A new space consortium, led by Nanyang Technological University (NTU), will helm the project. The satellite will be built and launched into space in 2025.

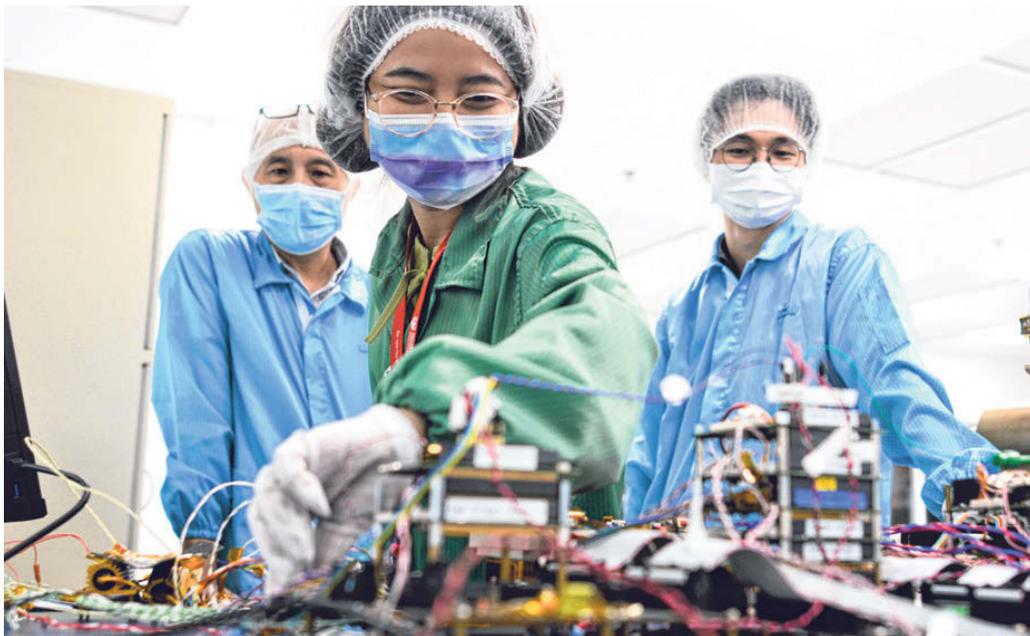
Since the satellite will be half the distance from earth compared with a conventional one, its remote sensing abilities will double, said Mr Lim Wee Seng, executive director of NTU's Satellite Research Centre.

This means that it will be able to capture images of damage caused by natural disasters at a higher resolution, for instance. Telecommunication will also improve, as a satellite closer to earth will reduce network delays.

Yesterday, members of the consortium, which includes the Satellite Research Centre, Temasek Laboratories at the National University of Singapore and NTU, and local satellite technology companies signed a research collaboration agreement to kick-start the satellite development.

The memorandum of understanding was inked on the sidelines of the two-day Global Space and Technology Convention held at Sheraton Towers, which began yesterday.

Flying satellites at very low earth orbit (VLEO) is still an emerging area, and the Singapore project will also collect data to fuel the development of future commercial VLEO satellites with multiple uses, from communications to climate and weather monitoring.



Scientists from Nanyang Technological University's (NTU) Satellite Research Centre working on new satellite technologies in their lab. A new space consortium led by NTU will helm the project of building an advanced small satellite that will orbit very close to earth to trial new technologies and test the emerging space of flying satellites at low altitudes. The satellite will be built and launched into space in 2025. PHOTO: NTU

This will help to position Singapore as a VLEO solutions hub, said members of the consortium in a joint statement yesterday.

To date, few satellites have been sent to fly at very low orbits.

The small satellite will also be equipped with Singapore's first locally designed space camera, which can take high-resolution images of objects as small as 50cm in length – about the size of a delivery parcel.

The camera, to be built by local tech firm LightHaus Photonics, is useful for applications such as sup-

ply chain monitoring, agriculture and mining.

One challenge of flying satellites close to earth is the machine running the risk of veering away and re-entering earth's atmosphere within a few days – due to atmospheric drag or friction.

"In lower orbit, the atmosphere is more dense and there is a higher amount of drag or friction which slows the satellite. And when the satellite starts to slow down, it will eventually re-enter the earth. You need an engine to compensate for it," said Dr Mark Lim, co-founder

of Aliena, a local space propulsion provider.

To solve that problem for the small satellite, Aliena has designed a fuel-efficient engine that will maintain the satellite's low orbit by producing stronger propulsion with an exhaust speed of 40km/s.

Conventional satellites have a propulsion system with an exhaust speed of around 8km/s, he added.

To further reduce atmospheric drag, the shape of the microsatellite will be longer and more rocket-like, compared with the rectangular or box-like conventional satellites.

Orbital debris, or space litter that comprises waste or unused material from spacecraft, is an ongoing problem ever since the launching of objects into space began more than 50 years ago.

To ensure that Singapore's small satellite does not end up as space junk after its use, its engine will be turned off, and the machine will descend to earth within a few days and eventually burn up in the atmosphere.

According to the United States' National Aeronautics and Space Administration, most orbital de-

bris is in low earth orbit, where the International Space Station also flies.

The microsatellite project is supported by Singapore's national space office, the Office for Space Technology and Industry.

Since 2011, NTU has designed, built and sent nine Singapore satellites into space.

The first was X-SAT, a 106kg remote sensing microsatellite built in collaboration with DSO National Laboratories.