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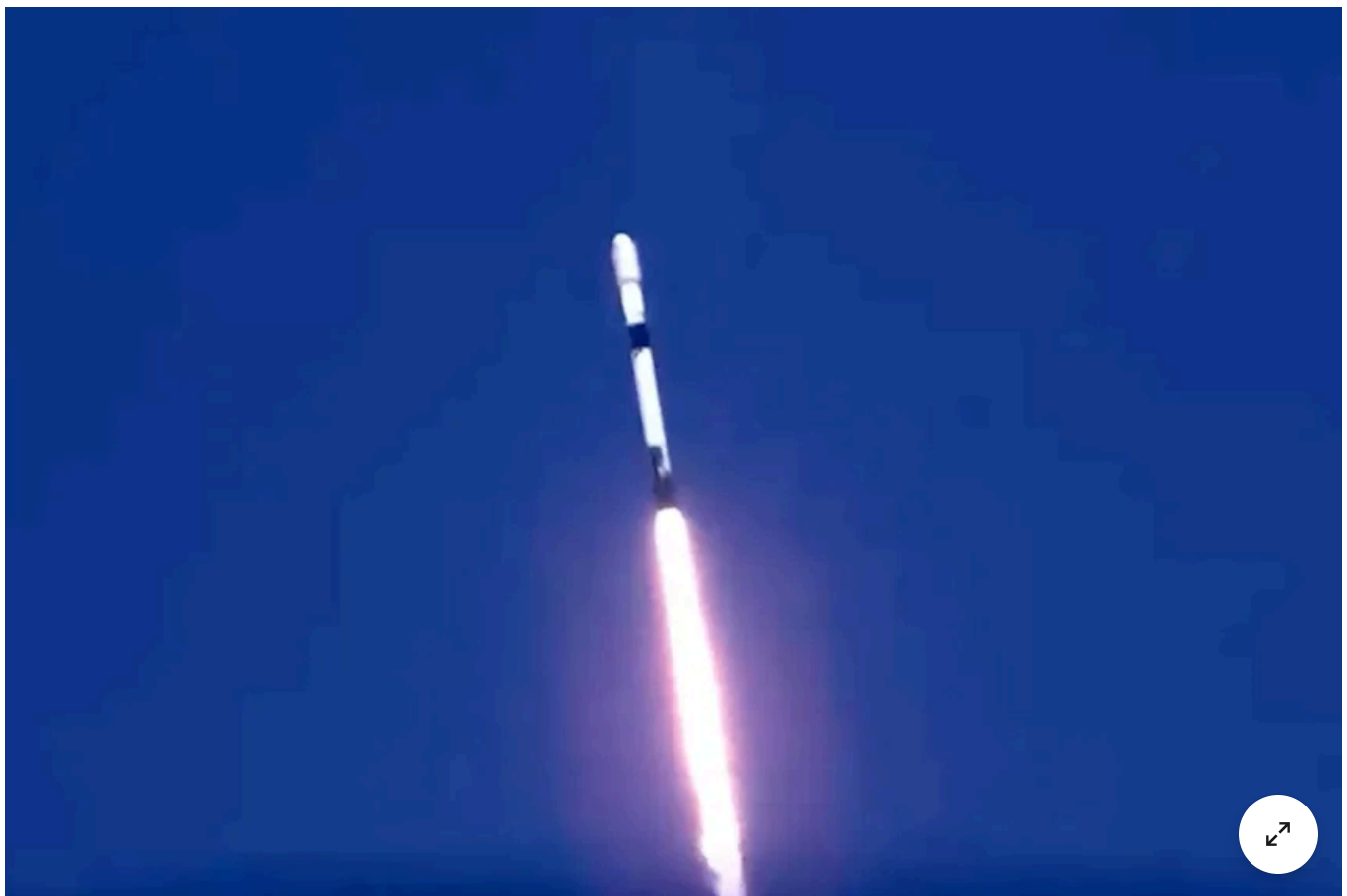
THE STRAITS TIMES

NTU satellite that uses AI to detect forest fires, oil spills launched by SpaceX rocket

Shabana Begum

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SpaceX's Falcon 9 rocket took off from California's Vandenberg Space Force Base on Oct 1, carrying 130 space vehicles, including Singapore's CRIMSON-1 satellite.

SINGAPORE – A Singapore-made eye in the sky was on Oct 2 launched by a SpaceX rocket into space, where it will keep watch for events such as forest fires and oil spills, and send pings back to Earth if it thinks such disasters are detected.

This shoebox-size satellite developed by Nanyang Technological University (NTU) is the first nanosatellite built here to be equipped with artificial intelligence technologies that can help it analyse and filter cloud-free images, so it relays only useful data. This cuts out the tedious work for scientists on the ground, who have had to sieve through every image.

The satellite, called CRIMSON-1, will be tested during a year-long mission. Researchers will study how well the 5kg satellite's computing system manages heat and uses up power under heavy workloads, said NTU and Singapore's space agency in a joint statement on Oct 2.

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The space vehicle will also test a new type of solar cells, which convert solar energy into electricity, in harsh space environments.



The CRIMSON-1 satellite (left) being integrated into the EXOpod Nova system, a satellite deployment system, which deployed the satellite into space after the SpaceX rocket was launched.

The new solar cells mounted on the satellite are made of an advanced material called perovskite, which is lighter and potentially cheaper than the solar panels used in space, which are made of gallium arsenide. This technology was

developed by NTU researchers and National University of Singapore spin-off Singfilm Solar.

Gallium arsenide solar cells cost between US\$250 (S\$319) and US\$450 per watt, while conventional silicon-based ones used on Earth cost less than US\$1 per watt.

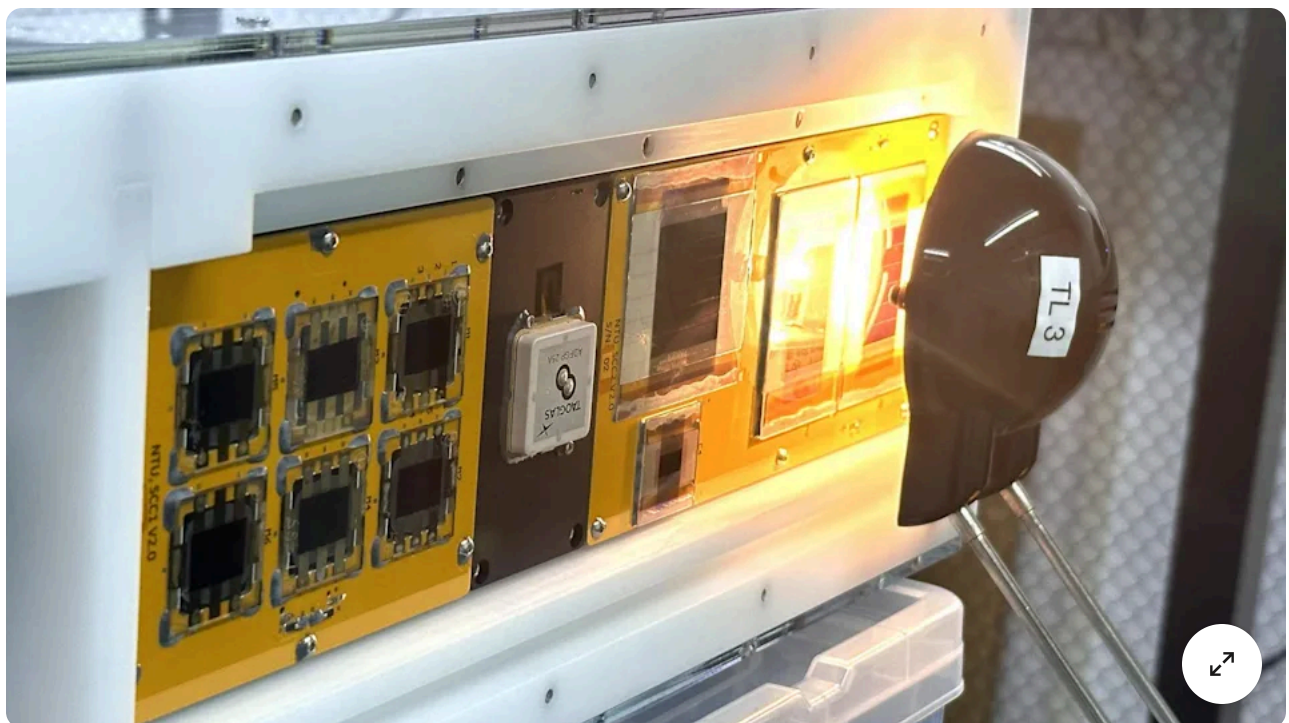
Perovskites, however, are much thinner and lighter than gallium arsenide, and potentially much cheaper to manufacture, making them attractive for future spacecraft.

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CRIMSON-1 will test how well the perovskite cells hold up in space and how much electricity they can generate. But the satellite itself will still be powered by gallium arsenide-based panels.

The 30cm-long machine was one of 130 space vehicles launched by a single SpaceX rocket from California around 11.30am on Oct 1 (around 2.30am on Oct 2, Singapore time).

CRIMSON-1 was released about 520km away from Earth around 55 minutes after SpaceX's Falcon 9 rocket took off from the Vandenberg Space Force Base.



Close-up of the CRIMSON-1 satellite, where the various perovskite solar cells are being tested at a lab facility.

This is NTU's 14th research satellite. To date, more than 30 Singapore satellites have been launched over the past two decades.

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The 30cm by 10cm by 10cm satellite was built by Singapore-based space tech firm Satoro Space, with NTU's AI technology and perovskite cells plugged into it.

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National Space Agency of Singapore, which was formed in April, under its \$210 million Space Technology Development Programme.

The programme aims to boost the country's space industry and research ecosystem, while making opportunities for home-grown tech to be tested in space.

Ngiam Le Na, chief executive of the National Space Agency of Singapore, said: "Perovskite solar cells will provide a compelling advantage over conventional

solar panels – their thin, lightweight properties make them particularly well suited for space applications, where every gram matters."



The team behind CRIMSON-1 at NTU Satellite Research Centre.

New solar technologies must prove they can survive the physical stresses of a rocket launch and endure the harsh conditions of space while generating consistent power, said the space agency and NTU.

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"CRIMSON-1 will test the cells' physical durability and efficiency after their journey from the ground into space and measure how much electrical power they generate," they added.

CRIMSON-1 is also supported by the Infocomm Media Development Authority, which secured satellite spectrum and orbital resources from the UN's International Telecommunication Union for its operation. Satellite spectrum

refers to radio frequencies that satellites and ground stations on Earth use to send signals to each other.

The 130 space vehicles carried by the 70m-long Falcon 9 rocket include mini satellites, two spacecraft and an AI data centre satellite, which is an experiment by Google.

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