'Rocket-on-a-rail' prepares to launch satellite

US Department of Defense wants a low-cost way to place satellites in orbit.

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Update, 4 November 2015 (12 p.m. BST): The Super Strypi test launch, which took place at approximately 2:45 a.m. BST today, failed. Telemetry from the rocket appeared to show it spinning out of control.

The US military is about to use a mindboggling set-up to launch a satellite: a rocket that whizzes along a rail before taking off.

The rocket is scheduled to launch from a 41-metre-long metal rail, placed at a 45-degree angle at site on the island of Kauai in Hawaii, as soon as 1 November. If all goes well, the vehicle will carry an Earth-imaging satellite all the way to space.

In some ways, the rail-guided launch system is retro — its design is based on a 1960s rocket meant to test a nuclear warhead in the high atmosphere — but it is also forward-looking. "This is the first of a number of new launch vehicles trying to solve the problem of getting tiny satellites to orbit cheaply and quickly," says Jonathan McDowell, an astronomer at the Harvard–Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who tracks space launches.

Commercial launch vehicles typically cost tens to hundreds of millions of dollars per launch. The US Department of Defense (DoD) says that the rail-guided system will cost as little as US\$15 million per launch: it aims to save money by eliminating complex guidance systems that normally steer the rocket to orbit, and by cutting preparation time on the launch pad.

Even so, the first launch has been delayed by more than a year. And critics question whether the rail launcher will ever move into full-scale production.



Mini satellites prove their scientific power

Self-guided satellite

The system is known as Super Strypi, after the Strypi rocket developed at the Sandia National Laboratories in Albuquerque, New Mexico, which formed the basis of the design. At launch, the rocket ignites the first of its three stages of motors and takes off, guided by the 115-tonne rail. As it travels higher, the rocket uses its own spin to stabilize itself as it flies towards orbit.

Super Strypi has limitations: it can launch only relatively small satellites, no heavier than about 300 kilograms, and it must deliver them into a standard low Earth orbit — as opposed to the high altitudes often used for monitoring Earth or space weather. The rocket launcher was developed by the DoD's Operationally Responsive Space office, an organization set up in 2007 to create launch systems and other space capabilities for the US military.

But not everyone is convinced that this work will pay off. In a 29 October critique, the Government Accountability Office noted that three different DoD offices are developing five new launch programmes between them, all with the same goal of carrying small satellites to similar orbits. Along with the Super Strypi, these include concepts to launch small satellites from beneath a fighter jet, and from an experimental spaceplane. There is no overarching plan to decide which of these move forward and when.



SpaceX rocket failure threatens support for commercial spaceflight

The first flight of Super Strypi will launch a University-of-Hawaii-built satellite called HiakaSat, designed to generate a series of infrared images of the ground below. It could study urban heat islands, active lava flows

or other environmental changes. The launch also carries a dozen of the mini-satellites known as CubeSats, including eight from NASA that will test how a network of CubeSats can communicate with one another in orbit.

Lift-off is scheduled from the Pacific Missile Range Facility in Kauai, on the northwestern end of the Hawaiian island chain. It would be the first orbital launch from Hawaii.

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Updates

Updated: Updated to reflect the failure of the test launch on 4 November.