Tiny CubeSat tracks worldwide air traffic

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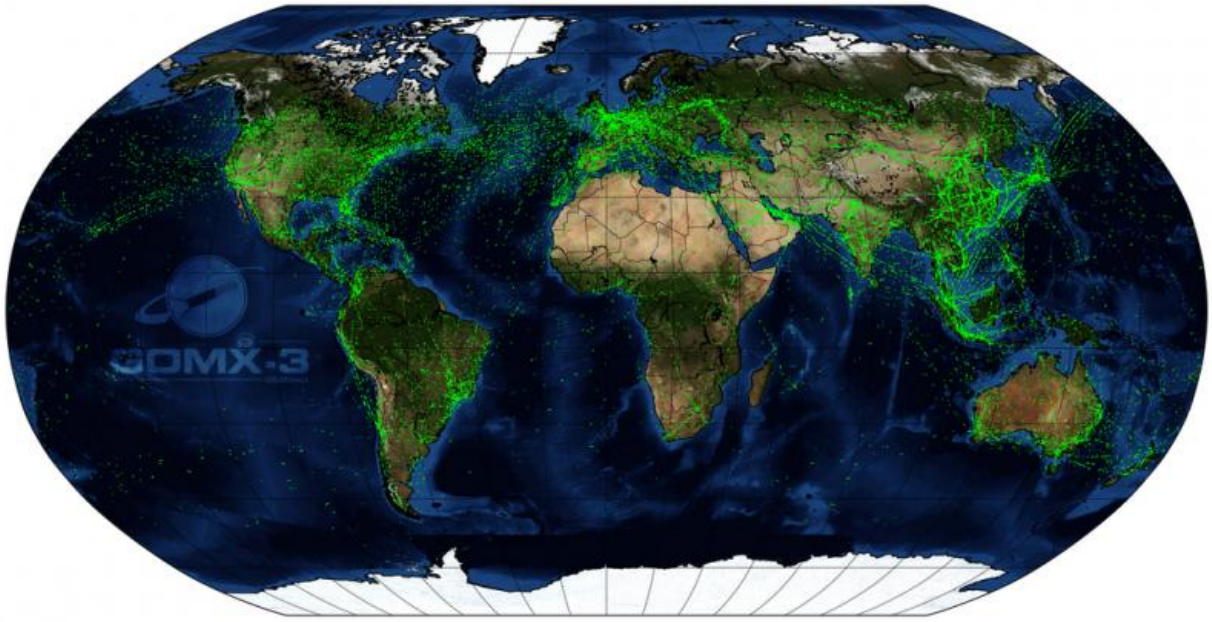


Detections of aircraft in flight made by ESA CubeSat GomX-3 during the last six months, since it was released from the International Space Station on 5 October 2015. Built by GomSpace in Denmark, the tiny 3-unit CubeSat has picked up millions of ADS-B signals which give flight information such as speed, position and altitude. All aircraft entering European airspace are envisaged to provide such automatic surveillance in the coming years. Credit: ESA/GomSpace

Since its launch six months ago, a satellite small enough to fit in an airline passenger's carry-on bag has been tracking aircraft in flight across the entire globe.

Built for ESA by GomSpace in Denmark, the GomX-3 CubeSat was ejected from the International Space Station on 5 October 2015, along with a Danish student satellite.

"CubeSats are based on standardised 10 cm cubic units," explains Roger Walker, overseeing ESA's technology CubeSat effort. "Being small and low-cost, they make ideal platforms for rapidly flight testing experimental technologies.

"This 3-unit GomX-3 is ESA's very first technology CubeSat to fly. We were able to make it operational within only 96 hours of its release from the Space Station, with a wide variety of tests taking place during the following months."

GomX-3's distinctive helical antenna has detected millions of signals from aircraft, building a detailed map of global aviation traffic.

These signals are regularly broadcast from aircraft, giving flight information such as speed, position and altitude. All aircraft entering European airspace are envisaged to provide such automatic surveillance in the coming years.

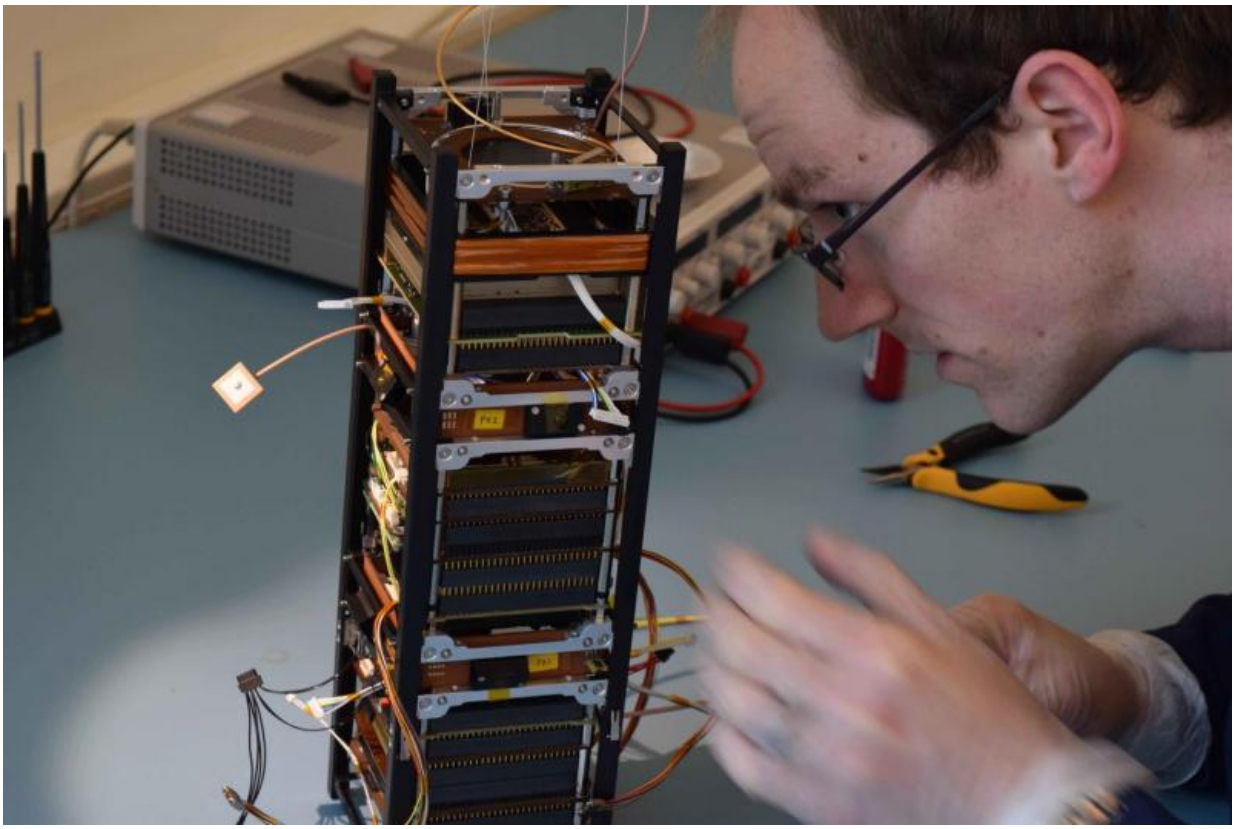
ESA's 2013-launched Proba-V first confirmed the feasibility of detection from orbit, opening up the prospect of a global aircraft monitoring system incorporating remote regions not covered by ground-based air traffic control.

Led by GomSpace in Denmark, GomX-3 is a 3-unit CubeSat mission to demonstrate aircraft ADS-B signal reception and geostationary telecommunication satellite spot beam signal quality using an L-band reconfigurable software-defined radio receiver. A miniaturised high data rate X-band transmitter developed by Syrlinks and funded by France's CNES space agency is being flown as a third-party payload. The satellite was deployed from the International Space Station on 5 October 2015. The distinctive helical antenna seen here has subsequently enabled GomX-3 to perform millions of detections of aircraft in flight. Credit: GomSpace

GomX-3 also carries a miniaturised X-band transmitter, developed by Syrlinks in France, which has demonstrated the rapid download of data.

In addition, the CubeSat is measuring radio signals emitted by telecom satellites to assess their overall transmission efficiency and how their signal quality changes with respect to distance from their target footprints.

"GomX-3 has in contrast to many other CubeSats demonstrated three-axis control, so it can be pointed as required, whether downwards or upwards, to an accuracy of 3º," explains Roger.



The technology-testing GomX-3 under construction. It was developed for ESA by GomSpace in Aalborg, Denmark, which is one of Europe's main CubeSat manufacturers. A 'three-unit' CubeSat, it measures 10x10x30 cm with an approximate mass of 3 kg, with payloads to detect signals from aircraft and telecom satellites. Credit: http://davidgerhardt.com

"A success in terms of planning, speed of development and technical achievements, GomX-3 has now completed its planned six-month technology demonstration mission and continues to operate normally.

"With its orbit naturally decaying from atmospheric drag, the satellite is predicted to reenter and burn up in September of this year."

GomX-3 was supported by ESA through its General Support Technology

Programme, aimed at convert promising engineering concepts into spaceworthy products.

Further ESA technology CubeSats are set for launch later this year. Meanwhile, GomSpace is developing a follow-up 6-unit CubeSat called GomX-4B, also supported by ESA, scheduled for launch in the second half of 2017.

Provided by European Space Agency