# UAVOS performs test flight of experimental turbulence payload

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UAVOS carried out the test flight of an experimental turbulence detection payload on its HiDRON stratospheric glider on 1 April.

UAVOS' operators launched the HiDRON from a high-altitude balloon at 23,900 m/78,412 ft. A launch routine was tested in which the HiDRON transitioned from free-fall to stable horizontal flight at 23,100 m/75,787 ft.

The payload was a combination of forward-sensing turbulence detection technologies developed by the University of Kentucky (UK) and a US federal agency that UAVOS declined to specify. The flight test aimed to help researchers assess the performance of a wind probe, along with an infrasonic microphone sensor.

UAVOS said on 14 April that researchers from the US federal agency designed this special infrasound microphone to pick up the ultralow frequencies generated by turbulence in the sky. This technology is being tested on the HiDRON for both turbulence detection and aeronautical research. The US federal agency has licensed the infrasonic microphone sensor to Stratodynamics, a joint partner with UAVOS on the HiDRON.

The HiDRON glider, powered by the UAVOS autopilot, enabled the experimental turbulence detection payload instruments to capture wind velocity, direction, magnitude, and low-frequency soundwaves in a flight environment, which is not possible with a passive lift-and-drift balloon flight profile. UAVOS said on 27 April that the collected data from the payload, such as altitude, location, and wind speed, are integrated by UAVOS' autopilot.

According to UAVOS, it is important to have forward-sensing turbulence detection on unmanned aerial vehicles (UAVs) and similar aircraft to fill the significant gaps in turbulence detection. These gaps impact suborbital vehicles and aviation in general.

Clear-air turbulence is sudden turbulence experienced during flight when there are no visible clouds or atmospheric features to warn of potential disruption.

Although not easy to visually detect, clear-air turbulence has a definite infrasound signature. Researchers at the US federal agency have developed technology to find these zones, which could revolutionise both flight planning and aeronautical research.

The instruments together are designed to aid forward-sensing turbulence detection for UAVs, commercial aircraft, urban air mobility (UAM) platforms, and the on-demand UAV delivery sector,

according to a company statement. While UAVOS previously conducted pre-flight testing with the licensed sensor, the 1 April flight was the first complete payload test in an operational environment, Nick Craine, the business development lead of Stratodynamics, was quoted by UAVOS on 12 April as saying.

The previous flight of this experimental turbulence detection payload on the HiDRON took place in September 2019, in Canada. The aircraft was released from a Canadian Space Agency (CSA) scientific gondola at 111,434 ft altitude and performed a four-hour controlled flight before landing at the Iroquois Falls Airport, about 80 km from the Timmins, Ontario launch site.

A HiDRON flight campaign earlier scheduled for late April at Spaceport America in New Mexico has been postponed due to schedule unavailability. While the date has not been finalised yet, UAVOS said it could take place in May. UAVOS plans to perform the same tests with the HiDRON and its experimental turbulence detection payload at Spaceport America as it did on the 1 April test flight.

**Comment**

Flying a UAV such as the HiDRON inside the stratosphere means operating it outside visual line of sight, in low pressures, and in cold temperatures. These environmental conditions pose many challenges to the aircraft's aerodynamic design, autopilot system, and ground infrastructure.

UAVOS tested the autopilot set-up and analysed flight test results from every phase of the mission. The lessons learned from this flight test will be used on future high-altitude missions and Mars analogue flight concepts.