F-35 has engaged vertical landing propulsion system

Milestone achieved by Lockheed Martin’s BF-1 flight-test aircraft on 7 January

Lockheed Martin F-35 has made fresh progress in a series of flight tests leading to the programme’s first vertical landing later this year.

The company’s BF-1 flight-test aircraft on 7 January engaged its short take-off and vertical landing (STOVL) propulsion system for the first time in flight, activating the shaft-driven lift fan from a forward air speed of 180kt (333km/h).

The milestone was followed two days later by a similar test performed at a reduced speed of 150kt, with the aircraft operating and at an altitude of 5,000ft (1,520m).

Flown by lead STOVL test pilot Graham Tomlinson, BF-1 will eventually have its forward air speed lowered to 0kt, before conducting the first vertical landing of an F-35B.

Shaft-driven lift fan activated from a forward air speed of 180kt

The Joint Strike Fighter programme had originally planned to complete the first vertical landing event in mid-2009, but US Marine Corps officials say it could now take place as late as June this year.

Achieving a vertical landing is considered an early landmark event for the F-35 test programme. BF-1 is the first-flight test aircraft for one of the three JSF variants that Lockheed is building.

A second STOVL test aircraft, BF-2, joined BF-1 at the US Navy’s Patuxent River naval base in Maryland earlier this month.

The new arrival will remain on the ground at the site to receive modifications until at least late January. No flight-test aircraft are currently operational for the conventional take-off and landing F-35A, with Lockheed having recently retired aircraft AA-1, or for the programme’s F-35C carrier variant.

Urban’s AirMule set to start untethered hover trials

Urban Aeronautics is planning untethered hover flights in March for its vertical take-off and landing AirMule unmanned air vehicle, having achieved more than 10 tethered tests of 1 min duration.

The AirMule, designed for cargo delivery and medical evacuation missions, is being used to test its hovering characteristics in winds speeds of up to 50kt (92.5km/h). It was hoovered autonomously at an altitude of 2ft (60cm) using its fly-by-wire control system, which employs inertial measurement units augmented by GPS navigation.

“We’ve achieved an important milestone in the development of our AirMule, having successfully completed the first phase of flight tests,” says Urban Aeronautics president Raf Yoeli.

The next phase will involve free hover tests at various heights above ground and low-speed flight manoeuvres. It is expected to last a few months. Once completed, we will follow this second phase with full flight envelope testing of the vehicle,” Yoeli adds.

The untethered hover tests will see gradually increasing altitudes, monitored with on-board laser altimeters and vehicle stability tests in the x and y planes.

An initial assessment has shown the AirMule’s vane control system is generating more than 2.0 Radians/sec² of roll acceleration for roll and yaw control. Urban says that roll acceleration will double with planned improvements, enabling “very precise hovering in gusty wind conditions”.

Urban’s ground control team monitors the performance of the AirMule’s Turbomeca Arriel 1 730hp (544kW) turboshaft engine, two main lift rotors and their hydraulic pitch change mechanisms, three proprietary gearboxes and other subsystems using three datalink channels. These provide 400 channels of real-time telemetry.