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Leonardo: the AW609 tiltrotor

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Introduction

The AW609 tiltrotor is one of the most significant technological innovations in the current global aviation landscape. Technically, the tiltrotor is an aircraft designed and built to synthesise the helicopter's operational versatility and the aeroplane's performance advantages. The helicopter and the aeroplane will remain faithful to their present formula with the requirements that have made them successful: hovering and vertical take-off/landing for the former; high speed, high altitude and long range flight for the latter. In the AW609, the proprotor nacelle is vertical for flight operations in its helicopter configuration. As soon as it reaches the right speed, the nacelle rotates forward progressively until the rotors are horizontal and act as driving propellers. During this conversion process, which takes place within an optimal conversion 'corridor' automatically managed by onboard computers, lift is transferred from the rotors to the wing. There are no sudden changes in altitude or flight characteristics during the conversion, in which the pilot retains complete control of the aircraft. The ability to integrate so many different characteristics into one vehicle overcoming certain limitations experienced by fixed-and rotary-wing. The result is an aircraft that allows stationary flight and vertical take-off and landing, plus a range and cruising speed twice that of a helicopter of equal capacity and a higher operating altitude.

Technical description

The AW609, with a take-off weight of around 8 tonnes and an airframe made entirely of modern composite materials, can complete the conversion procedure (from a helicopter's typical flight profile to that of an aeroplane and vice versa) in less than 60 seconds. In addition to greater speed and range than a helicopter, a pressurised cabin and an ice protection system make the tiltrotor even more versatile, allowing it to fly at an altitude of about 8,000 metres. The AW609 is equipped with a triple digital fly-by-wire (FBW) flight control system, which provides excellent manoeuvrability, reduced overall aircraft weight, safety and simplicity/containment of maintenance costs. All the parameters needed to fly the tiltrotor are displayed in an advanced cockpit equipped with liquid crystal touch screens. The modern anti-icing system allows it to fly in the most extreme weather conditions. All major systems are redundant, ensuring smooth operation in case of failure and helping to maintain high safety standards.

Performance

The AW609 is powered by two Pratt & Whitney PT6C-67A engines that allow it to fly at over 500 km/h and with a range of almost 1,400 km, which increases to over 2,000 km with auxiliary tanks. For specific missions, to increase range and load capacity, the AW609 can also take off in aeroplane mode with the engine nacelles partially facing forward and travelling along only short sections of runway.

Missions

Leonardo is currently developing configurations for different uses of the AW609 tiltrotor. The unique performance, particularly speed, range, agility and flexibility are ideal in passenger transport

missions, offshore transport in support of the energy supply industry, patrol and surveillance, search and rescue, medical transport, disaster relief and other government and military tasks. Where a helicopter cannot remain for extended periods at high altitudes or high speeds, the tiltrotor provides better performance in terms of altitude. It can cover greater distances in a unit of time while retaining the ability to take-off and land vertically. For passenger transport (up to nine plus pilot and co-pilot), the AW609 can connect the centre of two cities such as Milan and London, in about two hours flight time, heralding a real revolution in point-to-point connections in a context of innovative inter-urban mobility. In addition, it makes it possible to reach remote areas and localities that today do not have efficient or constant connections, such as the most isolated small islands. The AW609 is the perfect vehicle to support and supplement search and rescue (SAR) operations, maritime patrols and other public utility tasks to extend area coverage in migration control missions and to counter illegal trafficking. The AW609 covers distances that are currently not possible by helicopter while retaining the helicopter's ability to help shipwreck survivors. In SAR operations, the AW609 can locate and recover shipwrecks at distances of almost 500 km from the coast much faster. At present, these missions involve both aircraft and helicopters. In some cases, using a single vehicle would offer clear cost savings and greater operational flexibility and a significant reduction in time and, consequently, a higher probability of mission success. In medical rescue, the pressurised cabin and reduced vibrations in forward flight make it easier to stabilise the patient before arrival at the hospital.

Programme Status

The AW609 programme development has recently moved significantly closer to US FAA certification, after which deliveries to customers will begin. With this, the AW609 will be the world's first civilian-certified multi-role tiltrotor. The prototypes used in development activities, particularly in the United States and Italy, have clocked over 1,700 flight hours to date. Most of Leonardo’s Italian factories are involved in developing the AW609 and in producing the tiltrotor’s key components such as the structure, castings, rotor heads, transmission and avionics integration, together with the future provision of support services. The final assembly line is based at Leonardo’s US plant in Philadelphia, where manufacturing of the production models has already started. The entire training syllabus with advanced flight simulators and technical support services for customers has also opened. Bristow, one of the largest helicopter operators in North America and other parts of the world, will use the AW609 for various tasks. It will be the launch customer for the new tiltrotor in the US for commercial use. Significant interest exists in areas such as Australia (especially for relief operations to support the population in the country’s most remote areas) and Japan (to connect small islands that today are not served by fast means of transport to the main cities).