Group 4 - ÆTHER:

Sustainable & Accessible Air Transportation

This era is undoubtedly a time when conventional aircraft design is challenged and revolutionized by the emergence of Advanced Air Mobility (AAM). AAM is a new concept of air transportation using electric vertical takeoff and landing (eVTOL) aircraft, integrating new, transformational designs and flight technologies into existing and modified airspace operations. In this context, Aether is living up to this vision designing a full eVTOL concept aircraft adapted to the requirements of a unique spectrum of travelers, i.e. passengers with reduced mobility (PRM).

Aether is the Delft University of Technology's Design Synthesis Exercise (DSE) project answering to the 39th Vertical Flight Society (VFS) Annual Student Design Competition request for proposal. This competition challenges students to design an eVTOL aircraft for either 2 passengers with reduced mobility or 4 passengers with full mobility, in order to transport them between an urban, suburban or rural hub and an airport, separated by 100 miles (161 km). The design of the aerial vehicle follows special parameters and requirements to accommodate all types of passengers with affordable ticket prices. The vehicle needs to be capable of VTOL, climb to 4000ft and vertically descend before landing.

To achieve these goals, Aether design solution considers a distributed electric propulsion tilt-rotor aircraft with 4 propellers on the wing and 2 fuselage-mounted propellers. Such a configuration has the advantage of a helicopter during take-off, climb and descent, and the efficiency of an airplane during cruise. With a cruise speed of 180 km/h, Aether is able to complete the VFS mission within 1 hour. The requirement for the battery energy density is 400 Wh/kg, which is expected to be achieved in about 10 years from the time of designing this concept, and hence operation is expected to start in the same timeframe. The average vehicle price is estimated to be US $1.8M, offering one trip at an average ticket price of US $77, compared to a taxi fare of US $240 for the same distance.

The aircraft's conceptual preliminary design has been presently completed, with further analysis on the wing box structure and tilting mechanism to be performed in the remaining time of this DSE project. Aether was designed with a focus on sustainability, with sustainable and lightweight materials and zero-emission propulsion. Many of the requirements set by regulations and the team are complied with, with the design team working on ensuring the compliance with future certification requirements.