Voltayre’s innovative oil valve improves gearbox performance

A key innovation in the UHPE engine is the introduction of a gearbox (a gear train between the blower and the rotor), which enables the engine input blower to run at a different speed to the main rotor. This allows an increase in the secondary air flow provided by the blower while improving the efficiency of the different compression stages.

This gearbox, however, is dependent upon a carefully controlled flow of oil for lubrication and cooling to ensure efficient engine performance.

That’s where the Clean Sky VOLTAYRE (Valves for OIL regulaTion with High AccuracY and RELiability) project comes in. With the support of the European Commission’s Horizon 2020 funding, VOLTAYRE is focused on the design and manufacture of an innovative high flow direct drive oil valve, which will be qualified to TRL 5 level. The valve will be able to meter accurately and split the flows coming from the pump to the gearbox and to the engine, allowing the excess oil flow to return to the tank. The valve will also communicate a visualisation of the delivered oil flows with the FADEC (full authority digital engine control).

The VOLTAYRE concept is based on the upsizing of a patented electronic free low energy limited angle torque motor developed by FACT (Fluid Actuation & Control Toulouse), an SME based in L’Union, France. The company has developed a torque motor which provides high torque, high displacement, high ageing stability, and without dynamic seals which is able to directly drive a spool that can meter and split an oil flow of about 13000l/h@ 70 bar (57GPM@1000psi).

‘Due to the large range of power, we need to reach a large range of oil flow,’ says Sébastien Oriol, Topic Manager at Safran for the VOLTAYRE project. ‘It’s quite a new component because we have never done an oil flow measuring unit before.’

The critical design review was achieved in July 2020, followed by a successful detail design review in December 2020. The design is now complete and the manufacturing phase kicked off in early 2021, with the finalised component expected to be completed around mid-year.

‘We expect to have the full test campaign at the end of the year where we will perform a full hydraulic test and high pressure drop for measuring precision,’ says Oriol. The valve will also be subjected to vibration and structural tests in order to reach TRL5 level. This, says Oriol, ‘represents all global aspect of the components we want for the final engine demonstrator that follows.’

The VOLTAYRE project feeds into the UHPE engine.