Installation issues of a small turboshaft engine into a light helicopter

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ABSTRACT

The ESPOSA project develops and integrates novel design and manufacturing technologies for a range of small gas turbine engines up to approximately 1.000 kW (SL ISA) to provide aircraft manufacturers with a better choice of modern propulsion units. It also deals with engine related systems that contribute to overall propulsion unit efficiency, safety and pilot workload reduction. Through the newly developed design tools and methodologies for the engine/aircraft integration, the project also contributes to the improved readiness for new gas turbine engines installation into small aircraft.
ESPOSA[1] is a FP7 Level 2 research project intended to study the applicability of small gas turbine engines on aircraft. Three applications have been selected to receive the 200 HP-rated TP/TS100 turboshaft[2] engine of PBS, two fixed wing aircraft and one rotorcraft. This paper is related to the helicopter application of the TS100 turboshaft version into the Belgian B250 Winner Helico.
In this paper, all aspects related to design and installation of a new turboshaft into a small helicopter are tackled, from the support of the engine on the helicopter structure (chassis or airframe), the transmission system including the tail rotor, the cooling of the engine and of its lubrication oil, the air intake equipped with IBF (Inlet Barrier Filters) and the exhaust pipes to the fuel system or the controls. The integration of all these aspects and components in the helicopter is also detailed. Two examples are the full integration of the complete engine into the rear fuselage of the helicopter and CFD computations of the air flow in a first geometry of the "double ear" intake.

Keywords: small turboshaft, rotorcraft, integrated design, engine airframe, air intake, IBF.

[1] ESPOSA means Efficient Systems and PrOpulsion for Small Aircraft

[2] 200 HP is the derated power in SLS ISA conditions required for the B250 helicopter.