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MULTIOBJECTIVE AND MULTIPOINT OPTIMIZATION OF A HEAVY CLASS HELICOPTER ENGINE INSTALLATION USING EVOLUTIONARY ALGORITHMS

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Abstract. Aerodynamic design and optimization of the engine installation is a pivotal part of the helicopter design process. The engineers seek for an optimum configuration which maximizes the global efficiency of the aircraft resulting in lower fuel consumption. An adaptive, problem-independent and reliable optimization methodology would be particularly valuable in assisting the design process. In such a context, the application of advanced evolutionary algorithms coupled with CFD solvers for the accurate flow solution of validated numerical models represents a very powerful tool for parametric design and optimization of engine installation components. Within the JTI Clean Sky FP7 project "HeavyCopter" the consortium constituted by the University of Padova (UNIPD) and the spin-off company HIT09 developed an automatic optimization loop, based on the home made genetic algorithm GDEA, applicable to engine installation design as well as to general aircraft components optimization problems. This paper illustrates the application of the GDEA-based optimization loop at a forward and a hover reference flight conditions. The parametric modifications on the geometries are compliant with the architectural constraints of the engine bay. The algorithm pursues the minimization of the total pressure losses at the inlets, while keeping the flow distortion at the lowest through a functional penalization; the back-pressure is reduced at the exhausts in order to increase the power output of the engine, also preserving the entrainment ratio. The results highlight significant improved performance margins on all the components.