The modern engines for large aircraft transports are designed to achieve the best performance and to reduce the environmental impact and the fuel consumption. The idea at the base of these new designs is to optimize those engine elements, which not long time ago were considered with low benefits-costs impact. One of these tasks is the leakage flow reduction obtained through engine clearance control. A solution widely adopted on modern aircrafts is the thermal Active Clearance Control (ACC) system, through the air jet impingement cooling, for a Low Pressure Turbine (LPT) case. This system operates in order to cool down the LPT case, thus reducing the clearances during the cruise, with the consequent efficiency improvement.

The present research project proposes a method to simulate the entire LPT ACC system with a 1D approach, capable to couple the fluid-dynamics and the thermal aspects of this engine component. This method consists into a tool that couples two software. The first one simulates the ACC 1D fluid-dynamics, evaluating the overall mass flow and the pressure losses. The second one is an analytical tool accomplishing the ACC heat pick-up analysis. The proposed approach is applied to a Design of Experiment (DOE) performed on this system, focusing on the variations recorded on the overall air mass flow rate.

### CONCLUSIONS

The proposed method carries out a coupled fluid-dynamic and thermal analysis of the ACC performance. This method is fast and low demanding (around 30 minutes per model).