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Low boom airplane design process at Dassault Aviation

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Dassault Aviation as civil aircraft manufacturer studies the feasibility of a supersonic business jet and tries to federate in an Integrated Project (HISAC call2) the European competencies to answer to the problems of noise, emissions and sonic boom. One of the methodologies used to predict this last constraint consists of using CFD results as inputs for a propagation code based on a ray-tracing algorithm. This method was used in a 5th PCRD project (SOBER) and is part of a design toolbox dedicated to the evaluation and/or to the optimization of supersonic aircraft. For the low boom design process, sonic boom wave forms are given as input criteria of an optimisation loop. We will present during this meeting some results obtained using this approach: sonic boom levels are predicted as a function of aircraft shapes, flight conditions or manoeuvers. The inverse problem will also be looked at. This presentation will also highlight some numerical difficulties as the pertinence of sonic boom evaluations depends strongly on what is extracted from the flow computation. CFD results have to be assessed according to the numerical scheme or mesh refinement. Trade-offs have to be made when it comes to extracting a pressure distribution from the CFD results: One would want to extract the pressure as close to the airplane as possible since this is the zone where the CFD results have undergone the lesser numerical diffusion. Unfortunately, the equations solved for the propagation are not correct in the vicinity of the aircraft.

The complete document was not available at the publication time. It has been replaced by the submitted abstract.