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AERODYNAMIC DESIGN OF INNOVATIVE BUSINESS JET

Alain Bugeau[1], Zdenek Johan[1], Aurélien Merlet[1], Marc Stojanowski, Sébastien Vigneron[1] and *Michel Mallet[1]

[1] *Dassault Aviation*
78, quai Marcel Dassault,
92214 Saint-Cloud, France
sebastien.vigneron@dassault-aviation.fr

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ABSTRACT

Over the last twenty years, several projects have been explored the feasibility of a supersonic transport aircraft in Europe, Japan and the US. Market studies and forecast analyses [1], [2], [3] showed a strong interest for a small transport aircraft that could significantly reduce travel time (20% to 50%) especially for long haul flights.

Environmental friendliness has become an increasing concern over the world, and more specifically in the civil aircraft industry. ACARE targets drive the aircraft industry towards drastic emission reductions and ICAO objectives for community noise are becoming more and more stringent. In addition to minimizing engine emissions, a good way to reduce the aircraft environmental impact is to optimize its aerodynamics performances at both low and high speed regimes. Maximizing the L/D ratio during supersonic and transonic cruise allows for reduced engine thrust levels and thus lower NOx/CO2 emissions. Moreover, maximizing L/D ratio at take-off as well as aircraft lift at landing leads to reduced thrust levels requirements at a given climbing rate and thus lower engine emissions and noise levels. Thus aerodynamic design has to take into account several objectives in a wide range of flow conditions.

In order to support its supersonic business jet design activity [4], [5], [6] Dassault Aviation validated its aerodynamic performance assessment tools on various innovative SSBJ concepts that are currently being investigated in the frame of the European Integrated Project HISAC. As the leader of HISAC, Dassault Aviation coordinated the wind tunnel testing activity that was performed within this project. In 2007, two aircraft models were manufactured and tested in high speed regime (up to Mach 1.8) at ONERA S2MA (Modane, France) and TsAGI T-128 (Zhukovsky, Russia), and in low speed regime at RUAG LWTE (Emmen, Switzerland). These three test campaigns allowed for the generation of a large experimental database which was then used to calibrate and validate CFD codes.

The purpose of this presentation is to perform a comparison between 3D Navier-Stokes numerical results and wind tunnel test data. This analysis allows for code calibration and validation. The results presented will show that there is a very good agreement between numerical and experimental data. A comprehensive analysis of results cross-

checks between numerical and experimental assessment tools will be presented.

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