RUAG

Aerodynamics – Newsletter 18

Editorial

Dear reader,

Our holding, RUAG Schweiz AG, has gone through a reorganisation and as a consequence the company RUAG Aerospace Ltd. has disappeared in favour of the two new entities RUAG Aviation and RUAG Space. The Aerodynamic Center is attached to RUAG Aviation and continues to offer the services for which it is already well known throughout the aerodynamics community. It remains our commitment to provide our valued customer high quality services and products at competitive prices. This includes our unremitting dedication to practical innovations and the introduction of new capabilities which are continuously implemented based on customer requirements and feedback.

Lately, our capabilities for powered model testing have made a significant step forward. Newly installed hydraulic pumps allow testing models with even higher power requirements. A novel rotary shaft balance, new high-power propulsor units and the setting up of a telemetry system put us in an ideal position to cope with the future challenges of powered wind tunnel testing. Look for an upcoming issue of the Newsletter for more information on these exciting possibilities.

The participation in the HISAC project, which is the focus of the present Newsletter, may be more conventional from the point of view of the methods employed but is certainly also an innovative topic. The article shows how efficient and valuable combined low speed testing and advanced computational fluid dynamics simulations can be used to support, in this case, the aerodynamic design of an environmental friendly high speed business jet.

The Swiss CITIUS bobsleigh activity is an example of timely and immaculate service from our skilled personnel in the composite model shop. The results from the world cup races speak their own language about the quality of our products and the athletes…

I hope you enjoy our first newsletter of 2010. Please fell free to contact us for further information or come to see us at Aerospace Testing Expo (18. – 20. May 2010) in Hamburg.

Sincerely,

M. Guillaume

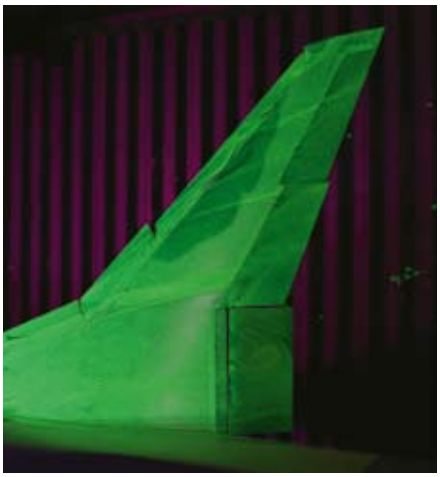
Michel Guillaume
General Manager Aerodynamics

Hisac, High Speed Aircraft: Wind Tunnel Testing and Computational Fluid Dynamics

Hisac is a research integrated project (IP) supported by the European Commission under the Sixth Framework with the main objective to establish the technical feasibility of an environmentally compliant supersonic small size transport aircraft (S4TA). The project, which ended in October 2009, was led by Dassault Aviation and involved 37 partners from industry, research and academia in 13 countries. The Aerodynamic Center contributed to the aerodynamic evaluation of the proposed aircraft configurations through numerical simulations and low speed wind tunnel tests.

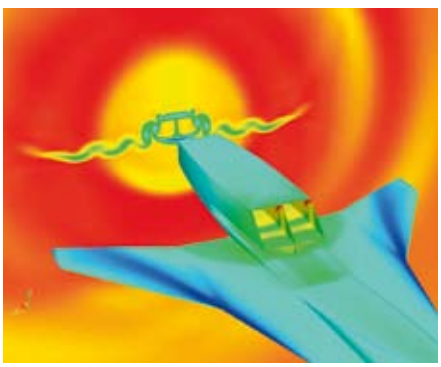
The design of a S4TA presents many challenges. Not only technical aspects have to be addressed but also environmental issues have to be considered. A successful product will produce a sonic boom quiet enough to fly at supersonic speeds over populated areas. In

the vicinity of the airport the noise level of such an airplane must be comparable to contemporary subsonic aircrafts. These are prerequisites for public acceptability and thus a commercially viable product. During the project four supersonic aircraft configurations were developed, each with a focus on one particular aspect: there was a low-sonic boom design, a low noise design, a long range design and a variable sweep design. By going through this design exercise each team gathered an in-depth understanding of the associated difficulties and the project as a whole provided a broad view over of the challenges related to future S4TAs.



In the frame of the program, wind tunnel models where built and tested for both the high speed and low speed flight regimes. The data thus obtained was mainly used for the validation of the CFD codes used by the various partners of the program. The high speed tests were performed in the ONERA (France) and TSAGI (Russia) wind tunnels while the low-speed data was obtained during a test campaign in RUAG's wind tunnel. The 1:10 scale of the model resulted in a length of over 4 meters and a span of only 2 meters. In addition to the main internal RUAG 6-component balance it was equipped with a number of pressure taps on the wings, the flaps and the slats. The main focus of the test was to determine the performance of the aircraft in the take-off and landing phases. Various flap and slat systems were investigated to determine their overall performance in conjunction with a highly swept wing optimized for supersonic flight and regarding their ability to generate high lift. Oil flow visualizations on selected configurations gave information on surface streamlines for comparison with CFD results.

Through its subsidiary CFS Engineering RUAG was also involved in work packages dealing with the numerical simulation of the flow around the airplane for different flight regimes. In a first work package the in-house flow solver NSMB (Navier Stokes Multi Block Solver) was benchmarked against results obtained by other partners and the wind tunnel tests. In a second phase one particular S4TA configuration was analyzed in detail. The interaction between the engines and the flow around the wings were of particular interest.



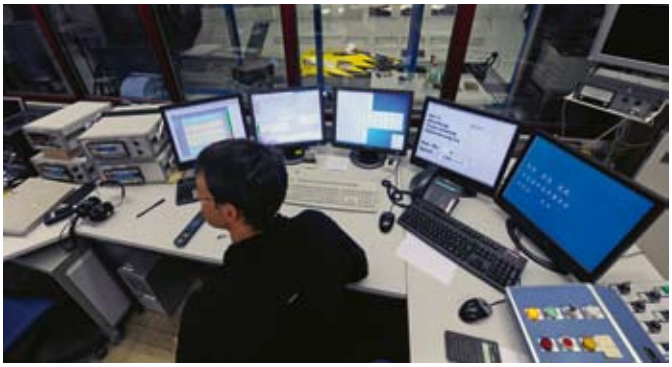
By being involved in one of the most futuristic research projects of today, RUAG was able to improve and extend its tools and engineering know-how to the full benefit of our customers.

Recent Activities

Swiss national bobsleigh teams at the LWTE

Following the 2006 Winter Olympics in Turin, the Swiss bobsleigh federation initiated "CITIUS" – Latin for "swifter". The Swiss Federal Institute of Technology Zurich (ETH Zurich) and several industrial partners, among them RUAG Aviation, are part of the project team.

The Aerodynamics Center was pleased to welcome the athletes of the Swiss national bobsleigh teams (men) for a testing session with the final sleigh design inside the Large Subsonic Wind tunnel Emmen (LWTE). The objective of the test was to find and confirm the best body posture and helmets to go for that 1/100th of a second decisive for winning or losing.



Not only the results of the drag reducing session, but also the combined effort of all CITIUS partners paid off few days after the wind tunnel test. Beat Hefti and his brakemen Alex Baumann started the 2009/2010 world cup season with a sensational first place on the bob run of Park City (USA). After that motivating start the Swiss 2-man sleds continued to be very successful, with Beat Hefti and Ivo Rüegg topping the world ranking of the International Bobsleigh and Tobogganing Federation.

In addition to wind tunnel testing, the CITIUS project relied on the experience of the Aerodynamics Center in manufacturing prototype carbon fiber composite parts. After two prototype monocoques were built in our workshop the design was frozen and a small series of 2-man-sleighs and 4-man-sleighs followed. The Aerodynamic Center is proud to have participated in this highly innovative project to provide fast, sturdy and yet light weight high tech equipment to the Swiss bobsleigh team.

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