OSTIV Congress, Thursday, 7 August 2008

The first paper of the XXIX OSTIV Congress was given by E. Schoeberl, on the subject of "From Sunrise to Solar-Impulse – 35 Years of Solar Powered Flight." Beginning with the sunrise project of R. J. Boucher in 1974, a history of solar powered aircraft development through, the Solar Impulse project of B. Precard, was presented. Over this period, the performance of solar powered aircraft progressed from model-sized aircraft that flew for only minutes to more practical aircraft with planned durations and ranges that are unlimited with continuous flight.

The next paper continued where the first ended. Hannes Ross gave a presentation entitled "Fly around the World with a Solar-Powered Airplane." The lecture began with an overview of the technical requirements for a successful solar-powered aircraft. With the goal of developing a solar-powered aircraft that is able to fly around the world, the concepts were specialized for the design of the Solar Impulse. The result is an aircraft with a gross weight of 1500 kg, a maximum lift-to-drag ratio of approximately 35, and a wing load of 8.0 kg/m^2. Because of the large weight fraction of the propulsion system, the aircraft payload to gross-weight fraction is only about 10%. A prototype is scheduled to fly in 2009, and the finalized Solar Impulse is to circumnavigate the globe in 2011. (www.solarimpulse.com)

After the break, "Experimental Study of Impact Phenomena in the Case of a Composite Glider" was presented by Dr. Miro Rodzewicz of Warsaw University of Technology. The presentation began with a review of the accident statistics from several countries around the world. Because of the small number of serious accidents, there is a lack of detailed information or design requirements regarding glider/crash impact scenarios. To address this deficiency, an experimental sled-test program was undertaken to obtain time histories of the deceleration and loadings, as well as the consequent results on the structure and crash dummies for several crash-impact cases.

The paper concluded with a number of recommendations to guide regulation, and made suggestions for future work. The data obtained from this effort will be welcomed by those working on glider crash-worthiness and will undoubtedly lead to safer sailplane cockpits.

After lunch, Johannes Dillinger gave the presentation, "Aerodynamic Design of the Open-Class Sailplane, the Concordia." This 28-m span glider is currently under construction by Dick Butler in Tullahoma, Tennessee. A detailed discussion of the wing and airfoil design for this glider was presented, as well as the design of the aft fuselage and tail assembly and its adaptation to an ASW-27 forward fuselage. The design of the wing/fuselage junction was also considered. This remarkable glider, having an aspect ratio of 57.2, is designed for a wing loading range of 39 to 62 kg/m^2. The lift-to-drag ratio is predicted to be in excess of 70.

Next, Professor Fabrizio Nicolosi gave two lectures. The first was entitled, “Research Activities on Light Aircraft Analysis and Optimization at the University of Naples.” This presentation dealt with an experimental and numerical research project that explored multiply-bladed winglets for hang gliders, as well as a classical winglet designed for a twin-engine aircraft. For the hang glider, wing tips with 5 elements resulted in improved performance over the baseline, while 3 elements hurt. The single winglet for the light twin also demonstrated a noteworthy improvement.

In his second lecture, Professor Nicolosi talked about “Aerodynamic Experimental Analyses and Optimization of a Twin-Engine Propeller Aircraft.” The aircraft considered was designed by Professor L. Pascale. The P2006, is simple, lightweight, and low cost, and first flew in December, 2007.

The last talk of the day was “Comparative Statistical Analysis of Soaring Competitions,” by Christoph Maul. This paper discussed the use of competition flight recorder data to characterize the air mass in which the pilots fly, and their usage of it, such as speed-to-fly and aligned lift. This paper presents some very interesting, and perhaps surprising, conclusions about the weather in which we fly. From the data utilized, information is extracted. Regarding the altitude bands actually used, (from 53 to 85% of the maximum height possible), that updraft strengths are essentially independent of altitude and the geographical position and that speed-to-fly theory, is reasonably valid. Sailplanes are designed for the weather in which we *believe* they fly…the more we know about what this weather actually is, the better our gliders will be. The written version of this paper appears in the July 2008 issue of *Technical Soaring*.
