A Cost-Effective Approach to Ultralight Machine Flight Testing – An Academic Perspective

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Abstract

We report on a currently on-going activity concerned with the flight testing (FT) campaign of a small aeroplane (Ultra Light Machine, ULM) towards its certification according to the German LTF-UL requirements. This effort sees the co-operation of a team formed by the manufacturer of the aircraft, Nando Groppo Srl, and a group of both permanent and external staff of the Department of Aerospace Engineering at the Politecnico di Milano (DIA-PoliMi), together with a number of graduate students.

In recent years, DIA-PoliMi has developed a line of education and applied research focused on flight testing. Among the main outcomes of this effort let us mention:

- the ULM-dedicated Flight Testing Instrumentation (FTI) system "Mnemosine", designed, developed and implemented at DIA-PoliMi, which started as the core of a PhD project in 2005;
- the graduate course of *Sperimentazione in Volo (Flight Testing)*, incepted in 2004, together with several MS thesis on the subject; and
- the collaboration with Club Astra flying school and Nando Groppo Srl in support to didactical activities and manufacturer fight testing needs.

Concerning the latter, in 2009 Nando Groppo Srl, a leading Italian manufacturer, was seeking support in the process of certification of the recent "Trial" model, a new three-axis control ULM, in an effort to expand its market on an European scale. Given the nearly absent regulations for ULMs in Italy, as well as in many other countries, typically manufacturers are not drawn towards undertaking a well-established FT programme with all the related investments, let alone a complete certification procedure according to severe requirements as those featured by the LTF-UL standards. As a result, often FT is plainly avoided, with easily deducible consequences on safety of ULM operations.

The present activity builds on the support of two of the co-authors, charged with the *Flight Testing* course and endowed with specific professional experience and skills at the highest attainable in Italy, the involvement of the other three, as members of the DIA-PoliMI scientific faculty also implicated in the course and in related activities, and finally with the enthusiastic participation of a number of students, involved in the *Flight Testing* course or in a FT-related MS thesis. A "Trial" machine has been fitted with the "Mnemosine" system and is currently undergoing an articulated flight campaign ranging over the whole LTF-UL items that require flight tests as necessary means of compliance. Results from this campaign are expected within the end of June, 2010, and will be presented in the final manuscript.

Based on experience accumulated with similar tasks (although not in view of any certification result) in the years from 2004 onwards, the authors expect promising results from the present effort. In particular, the availability of both the necessary expertise and an economic, dependable, simple and complete FTI system may represent a significant opportunity for the ULM and General Aviation environment at large, opening the access to cost-effective and reliable FT procedures, in view of enhanced flight safety and overall quality of light aircraft operations.