

# Guest Editorial

---

## SPECIAL ISSUE ON AIRCRAFT DESIGN EDUCATION IN EUROPE

Aircraft design is now established as a cornerstone of aeronautical engineering education, with its multidisciplinary and integrating character. Although very few graduates will actually participate in the overall design of a completely new aircraft in their professional careers, the design process is central to the engineering profession: it is the engineering methods and the capability of design that bind all engineering disciplines together and define the engineer. Students have to learn how to integrate the various design inputs and technical disciplines needed for the development of a new aircraft configuration. There are no absolute rules, no specified path to go down, and no clear-cut 'right answer'. Key terms in aircraft design include 'creativity', 'alternatives', 'sizing', 'trade-off', 'iteration', and 'optimization'.

To maintain its innovative capability the aerospace industry needs young engineers with appropriate scientific and technical backgrounds, and with suitable synthesis skills. Consequently, universities across Europe have introduced aircraft design courses into their curricula in the last few decades. However, this has introduced staffing issues and other problems. Traditionally, university lecturers have a research background and are rarely competent in design, since they lack experience. To an extent, this can be resolved by recruiting staff with industrial design experience. However, there is little funding for design research, and faculty members have to find additional lines of activity to establish an acceptable research record. Furthermore, from the point of view of teaching needs, design requires much more time and effort than regular academic courses, which is not always well understood by academic authorities. Finally, students can be frustrated by aircraft design, which they may find appealing but conceptually difficult, because of their analytical, rather than creative, backgrounds.

To discuss all those problems in a dedicated forum Professor Egbert Torenbeek of TU Delft, Professor Rodrigo Martínez-Val of UP Madrid, and Dr Kevin Knowles of Cranfield University, Shrivenham organised a workshop in June 1994 in Madrid. The aims of this event were:

- (a) to allow European lecturers concerned with aircraft design to continue active collaboration both in education and research;
- (b) to debate problems arising in aircraft design education, due to changing industrial and educational scenarios;
- (c) to enhance cooperation with the European aerospace industry.

The workshop was attended by some twenty lecturers from nine countries, and proved to be an appropriate forum for the variety of academic issues related to aircraft design. The European Workshop on Aircraft Design Education (EWADE) is now an established biennial forum, following meetings in Berlin, Bristol, Torino, Linköping, and Brno. At the Brno meeting in 2004, it was decided that the series should move to odd years to avoid clashing with major international aerospace meetings (notably ICAS). As a result of this, Professor Martínez-Val took the opportunity of his sabbatical placement in SupAéro, to organise the 7th EWADE meeting in Toulouse, hosted by Professor Jean-Luc Boiffier of SupAéro. It was agreed that the next EWADE in the series would be held in Samara, Russia, in early June 2007. The purpose remains, as originally conceived, to provide a forum for the exchange of ideas and experiences in aircraft design education, and to foster links with the industry.

This Special Issue contains selected papers developed from those presented at the Toulouse meeting. The first paper presents a thought-provoking debate, by Dr Trevor Young of the University of Limerick, on the challenges and conflicts of innovation in design. In the second paper Professor Arthur Rizzi of KTH Stockholm describes an international collaborative design project, set up in cooperation with Bristol University, based on industrial project management practices. The Czech Republic has a long tradition in light aircraft design and manufacture, and this is reflected by the very practical design work conducted at the technical university of Brno. This is described in the third paper, by Dr Robert Popela of VUT Brno.

Unmanned air vehicles (UAVs) provide a strong theme in recent university aircraft design studies. There are many reasons for this, including the growth in roles for UAVs, the range of technical challenges in a UAV system, and the ability of many universities to build and test small UAVs at full scale. A good example of an on-going project to design a large UAV system is given in the paper by Professor Giulio Romeo of Politecnico di Torino, who describes a HALE (high-altitude, long-endurance) UAV project. At a smaller scale, Christoffer Jouannet describes Linköping University's aircraft design curriculum, including a UAV project and flying demonstrator.

This Special Issue concludes with a review of the renowned aircraft design course at Cranfield University. This is a dedicated one-year MSc course which focuses on detailed design and includes close industrial collaboration. Alumni of this course, and its predecessors, occupy many senior positions in world aviation.

**Professor Rodrigo Martínez-Val**  
Universidad Politécnica de Madrid

**Dr Kevin Knowles**  
Cranfield University, Shrivenham