PRESS RELEASE

A European project will ensure cheaper, more stable and safer aircraft

They will cause less pollution and make less noise due to new technologies

A European project will ensure cheaper, more stable and safer aircraft which cause less pollution and make less noise. Coordinated by the UPM, it is training 16 doctoral students at the participating institutions to develop tools that will enable the optimisation of aircraft design and aerodynamic efficiency, thus paving the way for aircraft with laminar flow wings.

11.13.2018. The Technical University of Madrid (UPM) is coordinating a European project to train 16 doctoral students, to give them the scientific and technical skills required to improve the design of aircraft, making them more efficient and sustainable.

The project, entitled *Stability and Sensitivity Methods for Industrial Design* (SSEMID), seeks to overcome the challenges set by the aviation community for the next generation of aircraft.

The targets that the aircraft of the future must meet are: reduce the noise and CO2 emissions generated by current aeroplanes by half, and nitrogen oxide (NOx) emissions by up to 80%.

These objectives can only be met by increasing the efficiency of aircraft and improving their aerodynamics. This is the main goal of this European project.

These new developments are geared towards two fundamental aspects of aerodynamics: the flight envelope (mainly relating to the maximum altitude and speed that can be reached by an aircraft) and the stability of the fluid that surrounds the aircraft. Both are crucial elements of the design of aircraft.

This European project, which was launched in January 2016 for a four-year period, is maturing and industrialising new aerodynamic technologies that will meet the environmental targets set by EU policies.

In particular, the project is focusing on flow control, an emerging technology that improves aerodynamic performance and enables engineers to achieve an optimal design of the aircraft.

SSEMID has focused its research on three specific areas: the development of advanced numerical tools, devising methods to analyse the aerodynamic sensitivity of the flow (air) when facing external perturbation, and industrial applications of these innovations

Results

The preliminary results have enabled significant progress to be made in the development of methods for understanding turbulent flows (those that occur on the surface of the aircraft). Progress has also been made in generating new computational error estimation methods for the solutions obtained by computers, and in improving the capacity to analyse complex geometries (especially for advanced simulations). Finally, advances have also been made in the analysis of hypersonic configurations and in the aerodynamic optimisation of lifting surfaces, such as the wings.

The project will improve the state of the art of the various technologies which, in the future, will help to enhance the design of aircraft and make them more efficient in terms of energy consumption and protecting the environment, i.e. they will cause less pollution.

Furthermore, once completed, the project will have contributed towards the development of a new generation of numerical simulation methods in engineering, and the industrialisation of tools that will enable new aircraft to exceed the limits of current aerodynamics, paving the way for the manufacture of aeroplanes with laminar flow wings, or without high-lift surfaces (e.g. flaps), which will save fuel and produce fewer emissions.

These results will have a profound impact on the new design of aircraft, enabling a reduction in their design time, so that they can be launched onto the market in less time, thus saving costs and improving competitiveness. Additionally, they will make it possible to achieve a far more mature design, which will increase flight safety and stability.

Meanwhile, due to the results of this project, the design of the aircraft will help to further reduce air and noise pollution, which are directly related to fuel consumption, their drag and the weight of the aeroplane. Consequently, the aircraft of the future will be cheaper and safer and will have a far smaller impact on the environment.

Horizon 2020

SSEMID, with a contribution of 3.9 million euros, is funded under the EU's framework programme "Horizon 2020" as part of the *Marie Skłodowska-Curie Innovative Training Networks*.

It is coordinated by Eusebio Valero Sánchez, a professor from the Higher Technical School of Aerospace Engineers from the Technical University of Madrid. He is also a member of the *Research Center for Computational Simulation*. This centre brings together around 100 researchers in the area of Computational Science from three Madrid universities: Rey Juan Carlos (URJC), Complutense (UCM) and the Autonomous University of Madrid (UAM).

This research project is based on a network of collaborations between various European institutions. In addition to the UPM, the Imperial College of London (ICL, UK), Cambridge University (UCAM, UK), the Royal Institute of Technology of Stockholm (KTH, Sweden) and the

Katholieke Universiteit Leuven (KU Leuven, Belgium) are also participating. There are two US universities that are involved as partners: Purdue and San Diego.

There are also various national aeronautical research agencies from other EU countries involved in the project: the Office National d'Etudes et de Recherches Aerospatiales (ONERA, France), and Deutsches Zentrum für Luft – und Raumfahrt e.V. (DLR, Germany), and the Von Karman Institute (VKI, Belgium). The aviation industry is represented in the project by Airbus Group Innovation (UK), the company NUMECA (Belgium) and Xaar (UK).

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