AEROSPACE ENGINEERING

DIMEAS - On-board systems design and modelling for hybrid-electric and full-electric aircraft

Funded By	Dipartimento DIMEAS
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Context of the research activity	In the framework of propulsion system electrification, on one hand, the aircraft on-board systems have to be adapted to new energy sources and, on the other hand, new systems have to be developed to support the novel propulsion systems. Together with the need to design and model the electrified systems, one other concern is to develop an integrated thermal management system to cool the batteries, the electric motors and the fuel cells.
Objectives	The aim of the present research is to develop models for the on-board systems of the emerging new aircraft. In particular, the activities will be carried out within the HERA (Hybrid Electric Regional Aircraft - Clean Aviation) and Colossus (Horizon Europe) researches focusing on hybrid electric regional aircraft, hybrid electric utility aircraft and full electric urban mobility. The candidate will interact with the main partners of the above mentioned researches (LEONARDO Aircraft Division, Airbus D.S. , German research center - DLR, University of Naples - UNINA, Technical University of Delft - Tu-Delft and others). The candidate will contribute to the on-board systems architectures design and modelling for hybrid electric and full electric aircraft. The activity will be carried out at different level (aircraft, system, equipment). The architectures will include electrified on-board systems such as electrical environmental control system (e-ECS), electrical ice protection system (e-IPS), electric actuators (e.g. EMAs for flight control system or landing gear system), high-voltage high-power electrical power generation and distribution system (EPGDS). In some cases, the old technologies will be also addressed with the only aim to provide a reference. The studies will also involve the synergies with the propulsion system, i.e. with respect to integrated thermal management system (TMS), battery system (if necessary), pressurization, etc. In particular, the potential of synergistic opportunities of the hybridized propulsion powered from fuel-cells with other a/c systems will be considered. The activity will be carried out starting from the models already developed in DIMEAS with proprietary and commercial software.

Skills and competencies for the development of the activity	The candidate should be familiar with the following subjects: - aircraft on-board system design - aircraft on-board system modelling - aircraft design - aircraft electrification Moreover, the candidate should be able to interact and collaboratively work with other researchers