POLITECNICO DI MILANO

PhD in INGEGNERIA AEROSPAZIALE / AEROSPACE ENGINEERING - 39th cycle

PNRR 118 PA Research Field: AEROELASTIC ASSESSMENT OF FLEXIBLE WINGS CARRYING DISTRIBUTED ELECTRIC PROPULSION SYSTEMS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Advanced air mobility is promising the transformation of the aviation section to introduce new carbon-neutral vehicles. Using a distributed electric propulsion system is one of the most effective ways to design near-zero-emission aircraft. These systems are positioned along the wing and in some cases they can be even tiltable to allow for the transformation of the vehicle into an eVTOL (electric Vertical Take off and Landing). The classical approach to avoid aeroelastic problems is to use a highly stiff wing although this may be particularly ineffective for this class of vehicles given the weight penalty already generated by batteries. Consequently, it is of utter importance to understand the dynamic behaviour of this novel configuration to identify the best approaches to optimize the structural design.
Methods and techniques that will be developed and used to carry out the research	The candidate will start developing simple aeroelastic simulation models and tools that include the aeroelastic effect of propellers/rotors and highly flexible wing models. Then detailed numerical multibody-VPM models and experimental investigations will be carried out to better understand the behaviour of the effect of distributed electric propulsion systems together with the nonlinear structural effects due to the highly flexible wing. An internship of 6 months at RMIT of Melbourne Australia. Several configurations will be investigated. The most promising configuration obtained by moving the position of the propulsive units will be tested in the wind tunnel to

	the propulsive units will be tested in the wind tunnel to investigate the sensitivity of aeroelastic effects to the position of propellers. The laboratories of Politecnico di Milano and of the partner university RMIT University will be exploited for the experimental activities. Cooperation with NLR in the Netherlands will support the assessment of potential whirl-flutter problems. This research will be connected to the development of the Italian PNRR with a specific focus on the activities of MOST - Centro Nazionale per la Mobilità Sostenibile. A 6-month internship at industrial partners of MOST is planned.
Educational objectives	The candidate will acquire knowledge of aeroelastic design and experimental methods for lightweight structural design vehicles of Advanced and Urban Air Mobility vehicles. Knowledge of the certification standards for the carbon-neutral aviation vehicle will be also acquired by the candidate
Job opportunities	Aeronautical engineer in innovative aeronautic OEMs, Simulation engineer, and wind tunnel testing facilities.
Composition of the research group	2 Full Professors 0 Associated Professors 1 Assistant Professors 8 PhD Students
Name of the research directors	Prof. Giuseppe Quaranta Dr. Vincenzo Muscarello

Contacts
Dipartimento di Scienze e Tecnologie Aerospaziali - Politecnico di Milano Via La Masa 34, 20156, Milano - Italy +390223998405 - email: giuseppe.quaranta@polimi.it - web site: www.aero.polimi.it School of Engineering - Aerospace Engineering and Aviation Royal Melbourne Institute of Technology (RMIT University)Bundoora East Campus, 264 Plenty Road, Melbourne, VIC, 3082, Australiavincenzo.muscarello@rmit.edu.au

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad

Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Leonardo S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	RMIT (AU)
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The PhD candidate will receive a desk, possibly through a hot-desking procedure, and a personal computer, if needed. Apart from the compulsory ones, the PhD candidate will have the opportunity to follow additional courses and receive economic support to attend summer schools and participate in conferences. There will be the possibility of paid teaching assistantship.