PhD in Aerospace Engineering

(borsa in possibile collaborazione con l'Azienda ITACAe s.r.l)

Research Title: Innovative Aircraft structural design & production

Funded by	Politecnico di Torino (DIMEAS) & ITACAe S.r.l.

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Context of the research activity	Borsa di dottorato con possibile collaborazione con azienda ITACAe S.R.L. Aviation's contribution to global CO2 emission has come under scrutiny since the early 2000s. Recently, the 36-State ICAO Council has adopted a new aircraft CO2 emissions standard, which aims to reduce the impact of aviation's greenhouse gas emissions on the global climate. Environmental Responsible Aviation (ERA) of NASA's Fundamental Aeronautic Programme provides guidelines and expected targets completion for future generation aircraft. Gain in energy efficiency can be achieved through structural weight reduction and higher aspect ratio. The resulting slender, lighter and highly flexible structures are prone to exhibit aeroelastic instabilities. The extensive use of anisotropic materials can play a crucial role to enhance the aircraft performances with no additional penalties on weight. To this end, aeroelastic tailoring is a fundamental tool. Potential enabling technologies for passive aeroelastic tailoring are: Functionally Graded Materials (FGM), Variable Angle Tow (VAT) and curvilinear stiffeners. Previous research efforts have proposed models with different level of computational complexity to deal with aero-structural design of HAR wing. The ongoing revolution in Computer Aided Design and manufacturing technologies has broken down the barriers and paved the way to a variety of innovative solutions. The use of additive manufacturing (AM) can lead to numerous advantages either in terms of time and costs saving or, in the possibility of increasing the mould complexity and customization.

Objectives	• New design concept for future aircrafts • Homogenization theories and surrogate models for innovative structure simulation • Topological optimization with new technologies constraints; • Advanced computing technology for FE thermal-structural analyses & process simulation

Skills and competencies for the development of the activity	• Basic aerospace constructions skills • Composite manufacturing technologies • Aircraft and structural design • Aeroelasticity • Finite Element Modelling (FEM) • CAD & CAE methodologies • Additive manufacturing technologies