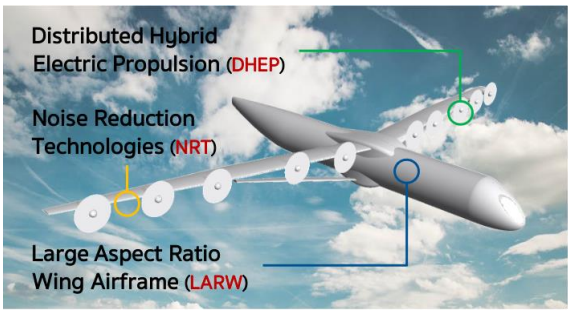
INDIGO Horizon European research project recruiting

Project description



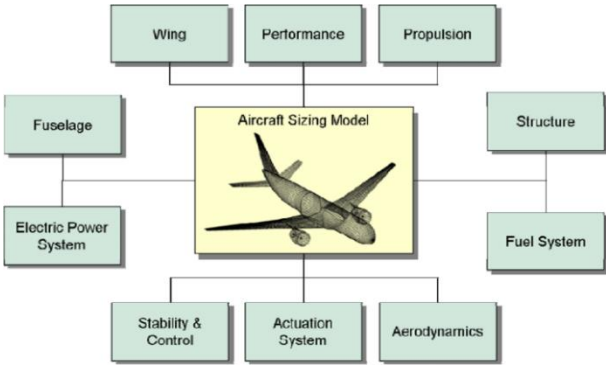
Achieving the goals of climate neutrality by reducing the impact of aviation is a task that requires a carefully drafted roadmap for the development of disruptive technologies and concepts of operations. With particular attention to the emissions of pollutants and noise in airport local airport areas, a synergetic approach is needed that combines interventions on the aircraft side and on the airport side. This calls for coordinated efforts in developing technologies that not only provide benefits during cruise conditions but also are capable of improving the local air quality and noise in airport areas where the impact of pollutants and annoyance to local communities has been demonstrated to be quite large in terms of morbidity and mortality. INDIGO is a collaborative project between academia, research centres and airports that aims at identifying the margins of improvement in airport local air quality and noise resulting from the introduction of a new non-conventional mid-range aircraft featuring distributed propulsion based on hybrid electric/sustainable and conventional fuel powertrain and large aspect-ratio wings capable to fly quietly and in zero-to-low-emission mode (i.e. electric and SAF) at low altitudes near airports and resort to conventional aviation fuel only when required, e.g. at higher altitudes or to recharge batteries during cruise. INDIGO will explore a new paradigm for the next-generation of silent and clean mid-range aircraft and for the way such a new aircraft will allow transforming the operations "at and near" airports. It will introduce improved methods for the analysis of future aviation environmental impact that, under the filter of uncertainty, will be able to account for non-conventional aircraft performance and future airport scenarios.

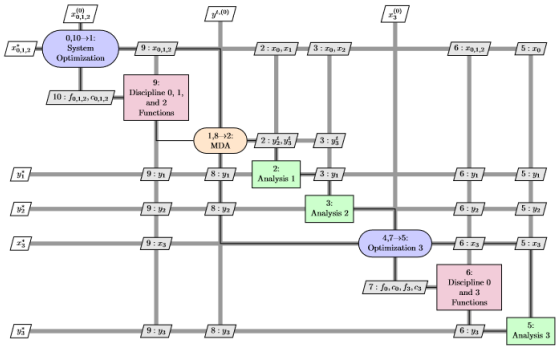
The Aeroelastic and Structural Design Lab (ASDLab) at University Carlos III of Madrid (UC3M) is offering **two** positions at PhD or Post-doc levels:

	PhD Studentship / Research fellowship(s)	
Topic	Multidisciplinary Design and Optimization (MDO) of Electric High Aspect-ratio wings Aircraft	Airframe design tools for multi-fidelity structural sizing and system integration of new generation quiet and green electric High Aspect-ratio wing aircraft
Reference	ASD0003-1	ASD0003-2
Department	Aerospace Engineering Department at University Carlos III of Madrid (UC3M)	
Research group	Aeroelastic and Structural Design lab (ASD Lab) https://aero.uc3m.es/asd_lab-home/	
Start Date (negotiable)	Negotiable, but ASAP is preferred (project starts on 01/02/2023).	
Salary	PhD position (18.000€ – 26.000€ p.a., negotiable) PostDoc position (25.000€ – 40.000€ p.a., based on assessment of merit)	
Eligibility	**Anyone eligible to work in Spain**. (See other requirements below)	
Duration of award	PhD: 3 years (extendable to 4 years) / Research fellow: 2 years	

Supervisors	Dr Rauno Cavallaro	Dr Andrea Cini

Position ASD0003-1: Multidisciplinary Design and Optimization (MDO) of Electric High Aspect-ratio wings Aircraft.





The goal of this position is to perform a multidisciplinary optimization (MDO) of High-aspect-ratio wings (HARW) featuring Distributed Electric Propulsion (DEP) at different fidelity levels.
The activity of the candidate will include:

- Using the State-of-Art approaches, tools and library in MDO (e.g., AGILE suite https://www.agile-project.eu/open-mdo-suite/, GEMSEO https://gemseo.readthedocs.io/en/stable/, OpenMDAO https://openmdao.org/)
- Integrating the several discipline modules within the optimization workflow.
- Selecting the most promising MDO mathematical formulations (MDO architectures)
- Launching the optimization campaign and support all related activities.
- Further advancing the SoA of MDO of new generation aircraft.

Position ASD0003-2: Airframe design tools for multi-fidelity structural sizing and system integration of new generation quiet and green electric High Aspect-ratio wing aircraft

This researcher position aims at developing multi-fidelity design procedure for performance optimisation of new generation green and quite aircraft featuring High-aspect-ratio wings (HARW) and Distributed Electric Propulsion (DEP). The activity will be mainly focus on developing the structural sizing tools defining the airframe internal structures and mass distribution.
The research activity will include:

- Developing shell-accurate beam element for multi-material hybrid tapered sections.
- Defining modelling strategy to include system integration into GFEM.
- Developing stress analysis and mass estimation DoE and surrogate models
- Performing minimum weight optimisation
- Developing advanced composite material optimisation
- Developing a strategy to effectively include certification and manufacturing constraints in airframe optimisation routines.
- Using in-house FE codes (Augusto) and commercial software (Nastran, Abaqus, OptiStruct)

Technical Requirements

Applicants **must**:

- For the PhD studentship: hold a MSc (or MSc student with 60 ECTS passed at contract signature) in aerospace engineering or a relevant discipline. Students with a background in aircraft design, and/or Multidisciplinary Design and optimization, and/or Aerostructures and FE analysis are particularly encouraged to apply.
- For the Research Fellowship: hold a PhD and demonstrated experience in MDO and aircraft design, or in aircraft structural design and FE.
- Have an outstanding academic record, critical and creative thinking.
- Be proficient in English (oral and written).
- Deal independently and proactively with scientific and engineering challenges; be self-motivated and capable of working under pressure to meet deadlines.
- Have programming skills (e.g., Python).

For further information please contact:

- **Position ASD0003-1: Dr Rauno Cavallaro** (ASD Lab), T: **+34 91624 8232**, E: **rauno.cavallaro+asd0003-1@uc3m.es**

- **Position ASD0003-2: Dr Andrea Cini** (ASD Lab), T: **+34 91624 8238**, E: **andrea.cini@uc3m.es**

Applicants are recommended to contact Dr Rauno Cavallaro or Dr Andrea Cini to start the official application.