European University

Marie Skłodowska Curie Action – Postdoctoral Fellowship 2023
Expression of interest – Hosting offer
(MSCA-PF-2023)

Contact Person/Scientist in charge *(data of the principal investigator of the research group/lab or scientific supervisor)*	**Name**	Melike
	Surname	Nikbay
	Email	nikbay@itu.edu.tr
Laboratory /Department /Institute /Centre / *(data of the centre/department where the fellow would be located*	**Name**	Istanbul Technical University AeroMDO Lab (Aerospace Multidisciplinary Design Optimization Laboratory) / Faculty of Aeronautics and Astronautics
	Address	ITU Faculty of Aeronautics and Astronautics, Ayazaga Campus, Maslak, Sariyer, Istanbul, 34469, Turkiye
Research Area *(Please select the research area: corresponding to the eight MSCA evaluation panels. You can select between one and up to three scientific areas per EOI)*		Social Sciences and Humanities (SOC) Economic Sciences (ECO) X **Information Science and Engineering (ENG)** Environment and Geoscience (ENV) Life Sciences (LIF) Mathematics (MAT) Physics (PHY) Chemistry (CHE)
Brief description of the Centre/Research Group *(max. 1,600 characters including spaces: information about the research centre or research group, scientific staff. Please include URL if possible)*		Communication: • Website: https://aeromdo.itu.edu.tr/ • E-mail: aeromdo@itu.edu.tr • Address: ITU Ayazaga Campus, Faculty of Aeronautics and Astronautics, No:305, Istanbul, Turkey • Social Media: @aeromdolab (Github/Linkedin/Instagram/Twitter) ITU Aerospace Multidisciplinary Design Optimization Group was founded in 2006 by Prof.Dr. Melike Nikbay. The AeroMDO laboratory was officially founded in 2019 within the ITU Faculty of Aeronautics and Astronautics. The AeroMDO team aims to train passionate and qualified researchers in the area of Multidisciplinary Design Optimization for the core values of being pioneer and community oriented in research. Focusing on need-based advanced knowledge, the group aims to develop advanced technology tools in the fields of computational aerodynamics, structural mechanics and acoustics with the help of multi-disciplinary optimization techniques for innovative design solutions. We support dissemination of knowledge in the field of aviation and space by cooperating with industry and international organizations and sharing our research results and achievements from our laboratory within the university in prestigious journals and papers. Within the scope of academic and research activities, we try to bring innovative, original and advanced technology outputs to the academy with national/international projects supported by ITU Scientific Research Projects Coordination Unit (BAP), TUBITAK, European Union and industrial companies. Within the scope of these supported projects, we train qualified undergraduate, graduate and doctoral level researchers. Research Application Areas • Aerodynamics • Structural Mechanics • Aeroelasticity • Optimization • Sonic Boom Minimization • Reduced Order Modeling • Multi-disciplinary Design Optimization • Uncertainty Quantification • Deep Learning, Machine Learning Software Information • Matlab • Python • SU2 Multiphysics Simulation and Design Software • MSC Nastran/Patran • CATIA V5 • Engineering Sketch Pad (ESP) • PANAIR • Gmsh FE mesh generator

European University

Project description *(max. 1,800 characters including spaces: short description of the research project / research line where the fellow would be hosted and develop his /her project)*	**Development of Environmentally Friendly Aircrafts with High Aspect Ratio Wings via Multi-fidelity Surrogate Modeling Based Aeroelastic Optimization:** The effects of climate change are becoming more evident in our lives. One of the challenging goals in civil aviation transportation today is the development of high aspect ratio wings that are both economically and environmentally efficient. The global aviation industry is responsible for approximately 2.1% of all man-made carbon dioxide (CO_2) emissions. With this awareness, as a part of the global effort to reduce CO_2 emissions in recent years, it is of great importance to examine wings with high aspect ratio and to reduce CO_2 emissions by limiting induced drag with increasing aspect ratio. The aspect ratio of aircrafts such as Boeing 787 and Airbus A350, which are widely used in today's civil aviation transportation is approximately 11 and this ratio is still far below the optimum value [1]. Thus, the design and development of high aspect ratio wings has become very crucial in the new generation civil aviation transportation. However, there are some difficulties and limitations in the design and operational processes of high-aspect ratio wings. Foremost among these are the limitations imposed by the high aspect ratio in airport operating areas such as the runway and taxiway separation. In this regard, folding wingtips attract great attention because it improves flight performance, efficiency and load alleviation as it minimizes the operational limitations. The folding wing concept allowing for flare angle adaptation was first patented by Airbus. A similar concept was adapted by Boeing to the B777X model with a 7m wingspan extension to improve performance by reducing drag. On the other hand, the flexibility that comes with increasing aspect ratio causes large deformations in the structure. Extremely flexible structures with high deformations become more susceptible to aeroelastic instabilities in flight with sufficient and high levels of perturbation. This situation revealed the necessity of examining the aeroelastic and aerodynamic effects of high aspect ratio wings with folding wing mechanism, the suppression of flutter out of the flight envelope to design more reliable structures. Within the scope of this project, the flutter problem that causes damage to aircraft structures is prevented by using a multi fidelity deep neural network and co-Kriging models and optimization algorithms for high aspect ratio wing configurations with folding wingtip mechanism. A more reliable flight will be possible for different flight conditions by increasing the flutter speed of the structure as compared to the initial design. In order to increase the flutter speed, it is aimed to perform (1) design changes in wing geometry, (2) placement/geometry of the folding wingtip system, and (3) changes in material properties. It is desirable that the optimization process be computationally efficient and at the same time reliable. The main purpose of the project is to study high aspect ratio wings with the concept of folding wingtip, which is efficient in terms of environmental, aerodynamic and airport operations. In addition, with the aim of developing technological capabilities in AI assisted design process in Turkiye, the development of in-house codes and methods, the adaptation of open-source codes and their coupling interfaces are aimed within the scope of the project. This Project will start in April 2023 and will continue for 36 months. We would like to host 2 postdocs for 12 months during this Project. We would like to get posdocs with track record in either aerodynamics, aeroelasticity, structural dynamics, machine learning, surrogate modeling and optimization.
Applications: documents to be submitted and deadlines *(Please indicate the documents that the candidate fellow should submit to establish contact: CV, letter of motivation, letter of references, etc., please indicate deadline. Recommended deadline: April 2023)*	CV, letter of motivation, letter of references, transcripts (undergraduate and graduate), MS and PhD theses, journal papers Recommended Deadline: 10 April 2023