

ABOUT NITROS

Helicopters are currently used in important applications providing a valuable contribution to society and economic growth. Thanks to the operational flexibility of helicopters it is possible to accomplish complex missions.

Today, the service of helicopters includes, search and rescue, coastguard, firefighting, disaster relief, territorial control, monitoring and inspection, heavy-lift support to construction and other sectors, aerial filming and media support. In the future, helicopters and other vertical flight vehicles, like tilt-rotors, compound helicopters, hybrids and a rapidly expanding class of easy-to-fly vertical take-off personal vehicles, are expected to see widespread use, as means of transport, exploiting the formidable capability to provide point-to-point connections.

However, if the expansion of the usage of rotorcraft vehicles is to follow the pace of grow followed by the fixed-wing public transport in the last years, several issues need to be urgently addressed to increase the use and the public acceptance of rotorcraft. In particular, aspects related to complexity of the operations and safety are of primary importance, due to the fact that in the last 20 years helicopter accident rates, worldwide, remained unacceptably high, when compared to fixed-wing aircraft.

The complexity of the phenomena involved in rotorcraft flight calls for the training of engineers with a genuine multidisciplinary background.



UNIVERSITIES



INDUSTRIAL PARTNERS



POLITECNICO DI MILANO

Established in 1863, PoliMI is one of the leading science and technology universities in Europe and it is the largest institute in Italy in Engineering, Architecture and Industrial Designs. Its premises are spread over 7 campuses for better interaction with local communities and private companies. The Department of Aerospace Science and Technology, (DAER) conducts research in a wide range of topics within the aerospace sciences, including rotorcraft, fixed wing and space related applications. The Department has over 100 members, researchers, collaborators, PhD students, technical and administrative staff. Fixed-wing aircraft and rotorcraft system modelling, analysis, simulation and testing represent a consolidated field of research for DAER, which has produced a long-standing collaboration with world-class aeronautical companies and the participation in several FP5, 6, 7 and CleanSky EU projects on fixed-wing aircraft and rotorcraft technologies.

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**NETWORK FOR INNOVATIVE TRAINING
ON ROTORCRAFT SAFETY**

A MARIE SKŁODOWSKA-CURIE ACTION JOINT
EUROPEAN DOCTORATE ON ROTORCRAFT SAFETY

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RESEARCH PROJECTS

Each research program is focused on a problem that affects the safety of the current or innovative rotorcraft configurations. The possible implications of the problem in terms of manufacturing, operations and certification procedures will be thoroughly discussed with the industrial partners.

SIMULATION AND PREVENTION OF ICE FORMATION AND SHEDDING ON ROTORCRAFT

IN SERVICE HEALTH MONITORING FOR ROTORCRAFT STRUCTURES

INNOVATIVE DESIGN FOR TILTROTOR COCKPIT FOR THE REDUCTION OF PILOT WORKLOAD

ROBUST FLIGHT CONTROL OF ROTORCRAFT MANOEUVRES IMMERSED IN OBSTACLE’S TURBULENCE

ROTORCRAFT WAKE MODELLING

DEVELOPMENT OF THE PHASE AGGRESSION CRITERION FOR ADVERSE ROTORCRAFT PILOT COUPLING PREDICTION AND REAL-TIME DETECTION (PAC)

MITIGATION OF AIRWAKE HAZARDS

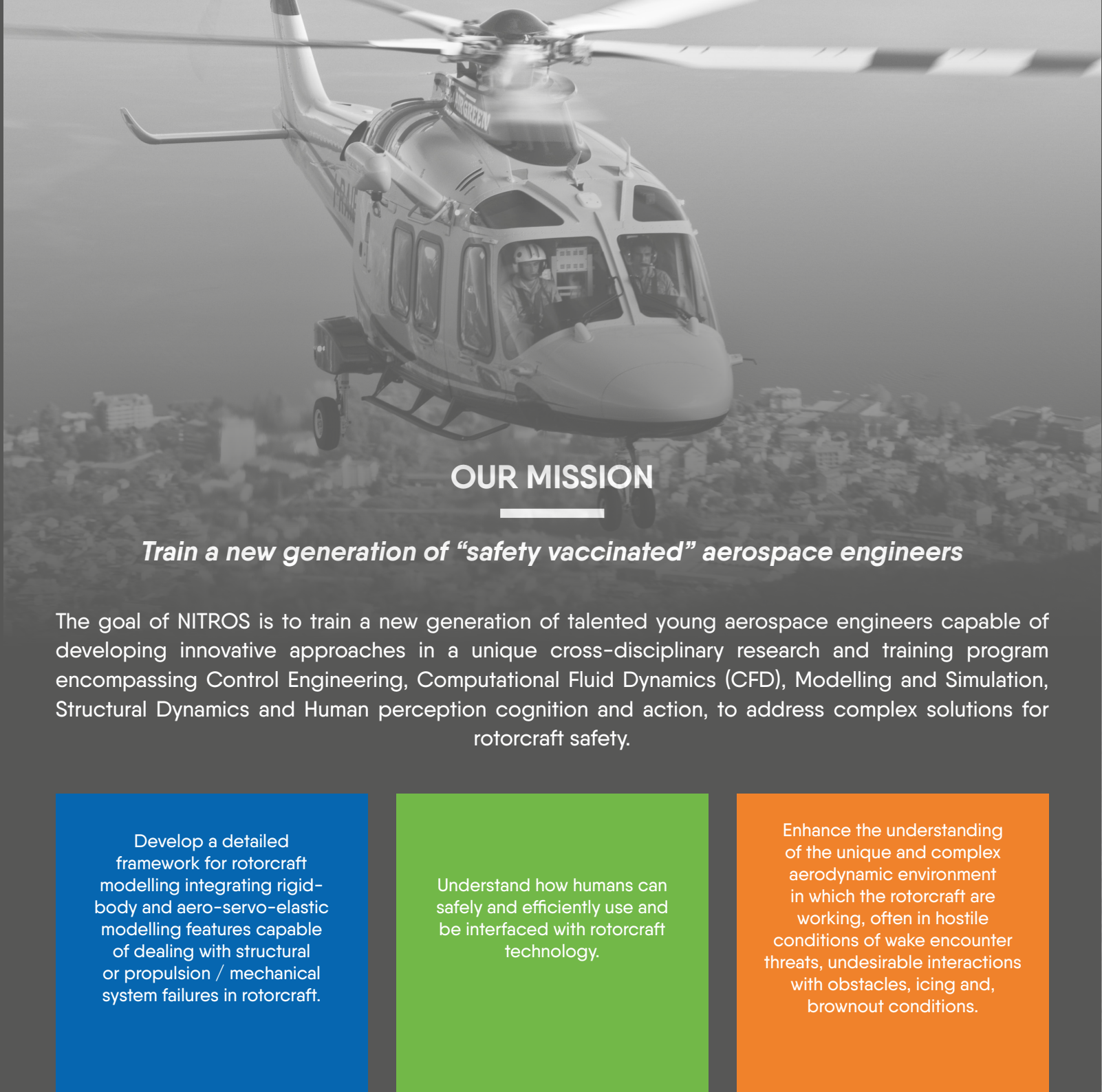
MODELLING OF BROWN / WHITE-OUT

ENHANCED HELICOPTER HANDLING QUALITIES THROUGH VIBRATORY LOADS EXPLORATION

REVEALING ADVERSE ROTORCRAFT PILOT COUPLINGS INDUCED BY FLIGHT CONTROL SYSTEMS

UNDERSTANDING THE USE OF AUTOMATION IN HELICOPTERS

ALLEVIATING FLIGHT SIMULATOR NEGATIVE TRANSFERENCE FOR HELICOPTER OPERATIONS



OUR MISSION

Train a new generation of “safety vaccinated” aerospace engineers

The goal of NITROS is to train a new generation of talented young aerospace engineers capable of developing innovative approaches in a unique cross-disciplinary research and training program encompassing Control Engineering, Computational Fluid Dynamics (CFD), Modelling and Simulation, Structural Dynamics and Human perception cognition and action, to address complex solutions for rotorcraft safety.

Develop a detailed framework for rotorcraft modelling integrating rigid-body and aero-servo-elastic modelling features capable of dealing with structural or propulsion / mechanical system failures in rotorcraft.

Understand how humans can safely and efficiently use and be interfaced with rotorcraft technology.

Enhance the understanding of the unique and complex aerodynamic environment in which the rotorcraft are working, often in hostile conditions of wake encounter threats, undesirable interactions with obstacles, icing and, brownout conditions.

HOW IT WORKS

The Horizon 2020 Marie Skłodowska-Curie Action Joint European Doctorate NITROS projects will guide 12 Early Stage Researchers through a Double PhD program. The Consortium of Universities is composed by some of the most important players on rotorcraft engineering training and research at European level: Politecnico di Milano, Technische Universiteit Delft, University of Glasgow, University of Liverpool. Training of ESRs is aimed at developing them as independent scientists, with high level in:

1

Problem-solving
decision making skills

2

Management
communication and leadership skills

3

Discipline-related
research skills

4

Transferable skills
improvements on a personal level