# Politecnico di Milano

The University "Politecnico di Milano" was founded in 1863. Its mission is to teach technologies and educate students to become researchers. The University is continuously updating its tradition as a school that focuses on quality and innovation in teaching and research. Scientific research at Politecnico di Milano has always been oriented toward innovation and quality, always seeking a strong relationship with the industrial world through technology transfer. Attuning to the needs of the industrial sector helps research to continuously explore new areas and stay at the leading edge of science and technology.

The scientific community of Politecnico di Milano is made of more than 1,300 professors and research fellows, with 38,200 students (2013 update). According to QS World University Rankings 2012/2013, Politecnico di Milano ranked 28th worldwide in the area of Engineering and Technology. On a worldwide scale, it is the first Italian university entering the QS ranking among the top 30 technical universities. Furthermore, Politecnico di Milano participates in the coveted "club" of universities ranked in the top 100 in the world in the most prominent international rankings, along with only 15 other European universities.

Politecnico di Milano is currently articulated in 12 departments, where research is co-ordinated and carried out, and 6 schools, where education is co-ordinated and implemented. Several service Centres provide support for technical and administrative purposes.

# Dipartimento di Scienze e Tecnologie Aerospaziali

The Dipartimento di Scienze e Tecnologie Aerospaziali (Department of Aerospace Science and Technology, DAER-PoliMi) was established within Politecnico di Milano as an autonomous institute in the 1950s. The personnel of DAER-PoliMi currently consists of 43 faculty, 27 technical and administration staff, 70 research assistants and Ph.D. students. The main activity within the Department is scientific research.

The Department itself is the main reference body for the B.Sc. (Laurea) course in Aerospace Engineering, the M.Sc. (Laurea Magistrale) course in Aeronautical Engineering and Space Engineering, and the Ph.D. (Dottorato di Ricerca) course in Aerospace Engineering. M.Sc. and Ph.D. courses are offered in English. Each year, about 250 students complete the B.Sc., 180 the M.Sc., and 15 the Ph.D. In parallel, DAER-PoliMi staff is strongly involved in several research activities with academia, industries and research bodies worldwide.

Politecnico di Milano
Aerospace Science and Technology Department (DAER)
Rotorcraft Research Laboratories (RRL)

Point of Contact
Pierangelo Masarati: pierangelo.masarati@polimi.it

Campus Bovisa
Via La Masa, 34 - 20156 Milano - Italy
Edificio B12 "Enrico Forlanini" - 2nd floor

tel. +39.02.2399.8323-24
fax +39.02.2399.8334

http://www.aero.polimi.it/

# Rotorcraft Research Laboratories

POLITECNICO DI MILANO

# Rotorcraft Research Laboratories - RRL

Research activities within the Aerospace Science and Technology Department (DAER) of Politecnico di Milano are organized in scientific laboratories. These laboratories represent the core of the research competences developed at DAER over the years. They are highly specialized, agile and vital competence centers. A long standing tradition of activities in relation with rotorcraft, and the presence of several labs with specific competences on the diverse aspects that characterize this type of vehicles, motivated the opportunity to coordinate the research activity in a higher level structure, the Rotorcraft Research Laboratories at DAER (RRL).

Its mission is:

- to communicate the competences of DAER in the area of rotorcraft technologies
- to act as the focal point for collection and distribution of information to the participating laboratories

Participating laboratories are:

- AMATECH - PoC: Giuseppe Sala (materials, technologies)
- ASCL - PoC: Marco Lovera (model identification, control systems design)
- AVLab - PoC: Marco Morandini (acoustics, vibrations, aeroservoelasticity, control)
- CrashLab - PoC: Paolo Astori (crashworthiness)
- FMSLab - PoC: Lorenzo Trainelli (flight dynamics)
- FRAME-Lab - PoC: Giuseppe Quaranta (aeroservoelasticity)
- RAL - PoC: Luigi Vigevano (aerodynamics)
- SIAMS - PoC: Alessandro Airoldi (composite materials)

The competences provided by these labs and their past and ongoing research activities are briefly described in the following.
The points of contact can be directly reached by email for further details. Further contact details are available through DAER's website **http://www.aero.polimi.it/**

The current point of contact for RRL is Pierangelo Masarati: **pierangelo.masarati@polimi.it**

**AMATECH - Aerospace Materials and Technologies.** The AMATECH laboratory (A.dvanced MA.terials & TECH.nologies) deals with the study and the experimental and numerical investigation of materials and technological processes: from basic material analysis (with DMA, DSC, rheometric, SEM techniques), to mechanical testing (damage mechanics, statics, fatigue, instability), from functional evaluation and non-destructive inspection (CT scan, Rx, US, thermography), to the development, implementation and technological monitoring of production processes (autoclave, vacuum bagging, filament winding, RTM, additive manufacturing). **giuseppe.sala@polimi.it**

**ASCL - Aerospace Systems and Control Laboratory.** The ASCL pursues the following objectives: to develop fundamental research in the area of systems and control; to perform applied research work related to systems and control both in aeronautics and space; to carry out experimental activities aimed at testing and proving new concepts in the area of ASC. **marco.lovera@polimi.it**
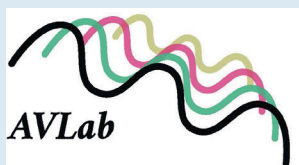
**AVLab - Aeroelasticity and Vibroacoustic Laboratory.** The Aeroelasticity and Vibroacoustics Laboratory deals with the simulation and control of the response of light aerospace structures. It studies the aeroelastic response, vibrations and noise emission of aircraft and helicopters. It develops nonlinear active control systems for flutter suppression and load alleviation, as well as real time vibration and noise control systems. It also develops high fidelity models and designs innovative control systems for large telescope adaptive mirrors. **marco.morandini@polimi.it**

**CrashLab.** Experimental analysis and numerical modeling of metal and composite structures under crash and impact conditions, including: definition of constitutive laws of materials, fluid-structure interaction, occupant's biomechanics, injury criteria, cabin safety, fuel system integrity, bird and hail impact. **paolo.astori@polimi.it**
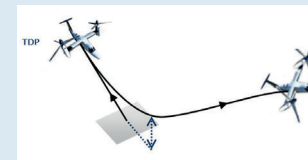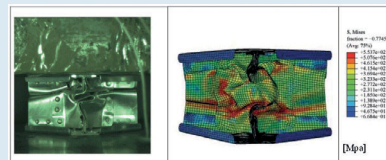
**FMSlab - Flight Mechanics & Flight Systems Laboratory.** Conceptual/preliminary aircraft and UAV design; airplane and rotorcraft modelling and simulation; performance and handling qualities analysis; design, analysis and testing of onboard sensor systems, actuator systems and cockpit instrumentation; flight testing. **lorenzo.trainelli@polimi.it**

**FRAME-Lab.** The objective of FRAME-Lab (Fixed- and Rotary wing Aircraft Multidisciplinary Engineering Laboratory) is the analysis of aircraft as complex dynamical systems, considering aeromechanics, aerodynamics, aeroelasticity, control, and man-machine interaction, in support of their integrated design. **giuseppe.quaranta@polimi.it**
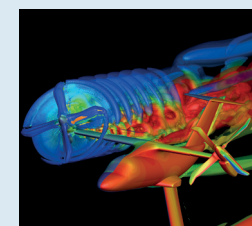
**RAL - Rotorcraft Aerodynamics Lab.** The goal of RAL is to perform numerical and experimental studies of complete helicopter and tiltrotor configurations. Its expertise includes: coupled CFD/CSD methods for helicopters with elastic blades; unstructured moving grids; investigation of rotor-fuselage mutual interference. Large and medium subsonic Wind Tunnels with a rotor driving system; dynamic stall experiments on blade sections. **luigi.vigevano@polimi.it**

**SIAMS.** The mission of the SIAMS laboratory (Structural Integrity of Advanced Materials and Structures) is the integration of numerical techniques for damage nucleation and propagation in the design of composite and hybrid structural components. SIAMS developed techniques for the simulation of complex damage scenarios, for damage characterization and modeling in the interface of composite and hybrid structures and can apply those techniques for the design of advanced structural monitoring systems. **alessandro.airoldi@polimi.it**