

## Giuseppe Quaranta

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**CONTACT INFORMATION** Dipartimento di Scienze e Tecnologie  
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**PERSONAL** Born in Bari, Italy on the 27<sup>th</sup> of August 1972  
Nationality: Italian.

### EDUCATION

**Ph.D., Aerospace Engineering** *cum laude*, May 2004

University: Politecnico di Milano, Dipartimento di Ingegneria  
Aerospaziale  
Thesis Topic: *A Study of fluid-structure interactions for rotorcraft  
aeromechanics: modeling and analysis methods*  
Sponsor: AgustaWestland  
Advisor: Professor Paolo Mantegazza

**Laurea, Aerospace Engineering**, 2000

University: Politecnico di Milano  
Thesis Topic: *Application of parallel computing techniques to dynamic  
analysis of complex aerospace systems*  
Grade: 98/100  
Advisor: Professor Paolo Mantegazza

### ACADEMIC POSITIONS

**Full Professor of Aerospace Structures** November 2019 to present  
Dipartimento di Scienze e Tecnologie Aerospaziali,  
Politecnico di Milano

**Associate Professor** March 2015 to October 2019  
Dipartimento di Scienze e Tecnologie Aerospaziali,  
Politecnico di Milano

**Assistant Professor** March 2011 to March 2015  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano

**Assistant Professor** (temporary position) June 2010 to February 2011  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano  
Sponsor: Regione Lombardia  
Project title: *CASE: Computational AeroServoelasticity for  
Environmentally friendly aircraft*

**Post-Doc Research Fellow** August 2009 to May 2010  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano  
Project title: *Aeromechanical and biomechanical modeling for aeroelastic Rotorcraft-Pilot Coupling analysis*

**Post-Doc Research Fellow** February 2009 to July 2009  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano  
Project title: *Development of state-space reduced order model for aeroservoelastic systems*

**Post-Doc Research Fellow** February 2007 to January 2009  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano  
Project title: *Aeroelastic analysis of innovative tiltrotors*

**Post-Doc Research Fellow** April 2004 to January 2007  
Dipartimento di Ingegneria Aerospaziale,  
Politecnico di Milano  
Project title: *Multibody approaches for the solution of aeroservoelastic problems*

TEACHING  
ACTIVITY

**Politecnico di Milano**

**Istituzioni di Ingegneria Aerospaziale** Spring 2014 to present  
First year of Laurea  
8 credits  
Average number of students: 250

**Aeroservoelasticity of fixed and rotary wing aircraft** Fall 2019 to present  
Fourth semester, Laurea Magistrale  
8 credits

**Flight Dynamics and Aeroelasticity of Rotary-Wing Aircraft** Spring 2014 to Spring 2019  
Ph.D. in Aerospace Engineering  
5 credits

**Dynamics and aeroelasticity of rotors** Spring 2012 to Spring 2019  
Fourth semester, Laurea Magistrale  
6 credits  
Average number of students: 15

**Flight mechanics and Handling Qualities of Rotorcraft** 2014  
Seminars for Master in Rotary Wing Technology  
12 hours

**Multibody systems dynamics** 2005 to 2013  
Seminars

PhD School in Aerospace engineering  
Seminars on multidisciplinary modeling methods (4-6 hours)

### **Dynamics and Control of Rotorcraft**

July 2012

Course on Flight Control organized by Prof. Marco Lovera  
Invited seminar, 3 hours  
Ph.D. Summer school organized by SIDRA (Società Italiana Docenti e Ricercatori in Automatica)  
Bertinoro (FC), Italy 19-21 July 2012

### **Teaching Assistant**

2002 to 2007, and 2013

Laurea Magistrale: Aeroservoelasticità (Aeroservoelasticity),  
Dinamica e controllo di strutture aerospaziali (Dynamics and controls of aerospace structures)  
30 hours of lessons and exercises  
Laurea: Dinamica dei sistemi aerospaziali (Dynamics of aerospace systems),  
Progetto aerospaziale (Aerospace structure design)  
30 hours of lessons, exercises and computer lab.

### RESEARCH INTERESTS

Research on multidisciplinary modeling for aircraft and rotorcraft dynamic design, verification and certification. Currently working on: Rotorcraft aeroservoelasticity; Flight simulation for rotorcraft certification and design; Simulation and control of dynamic stall; Analysis of an innovative blade configurations for rotorcraft; Rotorcraft Pilot Couplings; Morphing technology for aircraft aeroelastic control; Innovative approaches for Fluid Structure Interaction simulations; Ice accretion on rotorcraft; Multidisciplinary optimization.

### RECENT PAPERS

- V. Muscarello, F. Colombo, G. Quaranta, and P. Masarati, Aeroelastic Rotorcraft Pilot Couplings in Tiltrotor Aircraft *Journal of Guidance, Control, and Dynamics*, 2019, Vol. 42(3), pp. 524–537, doi:10.2514/1.G003922.
- F. Fusi, P.M. Congedo, A. Guardone, and G. Quaranta, Shape optimization under uncertainty of morphing airfoils *Acta Mechanica*, 2018, Vol. 229(3), pp. 1229–1250, doi:10.1007/s00707-017-2049-3.
- D. Kelly, W. Habashi, G. Quaranta, P. Masarati, and M. Fossati, Ice Accretion Effects on Helicopter Rotor Performance, via Multibody and CFD Approaches *Journal of the Aircraft*, 2018, Vol. 55(3), pp. 1165–1176 doi:10.2514/1.C033962.
- V. Muscarello, P. Masarati, and G. Quaranta. Robust stability analysis of adverse aeroelastic roll/lateral rotorcraft-pilot couplings *Journal of the American Helicopter Society*, 2017, Vol. 62(2), doi:10.4050/JAHS.62.022003.
- V. Muscarello, G. Quaranta, P. Masarati, L. Lu, M. Jones and M. Jump. Prediction and simulator verification of roll/lateral adverse aeroservoelastic rotorcraft-pilot couplings. *Journal of Guidance, Control, and Dynamics*, Vol 39(1), 2016, p. 42–60, doi:10.2514/1.G001121.
- V. Motta, A. Guardone, G. Quaranta. Influence of airfoil thickness on unsteady aerodynamic loads on pitching airfoils. *Journal of Fluid Mechanics*, Vol 774, 2015, p. 460–487, doi:10.1017/jfm.2015.280.

- M.D. Pavel, P. Masarati, M. Gennaretti, M. Jump, L. Zaichik, B. Dang-Vu, L. Lu, D. Yilmaz, G. Quaranta, A. Ionita, J. Serafini. Practices to identify and preclude adverse aircraft-and-rotorcraft pilot couplings — A design perspective. *Progress in Aerospace Science*, 2015, doi:10.1016/j.paerosci.2015.05.002.
- D. Isola, A. Guardone, G. Quaranta. Finite-volume solution of two-dimensional compressible flows over dynamic adaptive grids. *Journal of Computational Physics*, Vol. 285, 2015, p. 1–23, doi:10.1016/j.jcp.2015.01.007.

#### PATENTS

- G. Quaranta, et. al. inventors, Leonardo S.p.A. Divisione Elicotteri assignee, Rotor for a hover-capable aircraft and method for containment of vibrations transmitted to the mast of a rotor of a hover-capable aircraft. WIPO Patent, 2019087070A1, filed 30 October 2018
- G. Quaranta et. al. inventors, Leonardo S.p.A. Divisione Elicotteri assignee, Kit per un Elicottero. European Patent 18186028, filed 27 July 2018
- G. Quaranta et. al. inventors, Leonardo S.p.A. Divisione Elicotteri assignee, Kit per un Elicottero. European Patent 18186074, filed 27 July 2018

#### RESEARCH ACTIVITY

- Author and co-author of more than 241 publications on: international peer reviewed journals, international and national conferences; 133 documents surveyed in Scopus, h-index 19, 1166 total citations by 590 documents.
- Coordinator of the CleanSky 2 Project RoCS (Rotorcraft Certification by Simulation) for a the development of Flight Simulator certification procedures for Rotorcraft together with NLR, DLR, University of Liverpool, Liverpool John Moores University, GIEI, EASA and Leonardo Helicopter Division.
- Coordinator of the Project NITROS (Network for Innovative Training on Rotorcraft Safety) for a European Joint Doctorate dedicated to safety of rotorcraft flight sponsored by the the EU H2020 Marie Skłodowska Curie Action with universities Politecnico di Milano, University of Liverpool, TU Delft, University of Glasgow, and industrial partners NLR, Leonardo Elicotteri, CAA, Eurocontrol, Renewable UK, Bristow, Max Plank Institute. Grant Amount 3.146.893,92 Euros. [www.nitros-ejd.org](http://www.nitros-ejd.org)
- Participant to the UTOPIE (Uncertainty Treatment and OPTimisation In Aerospace Engineering) EU H2020 Marie Skłodowska Curie Action Innovative Training Network dedicated to Uncertainty Quantification and Optimization.
- Coordinator of the Action 2 and 3 of the project TEPS Twin Engine Pack System, for the development of a novel twin piston engine for rotorcraft application. Funded by Regione Lombardia and Fondazione Cariplo (2013-2015), in collaboration with RobbyMoto Srl, AQM, Meta-Systems
- Coordinator of the department scientific lab proposal FRAME-Lab Fixed and Rotary Aircraft Multidisciplinary Engineering Laboratory
- Principal investigator of the proposal "Shape-It!" for the application of morphing technology to rotorcraft blades (FARB 2012, Politecnico di Milano)
- Collaboration with the McGill University, Canada (Prof. W. Habashi) on rotorcraft performance degradation in icing conditions
- Co-investigator research program CROP Cycloidal Rotor Optimized for Propulsion (Collaborative EU FP7, Level 0)
- Part of FLOWMESH team working on the development of a novel CFD tool

for simulating the complex flow field around rotorcrafts.

- Co-investigator research program on *Strumenti Innovativi per il Progetto di Sistemi Antighiaccio per l'Aeronautica* (Innovative means for Anti-Ice Systems design), sponsored by Regione Lombardia.
- Co-investigator ARISTOTEL Aircraft and Rotorcraft Pilot Couplings : Tools and Techniques for Alleviation and Detection (Collaborative EU FP7).
- Co-investigator MAST/CTA Micro-aerial vehicles in collaboration with Univ. of Maryland, USA. Sponsored by US Army Research Office.
- Co-investigator PRIN 2007 *Modellazione dell'interazione bio-meccanica uomo-macchina nei veicoli* (modeling of man-machine interaction for vehicles), sponsored by Italian Ministry of University and Research.
- Principal investigator for the project Pilot biodynamical characterization for investigation of unfavorable rotorcraft pilot coupling, sponsored by Regione Lombardia.
- Part of the Action Group GARTEUR HC AG-16 RPC Helicopter Rotor-Pilot Coupling
- Co-investigator NICETRIP Novel Innovative Competitive Effective Tilt Rotor Integrated Project, European Collaboration on Tilt-Rotor (Collaborative EU FP6)
- Co-investigator ANTASME Advanced modeling techniques for aerospace SMEs (EU MATEO Program)
- Participation to the project 3AS Active Aeroelastic Aircraft Structures (Collaborative EU FP6)
- Participation to the project ADYN Advanced European Tiltrotor Dynamics and Noise (Collaborative EU FP6)
- Investigator in several industrial research program on rotorcraft aero-servo-elasticity, Rotorcraft Pilot Couplings, Vibration Reduction (COMFORT Project) in collaboration with Leonardo divisione Elicotteri (formerly known as AgustaWestland)
- Co-principal investigator in several industrial research program on aircraft aero-servo-elasticity and fluid structure interactions in collaboration with AleniaAermacchi
- Collaboration with the University of Wyoming on the development of systems for the control of dynamic stall.
- Research on tiltrotor aeromechanics in collaboration with NASA Langley and Army Research Laboratory, USA
- Research on mechanical system modeling of rubber components with Hutchinson
- Research on the design of aerodynamic screens for an adaptive telescope with Microgate

#### DEVELOPMENT OF RESEARCH TOOLS

- Part of MBDyn Team that developed an open source Multibody – Multidisciplinary software <http://www.mbdyn.org>
- Part of the FLOWMESH team to develop and innovative CFD software <http://www.aero.polimi.it/flowmesh/>
- Principal developer of the software MASST (Modern Aeroservoelasticity State Space Tools) in use for aeroservoelastic analysis in AgustaWestland and AleniaAermacchi
- Collaboration with IChrome, Ltd <http://www.ichrome.eu> for the

development of Shaper, a mesh-morphing software developed inside the multidisciplinary optimization suite Nexus

#### AWARDS

- Tutor of the student team FENIX that won the third place at the 33rd American Helicopter Society Annual Student Design Competition
- Tutor of the student team CAURUS that won the second place at the 31st American Helicopter Society Annual Student Design Competition
- Paper selected among the 10 best papers presented at the European Rotorcraft Forum 2012.
- Paper selected among the 10 best papers presented at the European Rotorcraft Forum 2011.
- Part of the GARTEUR HC AG-16 on Rotocraft Pilot Coupling that won the GARTEUR Award of Excellence for 2010/2011
- Part of FLOWMESH team that won the Cinqueper mille government grant of the year 2010. Flowmesh has been selected, together with other 11 projects of the Politecnico di Milano, as winner of the 2010 Cinqueper mille.

#### REFEREE SERVICE

*Computers & Structures*  
*Journal of Fluid Mechanics*  
*Journal of Sound and Vibration*  
*Design Automation for Embedded Systems*  
*ASME Journal of Vibration and Acoustics*  
*ASME Journal of Computational and Nonlinear Dynamics*  
*ASME Dynamic Systems, Measurements and Control*  
*AIAA Journal*  
*Aerospace Science and Technology*  
*Aeronautical Journal*  
*Proceedings of the Institution of Mechanical Engineer, Part G, Journal of Aerospace Engineering*  
*Journal of Nonlinear Mechanics*  
*IEEE Transactions on Systems, Man, and Cybernetics, Part B: Cybernetics*  
*Journal of Aerospace Engineering*  
*Journal of Fluids and Structures*  
*IEEE Transactions on Automation Science and Engineering*

#### OTHER

- Member of the “PhD Board” (Collegio di dottorato) in Aerospace Engineering since 2012. Advisor of 8 PhD students.
- Member of the “Giunta del Dipartimento di Scienze e Tecnologie Aerospaziali”, 2017-2019
- Advisor and co-advisor of more than 70 “master degree” (laurea magistrale) students.
- Member of the Modeling and Simulation Technical Committee of the Vertical Flight Society.
- Secretary of the Italian Chapter of the Vertical Flight Society.

- Tutor of the project team TP-HELI for the design of a novel light twin piston engine of the 10-th cycle of the Alta Scuola Politecnica (7 students).
- Member of the committee of a PhD candidate at University of Wyoming, Laramie, WY USA.
- Former member of the selection committee for international applicant at the “master degree” (laurea magistrale) in Aeronautical Engineering and Space Engineering.
- Co-organizer of: IFASD2017 International Forum on Aeroelasticity and Structural Dynamics, 25–28 June 2017, Como, Italy; 43<sup>rd</sup> European Rotorcraft Forum, September 2017, Milano, Italy