



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 38th cycle

Research Area n. 3 - Systems and Control

**PNRR\_352 Research Field: MODEL BASED SAFETY ANALYSIS AND ASSESSMENT FOR  
FLIGHT CONTROL SYSTEMS DEVELOPMENT**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1400.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	The development of airborne safety critical systems requires significant effort in managing safety design elements. The FCS (Flight Control System) "closed loop" nature, its complexity and the intricate interactions with other aircraft systems makes standard/manual safety assessment processes inherently error prone. The objective of this project is to define a Model Based approach to Safety Analysis to support FCS development, in line with Certification Regulation and applicable Standards.
<b>Methods and techniques that will be developed and used to carry out the research</b>	The various phases of the project will include analysis of Safety Requirements from Certification regulation and standards, analysis of FCS architecture and closed loop characteristics, definition of a process to guarantee completeness and correctness of Safety Objectives and Safety Requirement Specification, definition of a structured/automated Model Based approach to support Top/Down and Bottom/Up segments of Safety Assessment, definition of an environment able to support re-usability of Safety analysis related artifacts. Both standard safety analysis approaches (Fault Trees Analysis, Failure Model and Effects Analysis) and innovative approaches based on propagation graphs will be considered.



	<p>Development phases:</p> <ul style="list-style-type: none"> <li>- Identification of concepts and key factors</li> <li>- Methodological Definition of the assessment</li> <li>- Assessment and Validation Testing</li> <li>- Analysis of finding and Reports</li> </ul>
<b>Educational objectives</b>	<p>In addition to the training goals that are common to the whole curriculum in Systems and Control of the PhD in Information Technology, pertaining to advanced control, estimation and machine learning methods and transferable skills, this program will have a focus on safety analysis of engineering systems, with specific emphasis on flight control systems. The PhD candidate is expected to develop deep knowledge of advanced solutions for the safety analysis.</p>
<b>Job opportunities</b>	<p>Upon completion of the three-years-long program, the Doctoral graduate will have strong theoretical and practical knowledge in the field of flight control systems, safety analysis of complex industrial systems, model based design of fault tolerant control systems, which will allow her/him to pursue either a career in industry, with either a R&amp;D or a project management role in the field of safety and more in general of control and automation for engineering systems</p>
<b>Composition of the research group</b>	<p>1 Full Professors 3 Associated Professors 1 Assistant Professors 2 PhD Students</p>
<b>Name of the research directors</b>	<p>Prof. Riccardo Scattolini</p>

<b>Contacts</b>	
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<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--



Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Leonardo Divisione Elicotteri ( <a href="https://helicopters.leonardo.com/it/home">https://helicopters.leonardo.com/it/home</a> )
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Stanford University ( <a href="https://aa.stanford.edu/">https://aa.stanford.edu/</a> )
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p><b>Attinenza alle tematiche, alle missioni/componenti prescelte del bando PNRR v. D.M. 352, art.6</b></p> <p>La ricerca è pienamente coerente con la Missione 1: "Digitalizzazione, innovazione, competitività, cultura e turismo", e in particolare con la componente M1C2: "Digitalizzazione, innovazione e competitività nel sistema produttivo" del Piano Nazionale di Ripresa e Resilienza (PNRR). In particolare, si fa riferimento alla Transizione 4.0, volta a fornire nuovo impulso alla transizione digitale delle imprese e al tasso d'innovazione del tessuto industriale e imprenditoriale del Paese. Le metodologie di safety che si intende sviluppare potranno rappresentare un significativo contributo all'analisi della safety in tutti gli ambiti "safety critical", quali l'automobilistico, l'aeronautico e l'aerospaziale, la produzione dell'energia. Inoltre, la proposta è in linea con gli obiettivi generali M4C2 "dalla ricerca all'impresa" in quanto</p> <ul style="list-style-type: none"> <li>- rafforza una modalità di ricerca sinergica università/impresa</li> <li>- promuove innovazione di processo per sviluppo di alta tecnologia in ambito aerospazio</li> <li>- potenzia le competenze in un ambito di interesse per l'industria: la model based safety analysis</li> </ul> <p><b>Impresa, presso cui si svolgerà l'attività esterna</b></p> <p>Nome: Leonardo Divisione Elicotteri, Settore: aerospazio <a href="https://helicopters.leonardo.com/it/home">https://helicopters.leonardo.com/it/home</a> Mesi: 6 Attività: Sviluppo in azienda dell'attività relativa valutazione delle metodologie di safety sviluppate durante il progetto.</p> <p><b>Ente, università, azienda, centro di ricerca presso cui si svolgerà il periodo di studio e ricerca all'estero</b></p> <p>Stanford University</p>



Department of Aeronautics and Astronautics,

<https://aa.stanford.edu/>

6 months

Methodological Definition of the assessment methods

**All information regarding educational activities, personal funding, regulations and obligations of Ph.D. candidates are available on the web**

**site <https://dottoratoit.deib.polimi.it/>**