

# MECHANICAL ENGINEERING

## SE of Hydrogen storage/distribution for avionics

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<b>Context of the research activity</b>	Systems Engineering and Design of Hydrogen Storage and Distribution for Avionics

<b>Objectives</b>	<p>The strategic development of the all-electric aircraft as well as of green solutions to design innovative aircraft systems include the Hydrogen storage/distribution for avionics. This technology requires a systematic and holistic approach to design, which effectively integrates the customer needs, the functional modelling of the whole aircraft and of its systems, the numerical and quantitative modelling of its components and parts as well as a straight monitoring in operation, including data acquisition, elaboration and diagnosis. The Systems Engineering methodology fits those needs and provide the suitable framework to develop the whole product design. This approach allows reciprocally interfacing designer and customer to identify the relevant needs. It allows converting needs into requirements, and then drives the design activity through the functional modelling, investigating the behaviour, the architecture and the operation of the system. This is performed through some specific metamodels, based on dedicated languages as the SySML. Moreover, additional features like the technology charts allow exploring the state-of-arts of the available technologies. Leonardo expressively plans to integrate the proposed technology to create innovation in the aircraft product lifecycle development.</p> <p>This project aims at:</p> <ul style="list-style-type: none"> <li>• Analysing the state-of-the-art of the Hydrogen storage/distribution and of the avionic systems currently applied in some specific aircraft, for given mission profile</li> <li>• Modelling the functions, operations, architecture of systems related to the selected technology, to provide a preliminary functional modelling of the whole system.</li> <li>• Modelling the components, parts and elements of systems related to the selected technology, to provide a preliminary numerical (so-called physical in MBSE) modelling of the whole system.</li> <li>• Designing and implementing the system focused by this project within the Leonardo Labs</li> <li>• Developing even tools for creating the numerical models of aircraft systems, being compatible with the tool chain selected and set up by the Leonardo</li> </ul>
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#### Company

- Integrating the models and designs of the proposed system into the Digital Twin of the aircraft product currently under development in the Leonardo Company.
- Developing tools and procedures to predict the system reliability, associated to the architecture and the components of aircraft systems, since the beginning of the design process, to select the most suitable components and optimize the whole product development
- Developing a final document to describe the new integrated system implementing the selected technology.

#### Skills and competencies for the development of the activity

This project aims recruiting motivated and young people to perform an industrial-based doctoral education, starting from a Ms Sc degree in Engineering. Some skills are required as a good knowledge of mathematics, physics and technical domains of engineering. A good experience in numerical modelling is required (typically in general mathematical toolboxes, FEM modelling, coupled systems modelling...). A basic knowledge in optimization process is preferred as well as about the available tools. In addition, the candidate must exhibit very good skills in working in teams of researchers, in tight collaboration with a company, under a combined supervision between academy and industry. Good knowledge of systems is preferred, as well as a basic knowledge of MBSE. Education within aerospace or automotive or mechanical engineering is appreciated.