PROJECT FACTSHEET

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CO3

Cold spray of metallic coating on polymer and composite material

Inspiration

Aeronautic industries make use of the last technologies to ensure the efficiency of their products. The coating techniques guarantee many properties of the products such as lightning strike protection. However, these metallic coatings applied to aeronautic materials are commonly based on bronze mesh, which represents a manual and tedious process.

In order to prepare the mobility of the future, the Small Aviation Transport (SAT) is emerging as a solution to promote interregional travel. This complementary transport type would place itself as a sustainable alternative to the conventional aviation and terrestrial transports. Nevertheless, the current coating techniques used for conventional aviation present limited potential for cost effectiveness and technical reasons.

Improving of thermal and lightning strike resistant properties of the aircraft polymer components and composite materials requires an innovative approach for automated top surface deposition. Cold Spray, as alternative technique, could guarantee no porous, no oxidised, and no chemically and phase changed fully functional metallic coatings suitable to aeronautic requirements.

Innovation

The CO3 project aims to enhance the airplane fuselage and its component through a better understanding of the cold spray capabilities and the complete implementation of this innovative process in aeronautics. LIST will act as coordinator of the project, that gathers partners with strong interdisciplinary expertise and capabilities.

LIST researchers will be in charge of the polymer and structural composite samples, prototype and real scale demonstrator manufacturing, a part of the non-destructive testing, as well as the durability and ageing test. Thanks to its new structural composite processing laboratory, LIST will manufacture automatically in industry-like protocol samples by conventional LSP (Lightning Strike Protection) integration technologies, but also sample ready to be functionalised by cold spray technology.

With proven experience on surface and interface functionalisation and characterization, LIST researchers will contribute to the characterisation from the nano scale (Atomic Force Microscopy) to the micro scale (micro tomography) and macro scale (ultrasonic methods). Non-destructive method coupled with destructive characterisation, such as pull out test, will help LIST to identify and promote the bonding mechanisms of the coating, the durability behaviour.

Impact

The multi-scale approach will contribute to the set-up of this novel cold spray technology through a better understanding of the adhesion, erosion and deformation phenomena that can happen at different scales.

CO3 will prove, at the demonstrator scale, the cold spray coating process on a composite material by using industry representative composite manufacturing and coating process. The use of this two pilot lines for cold spray coating and composite manufacturing will allow the development, evaluation and validation at TRL6 demonstration level for the product and the associated manufacturing process. The process parameters control, the automation level as well as the process digitalization will guaranty reliable evaluation on 3D complex part geometry in industry transferable environment.

CO3 will enable to improve the metallic coating on complex material surfaces, and therefore provide a better lightning protection for aeronautic materials related to SAT. Furthermore, this new cold spray technology will open the path to further aeronautical and spatial applications.

Partners

ARMINES (FR) , Critt Metall 2T (FR) , Critt TJFU (FR) , MINES Paritech (FR) , PZL Mielec, Sikorsky Aircraft Corporation (PL) , Université de Lorraine (FR)

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Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

Henri PERRIN (henri.perrin@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST