IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (5)

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AN ADDITIVE MANUFACTURING REDESIGN OF A BOX EQUIPMENT WITHIN A LOGISTIC 4.0 FRAMEWORK

Abstract

Aerospace industry has increased its interest in Additive Layer Manufacturing (ALM) since its beginnings in the '80s and in the last decade new advancements in these technologies have led a proliferation of applications from the prototyping to the direct part manufacturing, rapid tooling and repairing. ALM for aerospace industry is no more only a very promising production technology but a real product/process/business game-changer offering opportunities previously unfeasible. At the same time, it requires a new complex design and development environment which introduction and regular adoption within aerospace industry practice represents a great challenge. One of the most important applications of ALM for aerospace systems are those related to the improvement of all the logistic aspects of the production line. Indeed, because of its strong foundation on the digital world the ALM allows a modification of the present logistic organization permitting remote manufacturing, obsolescence management and easy

customization of realized components within a serial production. Finally, it is relevant to point out that ALM enables easy integration of design change, has the capability to build virtually any shape, and at least as importantly it allows complex feature integration and part count reduction, greatly simplifying product assembly. As a result, also the functionality and the verification through the FEM simulation could benefit. For example, stress singularities, which tends to occur in proximity of interface points, are reduced and tuning of the FEM model with the experimental results would be much more efficient, since interface-related modelling issues would be avoided. In the present research, a fruitful collaboration between the Department of Mechanical and Aerospace Engineering and the Italian Air Force (ItAF), the possibility to apply the AM in a logistical framework is investigated. Objective of the study is the stand-by-compass case of the MB-339 trainer aircraft. As a first step the equipment geometry is acquired in a reverse engineering approach. Then, the stand-by-compass case is re-designed in the Additive Manufacturing framework and a flight test is performed as a functional validation of the manufactured equipment. As a final step, the original equipment and the ALM manufactured one are compared by vibration tests. From this experimental data important information for a further improvement of the design are acquired and discussed.