

Aircraft Components, Manufacturing and Design: Opportunities, Bottlenecks, and Challenges

Authors : Ionel Botef

Abstract : Aerospace products operate in very aggressive environments characterized by high temperature, high pressure, large stresses on individual components, the presence of oxidizing and corroding atmosphere, as well as internally created or externally ingested particulate materials that induce erosion and impact damage. Consequently, during operation, the materials of individual components degrade. In addition, the impact of maintenance costs for both civil and military aircraft was estimated at least two to three times greater than initial purchase values, and this trend is expected to increase. As a result, for viable product realisation and maintenance, a spectrum of issues regarding novel processing technologies, innovation of new materials, performance, costs, and environmental impact must constantly be addressed. One of these technologies, namely the cold-gas dynamic-spray process has enabled a broad range of coatings and applications, including many that have not been previously possible or commercially practical, hence its potential for new aerospace applications. Therefore, the purpose of this paper is to summarise the state of the art of this technology alongside its theoretical and experimental studies, and explore how the cold-gas dynamic-spray process could be integrated within a framework that finally could lead to more efficient aircraft maintenance. Based on the paper's qualitative findings supported by authorities, evidence, and logic essentially it is argued that the cold-gas dynamic-spray manufacturing process should not be viewed in isolation, but should be viewed as a component of a broad framework that finally leads to more efficient aerospace operations.

Keywords : aerospace, aging aircraft, cold spray, materials

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