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DEMONSTRATION OF ADVANCED MANUFACTURING FOR LAUNCH VEHICLES AND ENGINES

Abstract

The recent advancements in Additive Manufacturing have attracted attention for the lightweighting of complex space components whilst maintaining material strength. However, issues such as outgassing are especially problematic for certain Additive Manufacturing techniques. Meanwhile, advanced in other manufacturing techniques such as castings also enable the creation of highly complex yet incredibly strong parts. Furthermore, the use of polymer metal and ceramic matrix composites as well as an improved understanding of carbon fibre weaves has led to even more choices for selection of manufacturing methods. The wide variety and different options mean that the best manufacturing techniques may not be used or that designs are sub-optimal and do not use the latest advancements. This paper presents three case studies from the Advanced Manufacturing Research Centre on the use of advanced materials and manufacturing techniques for rocket structures and engines so that readers can gain a better understanding of the benefits and drawbacks of various materials/processes. In particular, this paper aims to address some of the hot topics in manufacturing such as AM and compare this to other advanced techniques to understand where are the real advantages and disadvantages. Examples of work will range from TRL 3 to 9. These include hot-fire testing of 3D printed engines to manufacture of carbon fibre launch structures.