

The Development of a Digitally Connected Factory Architecture to Enable Product Lifecycle Management for the Assembly of Aerostructures

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Abstract : Legacy aerostructure assembly is defined by large components, low build rates, and manual assembly methods. With an increasing demand for commercial aircraft and emerging markets such as the eVTOL (electric vertical take-off and landing) market, current methods of manufacturing are not capable of efficiently hitting these higher-rate demands. This project will look at how legacy manufacturing processes can be rate enabled by taking a holistic view of data usage, focusing on how data can be collected to enable fully integrated digital factories and supply chains. The study will focus on how data is flowed both up and down the supply chain to create a digital thread specific to each part and assembly while enabling machine learning through real-time, closed-loop feedback systems. The study will also develop a bespoke architecture to enable connectivity both within the factory and the wider PLM (product lifecycle management) system, moving away from traditional point-to-point systems used to connect IO devices to a hub and spoke architecture that will exploit report-by-exception principles. This paper outlines the key issues facing legacy aircraft manufacturers, focusing on what future manufacturing will look like from adopting Industry 4 principles. The research also defines the data architecture of a PLM system to enable the transfer and control of a digital thread within the supply chain and proposes a standardised communications protocol to enable a scalable solution to connect IO devices within a production environment. This research comes at a critical time for aerospace manufacturers, who are seeing a shift towards the integration of digital technologies within legacy production environments, while also seeing build rates continue to grow. It is vital that manufacturing processes become more efficient in order to meet these demands while also securing future work for many manufacturers.

Keywords : Industry 4, digital transformation, IoT, PLM, automated assembly, connected factories

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