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Unsettled Issues on the Viability and Cost-Effectiveness of Automation in Aerospace Manufacturing

Professor Philip Webb, PhD

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About the Editor

Credit Cranfield University

Professor Phil Webb is the head of the Centre for Structures, Assembly and Intelligent Automation at Cranfield University, where he holds the Royal Academy of Engineering and Airbus Chair.

He has over 25 years of experience in research into advanced manufacturing automation and robotics, and has published widely on the subject. He specializes in the application of automation in the aerospace industry and works with most of the major aerospace companies including Airbus, BAE Systems, Bombardier, and Rolls-Royce. A core element of this work is the development of human-robot collaborative systems, particularly using large high-payload robots. Professor Webb has published in this area and has developed numerous production demonstrators as well. His role as an Airbus Professor sits between academia and industry giving him the opportunity to bring emerging engineering research across into the manufacturing domain.

He is a Fellow of the Institution of Engineering and Technology, a member of the SAE International Automated Assembly and Fastening Committee, and a member the Council of the British Automation and Robotics Association. He has also served as the UK representative to the International Federation for Robotics. He sits on the ATI Future Structures Specialist Advisory Group and is the editor in chief of the *Aircraft Engineering and Aerospace Technology Journal*. He has served as an organizer and contributor to SAE's AeroFast and AeroTech conferences for many years.

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Unsettled Issues on the Viability and Cost-Effectiveness of Automation in Aerospace Manufacturing

Abstract

The aerospace manufacturing industry is, in many ways, one of the most sophisticated commercial manufacturing systems in existence. It uses cutting-edge materials to build highly sophisticated and safety-critical structures and parts. These components must withstand thermal and physical stresses at the limit of their structural and material properties. However, in many ways, it is also quite unsophisticated, with multiple processes relying largely upon human skill and dexterity. Unlike other manufacturing industries, such as automotive or consumer goods, there has been very little uptake of automation apart from its use in the supply chain for relatively simple applications (e.g., machine loading and welding) or through the use of large special-purpose machines.

There are increasing efforts to introduce automation, but uptake is still relatively low. Why is this and what needs to be done? Some may point to part size or the need for accuracy. However, as with any complex issue, the problems are multifactorial. While many articles and papers have already been written on this subject, this report seeks to build a more comprehensive picture of the views and attitudes backed by technical analysis to answer some of the questions (or at least have a better understanding of them). This report will also broaden the discussion from "Unsettled Issues on Human-Robot Collaboration and Automation in Aerospace Manufacturing" with a focus on conventional approaches to automation, as many of the business drivers, shortcomings, and barriers identified in this report overlap with human-robot collaborative approaches. To reflect on these differences while maintaining a degree of synergy, we have approached some of the same expert contributors but also sought alternative views. There are no right or wrong answers to the automation conundrum and indeed there are many contradictions. However, we hope this report will at least serve to stimulate the conversation around the effective deployment of automation and help to advance the cause.

NOTE: SAE EDGE™ Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE™ Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. SAE EDGE™ Research Reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

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