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THE SPACE LAUNCH SYSTEM (SLS): A DIGITALLY TRANSFORMED FACTORY FOR THE FUTURE

Abstract

The Space Launch System (SLS) Core Stage (CS) and Exploration Upper Stage (EUS) are manufactured at NASA's Michoud Assembly Facility (MAF), near New Orleans, Louisiana. The CS production system layout was initially constrained by available factory space at MAF, which concurrently hosts several NASA programs. Subsequent efforts to accommodate the new EUS production system began in early 2020, and were significantly impeded by travel and telework restrictions associated with the COVID-19 pandemic. In response, SLS factory design and facility utilization teams adopted Boeing's interactive Factory Layout Tool (iFLT). iFLT integrates and contextualizes legacy production system design, modeling and analysis methods within a common 3D environment. This optimizes production system layouts in a completely virtual, interactive environment, enabling a real-time modeling and simulation process for factory layout, and was granted US Patent 10,535,028. iFLT enabled multi-disciplinary teams to conduct some two-dozen factory optimization workshops virtually in 2020-21, producing an increasingly mature digital twin of the SLS production system. Several iFLT-adjacent applications were enabled by this digital modeling method and proof-of-concept releases followed in 2021. These provided virtual factory tours and site-familiarization curriculum for new-hires and remote staff. More recently, development has focused on the incorporation of Model-Based Design (MBD) and Model-Based Instruction (MBI) data. This enables improved end-user experiences for production technician training and production operations-assist. Each of these use-cases are further enhanced with adoption of Virtual reality (VR) and Augmented Reality (AR) and foster the adoption of digital manufacturing methods that will enable increased production rates and reduced program cost. This presentation focuses on the contribution of iFLT to the SLS production system optimization and its evolution as a production system digital twin. We will also highlight the adjacent, downstream use-cases that have enabled knowledge capture and created improved technician training and operations-assist that will reduce cycle times without sacrificing first-time quality.