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GETTING TO LAUNCH: LESSONS LEARNED FROM ARTEMIS I GROUND OPERATIONS

Abstract

With the successful launch of NASA's inaugural deep space human exploration test flight, known as Artemis I, NASA will build upon the knowledge and insights gained from its first-time manufacturing, test, and operations flow for its campaign of future missions to the Moon and Mars. The Space Launch System vehicle and Orion spacecraft were built at numerous manufacturing sites, tested for acceptance, and then delivered, fully stacked, integrated, tested, and loaded at Kennedy Space Center in preparation for launch at Pad 39B. This series of complex integrated activities required highly coordinated collaboration across multiple government and contractor teams to solve unique engineering challenges related to first-time testing and flight hardware integration. To ensure success, the Artemis I programs maximized efficiency in three key areas. First, processes and procedures were streamlined to ensure that hardware, software, and facility requirements were met in anticipation of major milestones. Second, standard resource management practices were tailored to account for externalities (i.e., attrition due to COVID impacts) and retain contract flexibility leading to launch. Finally, data-driven schedule performance assessments were updated continuously to account for risks, mitigations, and lessons learned. NASA will apply these insights gained from successful Artemis I integrated operations to future integration flows for subsequent flights. This paper provides a high-level case study for emerging spacefaring nations with an interest in evolving their human spaceflight launch capabilities.