QUALIFICATION OF ADDITIVELY MANUFACTURED MATERIALS FOR ROBOTIC SPACEFLIGHT

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ABSTRACT
The use of additively manufactured materials is of critical importance to reduce cost and schedule of spacecraft, particularly single-point designs which do not have elongated production runs. Given the high cost of failure, coupled with the challenges of new materials insertion and amortization over a single mission, alternate qualification methodologies and approaches are needed for a variety of spacecraft needs. This paper will cover the proposed approaches at NASA’s Jet Propulsion Laboratory, for a variety of applications, including polymeric, monolithic metallics and advanced gradient materials systems.

Examples will include the use of Ti-6Al-4V as secondary structure on the Planetary Instrument for X-ray Lithochemistry (PIXL), an instrument on the upcoming Mars 2020 rover mission, the use of AlSi10Mg for the primary drilling structure ground test unit for the Mars 2020 rover mission, as well as the use of Ultem and Torlon on the Cold Atom Laboratory (CAL), ECOSTRESS and Orbital Carbon Observatory 3 (OCO-3) missions to the International Space Station. Further discussions will illuminate the design of gradient materials systems, with inclusion paths to upcoming NASA robotic spaceflight missions.

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