Paper ID: 46390
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IAF SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)

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# ADDITIVE MANUFACTURING TECHNOLOGIES APPLIED TO SPACE PROPULSION

**Abstract**

Additive manufacturing is a method to rapidly create 3D, complex objects from metal, composite, and other common materials. A sketch of the component is created in a Computer Aided Design (CAD) software, which will then give direction to an additive manufacturing technology that will develop the sketch into a tangible object. Types of additive manufacturing technologies include vat photopolymerisation, material jetting, binder jetting, material extrusion, powder bed fusion, sheet lamination, and directed energy deposition. It has purposes in the biomedical, automotive, and engineering fields. Additive manufacturing is used in the space industry to create rocket components– including entire engines and propulsion systems– because the method is cost effective, time efficient, lowers the number of parts, and can produce intricate products that are not possible to create using traditional methods.

This paper will determine the effectiveness of additively manufactured liquid monopropellant thruster components for thrusters generating 25-200 N of thrust. The choice of monopropellant, the adiabatic flame temperature, operating temperature and pressure, materials, and size of the thruster will influence the decision to use additive manufacturing. Each monopropellants' characteristics are detailed, including material compatibilities and the monopropellants' ability to be integrated with additively manufactured components. The size of the thruster, temperature effects on additive manufactured materials, type of additive manufacturing, and cost effectiveness is also explored in this paper to determine the effectiveness of additive manufacturing.