

Advance Additive Manufacturing of Rocket Engine Components

An America Makes Project / Department of Defense Manufacturing Innovation Institutes

Technology: Ursa Major Copper Rocket Combustion Chamber



Project Participants: National Center for Defense Manufacturing and Machining (NCDMM), Ursa Major Technologies, Air Force Research Laboratory (AFRL/RXMS), US Army DEVCOM Aviation and Missile Command (AvMC), Office of the Secretary of Defense (OSD), Hadley Program, Ripley Program

Institutes' Role: America Makes received funding from OSD to advance technology/manufacturing readiness level (TRL/MRL) through applied research on critical high-speed, high-temperature flight vehicle components. America Makes identified Ursa Major Technologies to focus on further advancing process parameters of copper alloys and transitioning from prototype to full-scale engine component prints. Ursa Major is determining how the developed process can mature into a production-oriented system for in-space and high speed applications. This project would not have been possible without America Makes' public-private partnership and unique contracting process.

Technology Description: Ursa Major developed a Laser Powder Bed Fusion (LPBF) Additive Manufacturing process parameter set for GRCop-42 using an EOS M400-1 machine. GRCop-42 is a copper alloy that exhibits high strength and high thermal conductivity, making it very attractive for use in liquid rocket engine propulsion systems.

Impact: Additive Manufacturing of GRCop-42 shortens the manufacturing time from 6 months to 30 days for many critical engine components. GRCop-42 material properties enable improved engine designs and when combined with the design freedom of additive manufacturing, a significant overall engine performance increase.

