NASA SBIR 2016 Phase I Solicitation

Z3 Advanced Manufacturing

NASA is using several manufacturing processes supporting the Space Launch System to create structures with superior mechanical properties and increased reliability. Advancing the state of the art for advanced metallic materials and processes will continue to be a critical technology to build more efficient space vehicles with less expensive materials.

This topic seeks to develop new and innovative materials and manufacturing processes (both additive and subtractive) for lightweight and/or multifunctional metallic components and structures for NASA and related applications. Technologies that can enable joining of new or dissimilar materials, as well as significantly reduce costs, increase production rates, and improve weld quality should be considered.

Technologies should result in components with minimal or no machining; Technologies should provide novel techniques for producing high-strength components and joints that are highly free of defects. Emphasis on reduced structural mass, improves processing lead-time, and minimizes touch labor and final assembly steps, resulting in increased capability, reliability and reduced cost.

Subtopics

Z3.01 Advanced Metallic Materials and Processes Innovation

Lead Center: MSFC

Participating Center(s): JPL, LaRC

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This subtopic seeks innovative processes and development of metallic material systems. The emphasis is on solid state welding practices including but not limited to: ultrasonic, thermal, and friction stir welding; new concepts for built- up structure approaches for lightweight structural panel applications, advanced near-net shaping, additive manufacturing processes; advanced coating technologies for wear and environmental resistance; functionally-graded (gradient alloy) materials that exhibit superior performance exceeding that of the individual constituent alloys. Technologies should result in components with minimal or no machining.

Proposals are sought in the following areas:

- Joining new materials: technologies that enable welding on a wide range of alloys and a wide range of thicknesses, including high-strength, temperature-resistant materials (such as titanium alloys, Inconel/Nickel-Based alloys, steels, and copper), metal-matrix composites, and other materials previously considered unweldable.
- Joining of complex geometries: technologies that enable welding of complex curvature joints or other types of structure variations that increase manufacturing possibilities.
- Development and prototyping technologies for fabricating gradient alloy (functionally graded) or amorphous (bulk metallic glass) materials for solid state welding processes, near- net shape, and additive manufacturing processes.

Responses should identify key performance parameters and TRL advancement in terms of quantifiable benefits to address specific areas including but not limited to the following: reduced structural mass, increased structural efficiency, improved processing lead-time, minimized touch labor and final assembly steps, increased reliability and reduced cost. Scale-up and transition to aerospace hardware and products should also be addressed.