# Z3.03-5627 - Additive Friction Stir Deposition for In-Space Manufacturing

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NON-PROPRIETARY DATA

## IDENTIFICATION AND SIGNIFICANCE OF INNOVATION

The National Aeronautics and Space Administration (NASA) has identified the need for the Development of a large-scale additive manufacturing processes for on-orbit manufacturing. Technology development efforts are required to enable on-Orbit servicing, assembly, and manufacturing (OSAM) for satellites, robotic science, and human exploration. Current state of the art on-orbit manufacturing systems are constrained to a build volume similar to terrestrial additive manufacturing processes. Structural designs for truss structures, space telescopes, antennas, and reflectors are primarily driven by launch considerations such as payload faring dimensions and vibrational loads experienced during ascent. A large-scale, free-form additive manufacturing capabilities can eliminate constraints on the system imposed by launch, enabling the construction of larger, more complex and more optimized structures. IERUS Technologies proposed to investigate utilization of additive friction stir deposition (AFS-D), to robotically fabricate and repair large structures in the external space environment.

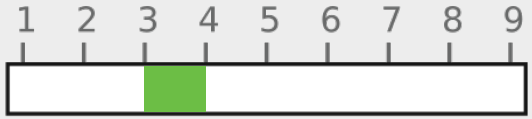
## TECHNICAL OBJECTIVES AND PROPOSED DELIVERABLES

At the end of the Phase II program, IERUS will have implemented its findings from the Phase I program to further mature the AFS-D system for in-space manufacturing. IERUS will also provide a prototype laboratory demonstration of the AFS-D system at the conclusion of this Phase II program. For this Phase II program the technical objectives are then as follows:

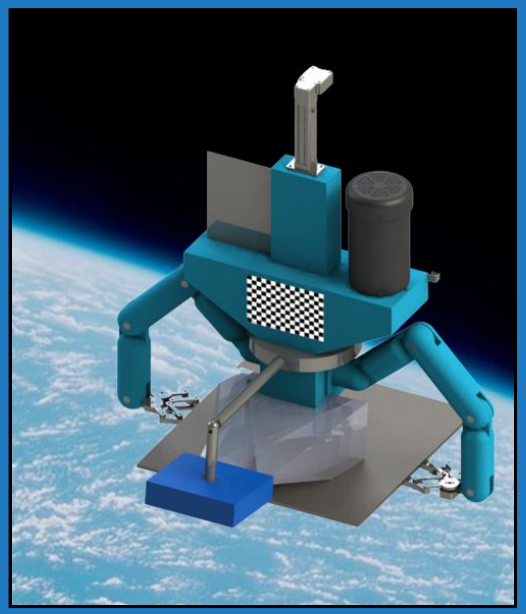
- Develop a simulation framework to accurately predict the space environments effects on the AFS-D system.
- Design and integrate new hardware to advance the AFS-D system for on-orbit manufacturing.
- Demonstrate the prototype AFS-D system's ability to rapidly build up structural aerospace grade metallic materials with real time monitoring of deposition temperature and accuracy.

## TRL

*Estimated*




## IMAGE TITLE: The Proposed AFS-D System



## NASA APPLICATIONS

The AFS-D process is well suited for additively manufacturing large metal structures in both terrestrial and space environments. The Vision System is applicable for inspection of additive manufactured components in both terrestrial and space environments.

## NON-NASA APPLICATIONS

Potential Non-NASA applications of on-orbit manufacturing and repair include commercial satellite servicing and manufacturing of large trusses, solar arrays and antenna reflectors for other government agencies such as the Air Force and DARPA. The Vision System can also be applied for commercial applications such as inspection of precision components for automotive and aerospace markets.

## FIRM CONTACTS

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