

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

The primary goal of this SBIR Phase I project is to advance the development of low-cost, functionally graded laser additive manufactured high temperature refractory and cermet pin tools for friction stir welding (FSW) and/or friction stir processing (FSP) of heat-resistant materials. A solid state process, FSW produces high quality welds in difficult-to-weld materials and is fast becoming the process of choice for manufacturing lightweight transport structures including for space launch vehicles. Development of pin tools for FSW/FSP of the high temperature materials is a major challenge, as current pin tools are expensive and often fail prematurely. Production of pin tools using an Additive Manufacturing (AM) approach could offer a viable option for producing near-net shaped and relatively inexpensive functionally graded pin tools suitable for welding high temperature materials. The near-net-shape nature of this process not only minimizes the amount of machining and grinding involved, but also greatly reduces the time for manufacturing, or repair, of the pin tools.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Potential NASA Commercial Applications includes metal structures and components for space launch vehicles, spacecraft, airframes, and gas turbines, emphasizing high temperature applications.

To the commercial space industry:

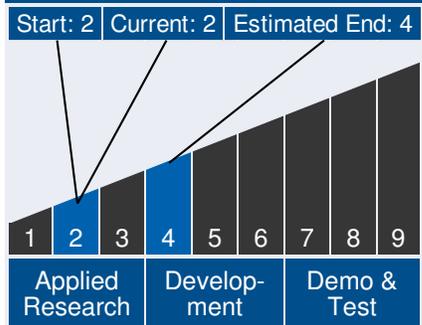
Potential Non-NASA Commercial Applications: Potential Non-NASA Commercial Applications includes metal structures and components for military and/or commercial space launch vehicles, spacecraft, airframes, air and land-based gas turbines, land vehicles (cars, trucks, trains), sea vehicles (recreation, passenger, cargo), and consumer products (electronics).



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

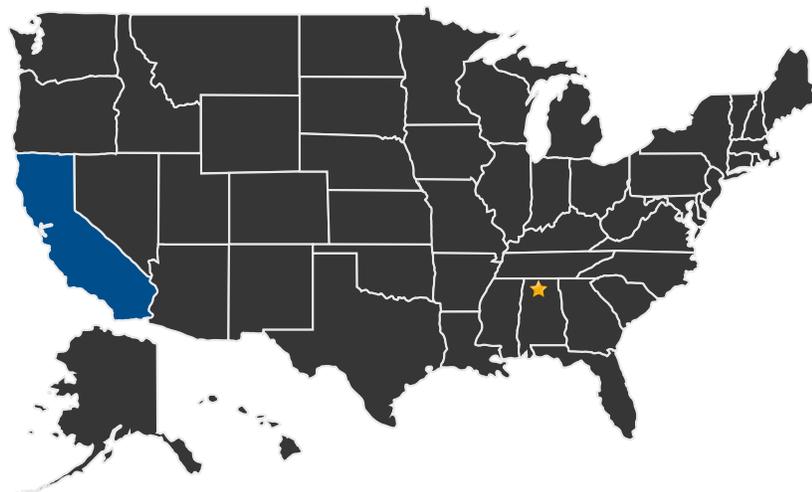
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U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Marshall Space Flight Center

Other Organizations Performing Work:

- Transition45 Technologies, Inc. (Orange, CA)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23302>)

Management Team *(cont.)*

Program Manager:

- Carlos Torrez

Principal Investigator:

- Edward Chen

Technology Areas

Primary Technology Area:

Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

- └ Materials (TA 12.1)
 - └ Special Materials (TA 12.1.5)

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IMAGE GALLERY



*Design and Manufacture of Pin Tools
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Phase I*

DETAILS FOR TECHNOLOGY 1

Technology Title

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

Potential Applications

Potential NASA Commercial Applications includes metal structures and components for space launch vehicles, spacecraft, airframes, and gas turbines, emphasizing high temperature applications.