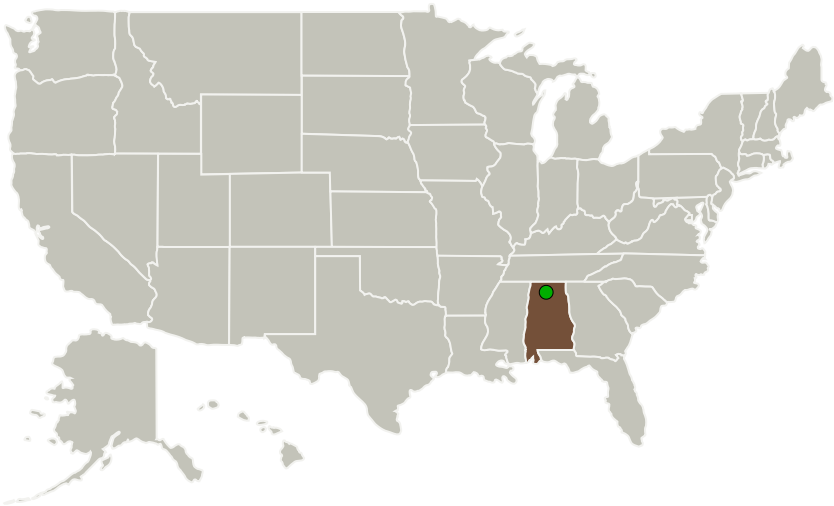
Additively Manufactured Bimetallic Combustion Chambers for Small Launch Vehicles, Phase I

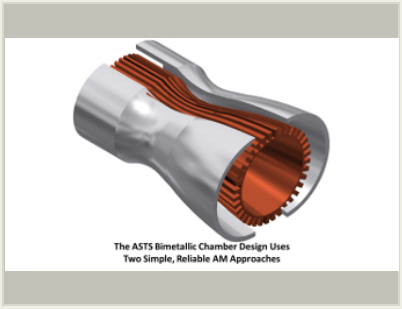
Completed Technology Project (2017 - 2017)

Project Introduction

Arctic Slope Technical Services, Inc. (ASTS) is pleased to present this proposal for demonstrating feasibility of an additive manufacturing (AM) approach for fabricating bimetallic combustion chambers. Our chamber design, which is applicable to future NASA small launch vehicles, exploits the combined capabilities of selective laser melting (SLM) and magnetic pulse welding (MPW), in order to reduce manufacturing lead time and cost and to improve quality through ease of inspection. The benefits of such a design are substantial. First, it is well understood that for complicated components like a modern combustion chamber, an AM manufacturing approach can drastically reduce cost (by 50% or more) and lead time (weeks instead of months). Second, our particular design overcomes weaknesses of other additive designs by enabling easy inspection of the printed parts that otherwise would have to undergo CT scanning or X-ray inspection, which has proven to be exceptionally difficult for complex internal geometries like regenerative cooling channels and propellant manifolds. Third, our basic material and manufacturing approach is scalable to booster class combustion chambers at a rate controlled solely by scaling of the build volumes available in commercial SLM machines (which is occurring rapidly). In fact, commercial MPW systems are already being used in the automotive industry that can instantaneously weld parts of several meters in length.

Primary U.S. Work Locations and Key Partners





Additively Manufactured Bimetallic Combustion Chambers for Small Launch Vehicles, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
ASRC Federal Astronautics, LLC	Lead Organization	Industry	Huntsville, Alabama
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations
Alabama

Images

Briefing Chart Image
Additively Manufactured Bimetallic Combustion Chambers for Small Launch Vehicles, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/131480)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ASRC Federal Astronautics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

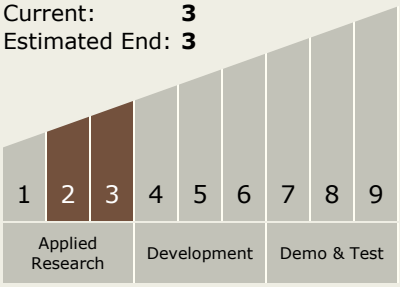
Carlos Torrez

Principal Investigator:

Joseph Sims

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  └ TX12.4 Manufacturing
    └ TX12.4.2 Intelligent Integrated Manufacturing

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System