Cryogenic Composite Tank Fabrication for Reusable Launch Vehicles, Phase I

Completed Technology Project (2011 - 2011)

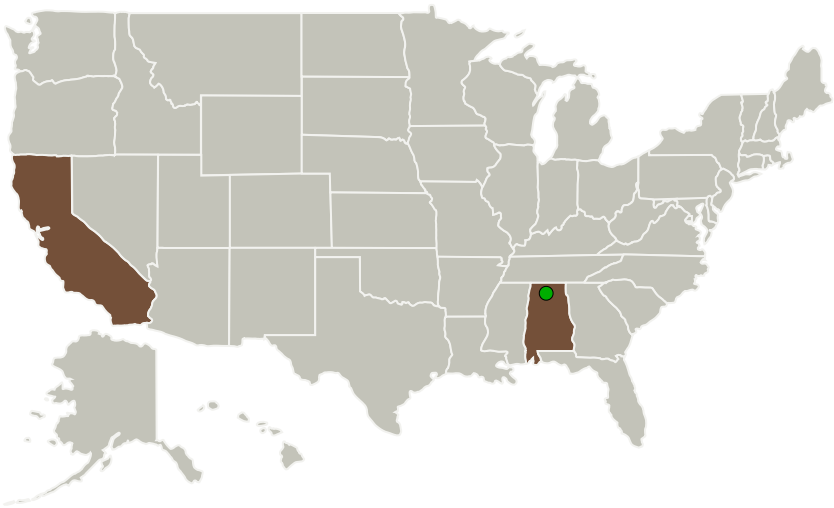
Project Introduction

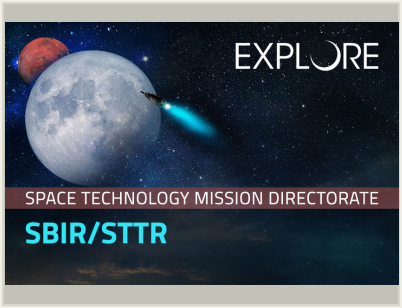
XCOR has conducted extensive research and development, and material characterization analysis of a nonflammable, high-strength, lightweight thermoplastic fluoropolymer composite material, trademarked Nonburnite

TM

, which is suitable for making reusable, reliable, low cost cryogenic tanks and structures for space flight service. XCOR's composite material is lighter than metal, and unlike graphite/epoxy, nonflammable. The material is immune to microcracking, has a low coefficient of thermal expansion (CTE), and is capable of withstanding hundreds of cryogenic temperature cycles. Additionally, it is durable, repairable, and can withstand extreme hot and cold temperatures. The fluoropolymer composite maintains strength and flexibility at extreme temperatures (-260 to plus 280 degrees C/-436 to plus 536 degrees F).Low CTE also allows this composite to be built into a vehicle's primary structure. Used as the internal skin in a sandwich structure (Nonburnite, foam, and carbon/epoxy) the composite skin-foam-skin material provides both thermal insulation and structure. These features, along with the high strength-to-weight ratio, make it an enabling technology for building lighter, highly reusable, and more robust propellant tanks, thus reducing need for maintenance between flights. Further, XCOR believes significant commercialization opportunities exist for the material after its manufacturing processes have matured.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
XCOR Aerospace	Lead Organization	Industry	Mojave, California
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138067)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

XCOR Aerospace

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

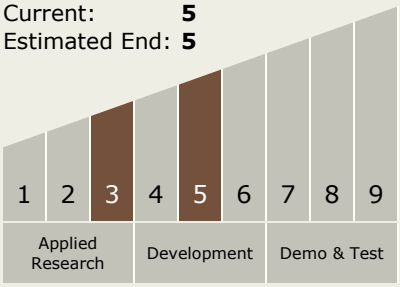
Carlos Torrez

Principal Investigator:

Jeff Greason

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  └ TX12.1 Materials
    └ TX12.1.1 Lightweight Structural Materials

Target Destinations

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