Z5.05-4027 - Fast Advanced Scout Terrain Rover (FASTR) Mobility Architecture for Lunar Missions

PI: Christopher McQuin , Motiv Space Systems, Inc. - Pasadena, CA

SBIR·STTR America's Seed Fund™ POWERED BY NASA

NON-PROPRIETARY DATA

IDENTIFICATION AND SIGNIFICANCE OF INNOVATION

Proposed Innovation

Motiv Space Systems (Motiv) and its partner, TRACLabs, propose a novel rover for Lunar exploration and resource utilization: The Fast Advanced Scout Terrain Rover (FASTR) is a rover mobility architecture designed to:

1) Carry, deliver, and/or deploy ISRU and science payloads; 2) Detect regolith entrapment and perform escape routines; 3) Autonomously avoid obstacles and navigate in unprepared terrain; and 4) Safely increase traverse surface speeds to >1m/s

Significance of the Innovation

1) The FASTR architecture will enable broad and rapid exploration of lunar regions of interest through autonomous navigation and an increase in traverse speed by two orders of magnitude from current Mars Rovers; 2) FASTR will be capable of deploying a wide array of science/ISRU payloads to prospect, characterize, and collect volatiles of interest; 3) FASTR's open architecture design will empower faster mission development cycles and increase the pace of rover enabled missions; and 4) FASTR minimizes the need for human intervention through on-board entrapment detection and escapement.

TECHNICAL OBJECTIVES AND WORK PLAN

Technical Objectives: Design a prototype architecture for traversing and navigating lunar terrain which:

1) Can carry a wide variety of ISRU and Science payloads and has the capability to deploy them in a variety of ways; 2) Can detect regolith entrapment and provide for escape modalities; 3) Autonomously navigate unprepared terrain; 4) Allows for both teleoperation and autonomous operations; 5) Can traverse representative Lunar terrain at speeds >1m/s; 6) Creates a 3D map of its navigated terrain for both localization and prospecting purposes; and 7) Maintains an open architecture to enable access for mobile Lunar exploration and utilization to civil, commercial and academic entities.

Task Breakdown:

1) FASTR Prototype System Architecture – High level system requirements, interface definitions, and overall architecture; 2) Navigation, Mobility, and Entrapment Escape Software – define augmentation of CRAFTSMAN software for rover architecture including simulation of rover; 3) Mobility Electromechanical Design – layout of all components for the mobility system (limbs, actuation systems, wheels, etc.); and 4) Robotic Configuration and Packaging – configure the rover including COTS (RoboMantis derivative) enabling robot subsystems (power, comm, etc.).

Proposed Deliverables:

Final Technical Report detailing the FASTR Prototype design ready for transition to Phase 2

TRL

Estimated

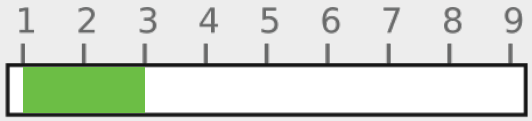
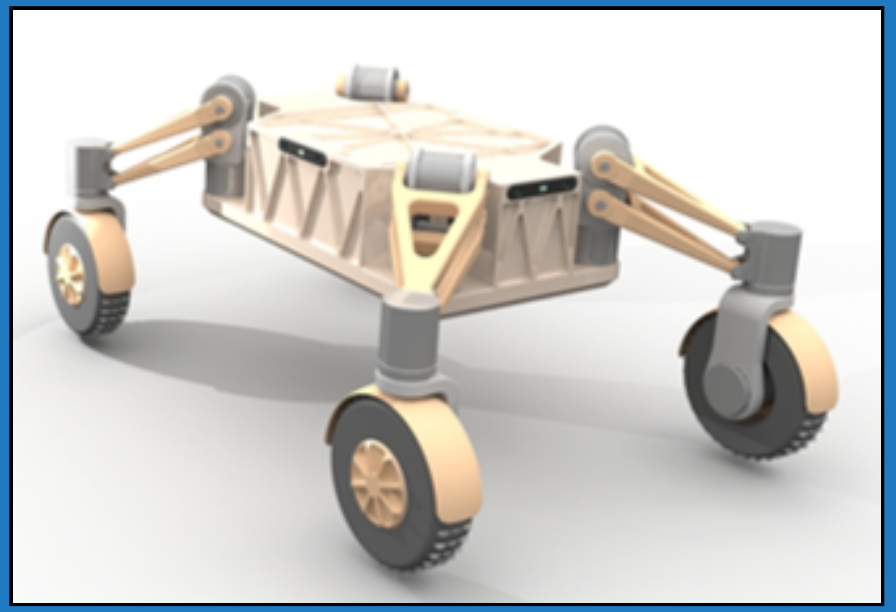


IMAGE TITLE: The FASTR Lunar Rover



NASA APPLICATIONS

1. NASA'a Moon to Mars campaign where advanced mobility systems will be necessary
2. The Commercial Lunar Payload Services (CLPS) program whereby as ISRU payload laden rover can be deployed to the surface of the Moon
3. Discovery and New Frontiers exploration mission opportunities
4. STMD Technology Demonstration Missions
5. Fetch Rover for Mars Sample Return

NON-NASA APPLICATIONS

1. Commercial space entities seeking rover deployments on the moon
2. Government needs for mobile robotics including the DOD, DHS, and DOE
3. First responders and search and rescue operations
4. Commercial terrestrial applications requiring outdoor mobile platforms in the agriculture, mining, manufacturing and utility plant industries

FIRM CONTACTS

Chris Thayer
Motiv Space Systems, Inc.
EMAIL: chris.thayer@motivss.com
PHONE: (626) 737-5988