NASA SBIR 2017 Phase I Solicitation

H10.02 Improved Operations via Interface Design

Lead Center: KSC

Participating Center(s): AFRC, SSC

Technology Area: TA13 Ground and Launch Systems Processing

This subtopic seeks to simplify prelaunch and surface operations through improved interface design concepts. Development and adoption of improved, standardized interfaces holds the potential of reducing the cost and complexity of future space systems and their related design and implementation, which can increase the funding available for additional flight hardware.

NASA is interested in areas of interface technology that lower launch vehicle operations costs and provide evolution paths for in-space exploration. This includes interfaces between systems normally present within a launch system. For the purpose of this subtopic a launch system includes a vehicle ready for flight with payload, and includes all related support systems and infrastructure.

A substantial portion of pre-launch processing involves the integration of spacecraft assemblies to each other or to the ground/surface systems that supply the commodities, power or data. Each assembly requires a reliable interface that connects it to the adjacent hardware which includes flight critical seals or connectors and other components.

The benefits of standardized, simplified interfaces are particularly strong for small launch vehicles. Due to a lack of common specifications and standards, each launch vehicle system may impose different interface requirements thereby resulting in unique components/subsystems tailored for each vehicle. This complicates recent efforts to establish a multi-user capability within the existing launch infrastructure. For the launch provider, unique interface requirements result in higher recurring cost per launch vehicle and reduced ability to incorporate newer subsystems as the vehicle matures.

Future activities at exploration destinations in space and on other surfaces will rely on a combination of structures and systems working together with a high degree of reliability. The impact of these interface-dependent tasks are of particular concern for surface systems where the additional work must be accomplished by crew performing Extra-Vehicular Activities (EVAs) or by purpose-built robotic systems. Areas of interface technology development relevant for surface operations may include (but are not limited to) cryogenics, modular systems, dust tolerance, standardized disconnects, and embedded intelligence.

For all above technologies, research should be conducted to demonstrate technical feasibility during Phase I and show a path toward Phase II demonstration, and delivering a demonstration package for NASA testing in operational or analog test environments at the completion of the Phase II contract.

Phase I Deliverables - Research to identify and evaluate candidate technology applications, demonstrate the technical feasibility, and show a path towards a demonstration. Concept methodology should include the path for

adaptation of the technology, infusion strategies (including risk trades), and business model. Identify improvements over the current state of the art for both operations and systems development and the feasibility of the approach in a multi-customer environment. Bench or lab-level demonstrations are desirable.

Phase II Deliverables - Emphasis should be placed on developing and demonstrating the technology under simulated operational conditions with analog earth-based systems including dynamic events such as commodity loading, disconnect or engine testing. The proposal shall outline a path showing how the technology could be developed into or applied to mission-worthy systems. The contract should deliver demonstration hardware for functional and environmental testing at the completion of the Phase II contract. The technology concept at the end of Phase II should be at a TRL of 5 or higher.