NASA SBIR 2011 Phase I Solicitation

O2.03 21st Century Spaceport Ground Systems Technologies

Lead Center: KSC

Participating Center(s): AFRC, ARC, GRC, GSFC

This subtopic seeks innovative solutions that will allow spaceport launch service providers to operate in an efficient, low cost manner and increases capabilities associated with integration, checkout, and preparations required to configure and ready space systems for launch. The goal is a set of technologies, processes, and strategic concepts that can be collectively used to facilitate launch vehicle processing by reducing complexity, turn-around times, and mission risk while implementing novel concepts for the processing of launch vehicles.

The long-term vision is to have "airport-like" spaceport operations. Therefore, the development of effective spaceport technologies is of primary importance to NASA. These technologies will need to support both the existing and future vehicles and programs. Additional key operating characteristics for a spaceport focus are interoperability, ease of use, flexibility, safety/environmental protection, support multiple concurrent operations, and the de-coupling of pre-launch processing from other users on the range.

Specific areas of interest:

- End-to-End Command and Control Services.
- Technologies and Capabilities that enable flexible and adaptable control by integrating enterprise capabilities with remote and distributed control functions while simultaneously maintaining security and safety for critical operation.
- Communications Services and RF/Optical Services to enable virtual distributed teams for control, engineering, safety analysis and support.
- Technologies and Capabilities that enable multi-government teams of operate existing or new assets in the most cost efficient manner. In, addition technologies or capabilities that would move existing government provided capabilities and provide a path to commercialization in the future.
- Preventative and condition based maintenance along with self-healing capabilities for ground systems.

- Technologies and Capabilities that reduce required work content, through an automated understanding of when and if maintenance work needed to be performed, in addition, capabilities that reduce cost or provide additional mission assurance capabilities at comparable or reduced cost.
- De-coupled pre-launch processing where the strategy for de-coupling involves the spaceport?s capacity, configurability and Space-Based capabilities.
- Technologies and Capabilities that reduce the amount of ground operations that must be coordinated with other Range users, which would enable every user on the Range to believe they are the only user of the range throughout the ground flow.
- Spaceport and Range technologies and capabilities that increase launch attempts per day and/or consecutive days across the entire Florida Launch and Range Complex.
- Technologies and Capabilities that provide, localized, accurate forecasting of weather in support of Ground Operations.
- Improve security and control of range hazard areas.
- Technologies and Capabilities that improve the security of the range while reducing the cost to perform and monitor the Range volume.
- Innovative systems for payload recovery techniques with advancements in the areas of Mid-Air Retrieval (MAR) systems and guided payload recovery systems (such as a guided parafoil system).
- Technologies and Capabilities that allow in-flight recovery of small vehicles and payloads. In addition, Technologies and Capabilities that significantly reduce the cost of recovery operations.

Priority will be given to innovative solutions that:

- Enable low-cost concepts that reduce operations and life cycle costs.
- Demonstrate a transition path into spaceport operations.
- Can achieve high-fidelity ground-based demonstrations within the next 4 years; longer-term development proposals will be accepted, but will be considered at a lower priority for funding.

Research should be conducted to convincingly prove technical feasibility during Phase I, with clear pathways to demonstrating and delivering functional prototypes, meeting all objectives, in Phase II.

Phase I Deliverables: Feasibility study, including simulations and measurements, proving the proposed approach to develop a given product (TRL 3-4). Verification matrix of measurements to be performed at the end of Phase II, along with specific quantitative pass-fail ranges for each quantity listed.

Phase II Deliverables: Working model of proposed product, along with full report of development and measurements, shall emphasize cost reduction and efficiency technologies, and include a populated verification matrix from Phase II (TRL 5). Opportunities and plans should also be identified and summarized for potential commercialization.