



NASA SBIR 2012 Phase I Solicitation

H11 Radiation Protection

The SBIR topic area of Radiation Protection focuses on the development and testing of mitigation concepts to protect astronaut crews and exploration vehicles from the harmful effects of space radiation, both in Low Earth Orbit (LEO) and while conducting long-duration missions beyond LEO. Advances are needed in mitigation schema for the next generation of exploration vehicles inclusive of radiation shielding materials and structures technologies to protect humans from the hazards of space radiation during NASA missions. As NASA continues to form plans for long duration exploration, it has also become increasingly clear that the ability to mitigate the risks posed to both crews and vehicle systems by the space weather environment are also of central importance. This Radiation Protection Topic will concentrate on the Alert and Warning Systems. This area of interest is ways in which SBIR-developed technologies can contribute to NASA's overall mission requirements are advances in the understanding and predictability of space weather science. Current operational space weather support utilizes both inter- and extra-agency assets to maintain situational awareness and mitigate radiation risks associated with agency missions. Operational space weather support consists in the most basic terms of maintaining situational awareness of both the state of the Sun as a physical system and the radiation environment and its dynamics within the Heliosphere, and altering in real-time, a mission in order to minimize their effects. Therefore, advances are needed in the development of scientific research products for real-time operational forecasting tools to mitigate mission risk. Research under this topic should be conducted to demonstrate technical feasibility during Phase I and show a path forward to Phase II hardware demonstration, and when possible, deliver a full-scale demonstration unit for functional and environmental testing at the completion of the Phase II contract.

Subtopics

H11.01 Radiation Prediction (Integrated Advanced Alert/Warning Systems for Solar Proton Events)

Lead Center: JSC

Participating Center(s): LaRC

Advances are needed in alerts/warnings and risk assessment models that give mission planners, flight control teams and crews sufficient advanced warning of impending Solar Proton Event (SPE) impact. Research and development should be targeted which leverages modeling techniques used throughout terrestrial weather for extreme event assessment. There is particular interest in development of models capable of delivering the probability of no SPE occurrence in a 24-hour time period, i.e., an "All-Clear" forecast.

Forecast techniques should utilize the historical record of archived SPEs to characterize model forecast validity in

terms accepted metrics, i.e., skill score, false alarm rates, etc. Specific areas in which SBIR-developed technologies can contribute to NASA's overall mission requirements include the following:

- Innovative forecasting solutions that leverage model development in other areas such as ensemble forecasting of hurricane tracks, flooding, financial market behavior, and earthquake prediction.
- Innovative methods that integrate historical trending, real-time data, and fundamental physics-based models into advance warning and detection systems.

Technology Readiness Levels (TRL) of 2 to 4 or higher are sought.

Potential NASA Customers include:

- Human Exploration and Operations Mission Directorate.
- International Space Station Program.
- Science Mission Directorate.