

**SOLICITATION NO. NNG14490137R**

**NASA Sounding Rocket Operations Contract III  
(NSROC III)**

**ENCLOSURE 1**

**TOP PROGRAM TECHNICAL CHALLENGES**

**NOVEMBER 2014**

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**Enclosure 1 – Top Program Technical Challenges**

ENCLOSURE 1

TOP PROGRAM TECHNICAL CHALLENGES

1. **Background:** A major contributor to the decades of successful missions on the Sounding Rockets Program is the use of reliable propulsion systems. In recent history, however, several technical challenges have arisen with heritage rocket motors that have added significant risk to the Program. These include, but are not limited to, combustion instability, residual thrust at the end of nominal burn-time, inconsistent thrust vs. time performance, excessive nozzle erosion during burn, and failure to ignite at high altitude (Additional information is included in the Procurement Library). The Program must maintain a continuous operational pace in order to serve the science goals of the Agency, so interruptions in the launch manifest due to vehicle problems are intolerable.

**Challenge:** In the event that heritage propulsion systems exhibit major technical performance anomalies (such as those listed above), or experience delayed or reduced availability, describe what methods will be employed to help the Program maintain progress in launching missions without compromising success criteria. The approach must remain consistent with NSRP risk posture and low cost access to space (LCAS) approach as described in Section 1.0 of the SOW. Consideration may be given to alternative propulsion units, launch sites, flight rules and launch windows (for missions that can tolerate a change in launch date without compromising science objectives). Also describe the approach to investigating and subsequently eliminating the technical anomalies or availability perturbations. This should include any design, analysis, and testing protocol that will be employed, as well as programmatic, contractual, procurement or logistical methods that will be used.

2. **Background:** Flight Termination Systems are required on sounding rockets that are predicted to fly higher than 110 km altitude at White Sands Missile Range. These systems may also be required on certain missions with tailored trajectories from other launch sites, such as Poker Flat Research Range. The Program requires reliable Flight Termination ordnance components to ensure public safety per very strict Range Commanders Council (RCC) requirements. These requirements make development and maintenance of flight termination ordnance components very labor intensive and expensive. The Program would benefit greatly from a flight termination ordnance design that is compatible with as many launch vehicle configurations as possible, thus reducing repeated development efforts and expenses, while allowing flexibility in launch vehicle selection.

**Challenge:** Describe the approach that will be employed in developing a common flight termination ordnance package for multiple sustainer and exo-atmospheric motors to be utilized at multiple launch sites. The design and testing must meet RCC requirements (an example of a tailored FTS requirements document for the Black Brant is in the procurement library) and remain consistent with NSRP risk posture and low cost access to space (LCAS) approach as

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described in Section 1.0 of the SOW. Include a detailed description of the purchase quantities and phasing, as well as programmatic, contractual, procurement or logistical efforts that will be necessary to ensure adequate inventory to support the Mission Model.

3. **Background:** The NASA Sounding Rockets Program has developed strong relationships with numerous members of the scientific and technology research communities both nationally and globally. A major contributor to this has been close communication and collaboration with Principal Investigators and their team members on the technical aspects of their instrument design. Flight on a sounding rocket can be very dynamic and violent. The Program requires the appropriate balance between insight/oversight related to science instruments and enabling researchers to push the envelope of scientific discovery or technology development.

**Challenge:** To ensure reliability of science instruments consistent with the NSRP risk posture as described in Section 1.0 of the SOW, provide the appropriate level of oversight and insight into the design, analysis, and testing of the instrument to increase the likelihood of mission success, while not imposing excessive requirements, processes, and cost on the Principal Investigator and Program. Examples include, but are not limited to, requesting relevant design information from Principal Investigators for review, defining appropriate functional and environmental testing of science instruments, and offering the appropriate level of technical assistance to Principal Investigators and their teams who might be deficient in certain expertise areas.