NASA SBIR 2008 Phase I Solicitation

O4.02   Precision Spacecraft Navigation and Tracking

Lead Center: GSFC

Participating Center(s): ARC, GRC, JPL

This solicitation seeks proposals that will serve NASAâ€™s ever-evolving set of near-Earth and interplanetary missions that require precise determination of spacecraft position and velocity in order to achieve mission success. While the definition of â€œpreciseâ€ depends upon the mission context, typical scenarios have required meter-level or better position accuracies, and sub-millimeter-level or better velocity accuracies.

Research should be conducted to demonstrate technical feasibility during Phase 1, and show a path toward a Phase 2 hardware and/or software demonstration of a demonstration unit or software package that will be delivered to NASA for testing at the completion of the Phase 2 contract. The Small Spacecraft Build effort highlighted in Topic S4 (Low-cost Small Spacecraft and Technologies) of the solicitation participates in this subtopic. Offerors are encouraged to take this in consideration as a possible flight opportunity when proposing work to this subtopic.

Purpose: NASA Needs vs. Current State of the Art

 This solicitation is primarily focused on NASAâ€™s needs in three focused areas: onboard near-Earth navigation systems; onboard deep-space navigation systems; technologies supporting improved TDRSS-based navigation. Proposals that leverage state-of-the-art capabilities already developed by NASA such as GEONS (http://techtransfer.gsfc.nasa.gov/ft-tech-GEONS.html), Navigator (http://techtransfer.gsfc.nasa.gov/ft-tech-GPS-NAVIGATOR.html), GIPSY, Electra, and Blackjack are especially encouraged. NASA is not interested in funding efforts that seek to â€œre-invent the wheelâ€ by duplicating the many investments that NASA and others have already made in establishing the current state-of-the-art.

General Operational Specifications and Requirements:

Core Capabilities:

Onboard Near-Earth Navigation System

 NASA seeks proposals that would develop a commercially viable transceiver with embedded orbit determination software that would provide enhanced accuracy and integrity for autonomous onboard GPS- and TDRSS-based navigation and time-transfer in near-Earth space via augmentation messages broadcast by TDRSS. The augmentation message should include information on the TDRS orbits, status, and health that could be provided by future TDRS, and should provide information on the GPS constellation that is based on NASAâ€™s TDRSS Augmentation for Satellites Signal (TASS). Proposers are advised that NASAâ€™s GEONS and GIPSY orbit determination software packages already support the capability to ingest TASS messages.

Onboard Deep-Space Navigation System

  NASA seeks proposals that would develop an onboard autonomous navigation and time-transfer system that can reduce DSN tracking requirements. Such systems should provide accuracy comparable to delta differenced one-way ranging (DDOR) solutions anywhere in the inner solar system, and exceed DDOR solution accuracy beyond the orbit of Jupiter. Proposers are advised that NASAâ€™s GEONS and DS-1 navigation software packages already support the capability to ingest many one-way forward Doppler, optical sensor observation, and accelerometer data types.

Technologies Supporting Improved TDRSS-based Navigation

  NASA seeks proposals that would provide improvements in TDRS orbit knowledge, TDRSS radiometric tracking, ground-based orbit determination, and Ground Terminal improvements that improve navigation accuracy for TDRS users. Methods for improving TDRS orbit knowledge should exploit the possible future availability of accelerometer data collected onboard future TDRS.

Optional Capabilities:

NASA may consider other proposals relevant to NASAâ€™s needs for precise spacecraft navigation and tracking that demonstrably advance the state-of-the-art.

Development Timeline Associated with NASA Needs:

Phase 1 deliverables should include documentation of technical feasibility, which should at minimum show a path toward hardware and/or software demonstration of a demonstration unit or software package in Phase 2.

Phase 2 deliverables should include a demonstration unit or software.

The proposer to this subtopic is advised that the products proposed may be included in a future small satellite flight opportunity. Please see the SMD Topic S4 on Small Satellites for details regarding those opportunities. If the proposer would like to have their proposal considered for flight in the small satellite program, the proposal should state such and recommend a pathway for that possibility.