



## NASA SBIR 2009 Phase I Solicitation

### S4.02 Radiation Hardened Integrated Unit: GPS/IMU/Time/Processor

Lead Center: ARC

Participating Center(s): GSFC

Many subsystems and components are gaining benefit from miniaturization and reduction in mass and power requirements. Often many different avionic control system components are necessary for small spacecraft missions with stringent pointing requirements. A considerable saving in mass, power, and system complexity can be obtained by integrating components into a single unit. Of particular interest is a GPS, IMU, and timing signal combination in a single unit with an internal low-power processor to perform the internal calculations to provide the spacecraft with the necessary location and attitude knowledge.

Proposals are sought for an integrated GPS, IMU, and timing signal unit coupled with a low power processor to provide the necessary signals to spacecraft components.

The integrated unit should address or consider the following performance parameters:

- Mass less than 2.5kg
- Average power usage less than 15W
- GPS:
  - Position accuracy: 1-5m
  - Velocity accuracy: 1m/s
  - Time to first fix: 1 minute
  - Use L1 signals; desirable to incorporate L2 signals

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- IMU:
    - Rate Range: 500 deg/sec
    - Bias repeatability: 0.005 deg/hr
    - Scale Factor Accuracy: 1 to 5 ppm
    - Angle random walk: 0.005 deg/rt-hr
  
  - Timing:
    - $10^{-8}$  to  $10^{-10}$  Allan deviation
  
  - Able to tolerate an acceleration load of ~25g
  - Stable over standard internal spacecraft bus operating temperatures of -25°C to 40°C
  - Radiation tolerant with Total Ionizing Dose (TID) of 10 - 400 kRad (Si) with an average goal of 100 kRad (Si)
  - Compatible with the Space Plug and Play Architecture (SPA) developed at AFRL (See <http://www.dukeworks.org> for information on SPA)
  - Capable of surviving space launch environments

Although these are baseline goals, proposals that are able to achieve near comparable values will also be considered.

The proposer to this subtopic is advised that the products proposed may be included in a future small satellite flight opportunity.