JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION (JOFOC)
(In accordance with Federal Acquisition Regulation (FAR) 6.3– Other than Full and Open Competition)

1. **This document is a justification for other than full and open competition prepared by NASA's Goddard Space Flight Center (NASA's GSFC):**

   NASA's GSFC has a requirement to modernize the Formation Flying Testbed facility (FFTB), which is used to test and verify a spacecraft's ability to determine its position in relation to other spacecraft or in relation to the Earth. The FFTB makes frequent use of Global Positioning System (GPS) constellation signal simulators to generate the Radio Frequency (RF) environment required to test spacecraft subsystems. The Government requires highly specialized and complicated GPS constellation signal simulators ("the simulators") that generate the appropriate signals over the highly dynamic conditions. Large business Spirent Federal Systems (Yorba Linda, California) is the only responsible source that can satisfy Agency requirements. This document justifies the determination for using other than full and open competition.

2. **The nature and/or description of the action being approved:**

   NASA's GSFC has an on-site GPS test facility called the FFTB which is used to research, develop, test, and verify GPS receivers for NASA missions and experiments. It is also used to independently test and verify performance of private sector GPS receivers. Currently, the FFTB facility is supporting the Magnetospheric Multiscale (MMS) and Global Precipitation Measurement (GPM) space flight missions in verifying their orbit determination algorithms and circuitry using hardware-in-the-loop testing. This commercial acquisition modernizes the FFTB while still maintaining compatibility with other institutions, within and outside of NASA, which perform similar work.

3. **Description of the supplies or services required, including an estimated value:**

   NASA's GSFC proposes to acquire (1) one complete 4-RF output GPS constellation signal simulator system, (2) a 2-RF output GPS constellation signal simulator subsystem, (3) additional hardware to expand the capability of a previously acquired 2-RF output GPS signal simulator subsystem from 12 simulation channels to 16 simulation channels in L1, L2 and L5, requiring eight channel cards in total, (4) a distribution unit for connecting the previously acquired 2-RF output GPS constellation signal simulator subsystem with the 2-RF output GPS constellation signal simulator subsystem acquired by this procurement, and (5) integration and initial calibration of the 4-RF output GPS constellation signal simulator system which will be created by combining the previously acquired 2-RF output GPS constellation signal simulator subsystem with the 2-RF output GPS constellation signal simulator subsystem acquired by this procurement.

   The GPS simulator is a system which emulates the signals produced by the existing GPS satellites currently in orbit. The simulator creates the carrier signals, ranging codes, and navigation messages generated by each GPS satellite and adjusts their

delays and frequency shifts in the same manner that the signals would be received if a GPS receiver were to be in orbit around the earth. Due to the duration of tests, it is critical for the simulator to run continuously for two weeks with no frequency or phase discontinuities in the RF environment. Additional requirements include the following:

- The simulators shall be delivered in six separate chassis. Four of these six chassis will comprise one 4-RF output GPS constellation signal simulator system. The remaining two chassis will be combined with the previously acquired 2-RF output GPS constellation signal simulator subsystem to create a new, independent, and separate 4-RF output GPS constellation signal simulator system.

- Each of the six simulator chassis shall have one RF output for a total of six RF outputs.

- Each RF output shall support the generation of a minimum of 16 (sixteen) simultaneous, unique GPS satellites.

- Each RF output shall simultaneously generate L1, L2, and L5 GPS signals.

- The simulators shall include all necessary simulator specific hardware (PC, monitor, power adapters, and simulator-to-simulator cables, etc.) as required for normal everyday use.

- The simulators shall include all necessary software to create LEO, GEO, and HEO orbits about the earth with altitudes including the range of 1 to 24 earth radii.(0 - 153,000 km above sea level).

- The simulators shall include all necessary software to control, modify, and save to a file the aforementioned orbits.

- The simulators shall generate orbital scenarios that are re-playable on both the STR 4500 and GSS 6700 simulators.

- The simulators shall be delivered with the "no_pe" firmware installed. It is understood by NASA that this limits the scenario iteration rate to 10Hz.

- The simulator shall accept a 10 MHz reference frequency with which it shall synchronize its signal dynamics.

The proposed contract is anticipated to be awarded February 15, 2013 with the delivery of the GPS simulators due 18 weeks after the contract award date. The value of this acquisition is approximately $2,011,000.

4. **Statutory authority permitting other than full and open competition:**

The applicable statutory authority permitting other than full and open competition is 10 U.S.C. 2304 (c) (1), as cited under FAR 6.302-1, only one responsible source, and no other supplies or services will satisfy Agency requirements.

5. **A demonstration that the proposed contractor's unique qualifications or the nature of the acquisition requires use of the authority cited:**

The following vendors were analyzed for ability to meet requirements. None of these vendors are capable of meeting all of the requirements.

Navigation Laboratories (http://www.navlabs.com)

- SCS-1000 and SCS-3500 do not support L5. (L1, L2 and L5 is required)
- SCS-3700 and SCS-3900 are not capable of producing playback scenarios compatible with existing playback simulators.

SpectraCom (http://www.spectracomcorp.com)

- GSG-L1, GSG-54 and GSG-55 support only L1.
  - They do not support L2 or L5 (both required).
  - Maximum simulation Altitude is 11 miles, but 153,000 kms is required.
- GSG-L1
  - Supports only 1 channel (Sixteen channels are required)
- GSG-54
  - Supports only 8 channels (Sixteen channels are required)
- GSG-55
  - Do not support L2 or L5

Averna (http://www.averna.com)

- URT-5000, URT -2200, URT-1100 URT-800:
  - Units do not generate signals. It only plays back recorded signals.
  - Signals must be recorded from over-the-air environments using Averna's recorder module.

FFTB has purchased twelve simulators from Spirent over the last decade. GPS receivers flying on both the GPM and MMS missions are dependent upon Spirent GPS simulators for testing and validation, because Spirent products are the only ones that are compatible with the customized FFTB software used for validation and testing of MMS and GPM receivers, and existing STR 4500 and GSS 6700 playback simulators. A large percentage of FFTB based testing focuses on the acquisition and tracking of ultra-weak GPS signals in the space environment. The procured GPS simulators are highly specialized and much more complicated than similar devices used for terrestrial and avionics applications. This is because simulators used in

space based applications are required to generate the appropriate signals over the highly dynamic conditions.

Since 1998, the FFTB personnel as well as other personnel from GSFC have worked closely with Spirent to understand, verify, and modify the models that they use in their simulators. As a result, Spirent has modified its software line to accommodate the cutting-edge research that is being performed in the FFTB. The procurement from another vendor would require a substantial amount of work re-validating the simulator's performance, creating substantial and unacceptable delays to FFTB product deliveries for the GPM and MMS missions.

In order to verify proper functionality of simulators from other sources, a checkout period would be required for each vendor. During this period, tests would be conducted over a series of operating scenarios. This series of tests, using the Navigator GPS receiver, would require the vendor to exhibit performance in launch, Low Earth Orbit (LEO), High Earth Orbit (HEO), highly elliptic orbits, cis-lunar trajectories and Earth atmospheric reentry. Additionally, several corner case tests such as verification of the week rollover, 1024 rollover, and atmospheric model verification would need to occur before any potential vendor can be approved. It is estimated that this series of tests would require 6-8 weeks of testing per vendor, assuming availability of a NASA weak signal GPS receiver and would also require 3 man-years of effort (approximately $600K). Furthermore, the MMS mission launch would be delayed 6 to 9 months. This delay would negatively impact both the MMS mission schedule and budget.

The substantial personnel and laboratory costs required to screen potential simulators will offset any financial advantages realized by open competition. Additionally, due to these vendor screenings, the delivery of a GPS Simulator will be delayed until such evaluation periods were completed, thus creating unacceptable delays in fulfilling the agency's requirements. If a delay in final delivery of the GPS Simulator occurred, the FFTB facility will be negatively impacted as the facility will lose factory support (ex. parts, etc.) on our existing GPS simulators in June 2013, as the existing GPS simulators will become obsolete and parts will not be produced. After June 2013, any component failure within the existing GPS simulators will have a direct and negative impact on the ability of the FFTB to support the MMS and GPM space flight missions. With certainty, this negative impact would cause a slip of 9 to 12 months in the MMS launch date, and hinder troubleshooting capability during environmental testing and on-orbit for GPM.

6. **Description of the efforts made to ensure that offers are solicited from as many potential sources as practicable, including whether a notice was or will be publicized as required by Federal Acquisition Regulation (FAR) 5.2:**

In accordance with FAR Part 5.2, this procurement was synopsized on NASA's Acquisition Internet Services (NAIS) Business Opportunities web site on January 2, 2013.

NASA's GSFC used the combined synopsis and solicitation procedures in accordance with FAR Subpart 12.6. The results of the synopsis are included in Section 10 below.

7. **A determination by the contracting officer that the anticipated cost to the Government will be fair and reasonable:**

   The proposed price by Spirent Federal Systems will be evaluated by the Contracting Officer's Technical Representative and the Contracting Officer to determine if the price is fair and reasonable. Since certified cost or pricing data is not required for commercial items in accordance with FAR 15.403-1(b)(3), data other than certified cost or pricing data will be used as necessary to establish a fair and reasonable price. Strategically, this will include utilizing data related to prices (*e.g.*, established catalog or market prices, sales to non-governmental and governmental entities), relying first on data available within the Government; second, on data obtained from sources other than the offeror; and, if necessary, on data obtained from the offeror. Cost data may be used if necessary.

8. **Description of the market research conducted, and the results, or a statement of the reasons market research was not conducted:**

   Market research activities have been conducted for the GPS Simulator procurement. Assigned procurement and technical personnel reviewed available on-line product literature provided by potential vendors. The assigned personnel also reviewed the results of market research conducted less than 18 months ago and determined the market research to still be current, accurate, and relevant. NASA does not believe any alternate sources can (within this limited time frame) fulfill the contract requirements without risk of an unacceptable delay to the critical missions noted above.

9. **Other facts supporting the use of other than full and open competition:**

   On September 26, 2011, Code 596 began initial efforts to modernize the FFTB with the purchase of a partial GPS simulator system from Spirent Federal Systems. Spirent Federal Systems was the only responsible source that could satisfy Agency requirements. This acquisition will complete that system. Therefore, Spirent Federal Systems is the only vendor which can deliver the equipment necessary to complete the partial system.

   Over the past decade, Code 596 has developed a suite of software which is specific to the Spirent systems. This software generates the remote commanding information to control the Spirent GPS simulator. Based on these commands, GPS signals are accurately generated and their dynamics are accurately simulated.

   If another vendor were to provide a GPS simulator, the effort to duplicate and verify this software suite would span 4-6 weeks. The engineering cost of the effort would further reduce any benefit of open competition.

10. Sources, if any, that expressed an interest, in writing, in the acquisition:

In accordance with the requirements of FAR 5.203(a), a notice of NASA's intent to acquire the GPS simulator was published through NAIS to the Electronic Posting System and to the Federal Business Opportunities worldwide Web site on January 2, 2013 with an offeror response date of January 17, 2013. NASA GSFC used the combined synopsis and solicitation procedures in accordance with FAR Subpart 12.6. During the 15-day response period, only Spirent Federal Systems submitted an offer in response to the GPS Simulator combined synopsis and solicitation.

11. The actions the Agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required:

Code 596 will examine the feasibility of verifying the proper functionality of simulators from other sources as well as examine the cost of duplicating and verifying the software suite. This effort will include assessing the personnel and laboratory costs required to screen potential simulators. Additionally, Code 596 will study any barriers (ex. availability of a NASA weak signal GPS receiver) that may exist regarding corner case tests and extensive time the tests require for simulator approval.

JOFOC Signature Page for Global Positioning System (GPS) Constellation Signal Simulator; Combined Synopsis/Solicitation # NNG13450485Q

TECHNICAL DIRECTORATE: I certify that the facts presented in this justification are accurate and complete.

Charles E Clayett 11/29/2012

Signature Date

CONTRACTING OFFICER: I certify that this justification is accurate and complete to the best of my knowledge and belief.

Cte M. Reid 11/29/12

Signature Date

PROCUREMENT OFFICER:
dr (CONCURRENCE)

S. Rell 2/1/13

Signature Date

GSFC COMPETITION ADVOCATE:
(APPROVAL)

2/8/13

Signature Date