Limited Source Justification

Free Space Optical Communication-2 (FSOC2) effort

1. Identification of the agency and contracting activity:

This justification for an exception to fair opportunity has been prepared by the National Aeronautics and Space Administration Headquarters (NASA HQs), Space Operations Mission Directorate (SOMD), Space Communications and Navigation (SCaN) Office, and the NASA HQs Procurement Office, GSFC, Greenbelt, Maryland.

2. Nature and/or description of the action being approved:

In accordance with FAR 16.505 (b) (2), Exceptions to the fair opportunity process, this document provides justification that only one awardee is capable of providing the supplies or services required at the level of quality required because the supplies or services ordered are unique or highly specialized (FAR 16.505 (b) (2) (i) (B)).

3. Description of supplies or services required to meet the agency's needs and estimated value:

The objective of this acquisition is to obtain atmospheric modeling and simulation support to develop international standards green and blue books, perform trade studies to determine the optimal ground station network sizing, ground station locations, and to assess various operational concepts to achieve high availability of the deep space to ground optical links-referred to as the Free Space Optical Communication-2 (FSOC2) effort.

Since 1996, through several government-held contracts with various government agencies, including the current NASA delivery order NNH10CC88D, which was ordered off of the Alliant Governmentwide Acquisition Contract (GWAC) GS00Q09BGD0056, Northrop Grumman Systems Corporation (NGSC) has developed a unique state-of-the-art capability relating to optical communications. This capability is the result of large government investments and internal NGSC investments. The NGSC's capabilities that have been developed under the U.S. Government's free space optical communications programs are numerous. They include data collection and processing, custom site selection optimization algorithms and software development, use of computational hardware, two atmospheric science labs with high performance computing capabilities, and key personnel who have developed, maintained and matured this capability.

The scope of work for this acquisition includes the following:

- Perform trade studies to determine optimal ground station architectures by accessing NGSC proprietary cloud data
- Assess various operational concepts

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- Perform all necessary prerequisite tasks
- Develop international interoperability standards for atmospheric mitigation

Specifically, NASA HQs SCaN Office seeks to obtain the following for this requirement:

- Data and results regarding system optimization to support customer milestones.
- Parametric trade study results for the locations and availability of various-sized ground station networks within the continental United States (CONUS) and Outside of the Continental United States (OCONUS), and the corresponding time series line of sight (LOS) data.
- Parametric trade study results for various operational concepts of the space-ground links.
- Trade study results to support fielding and deployment of CONUS and OCONUS ground stations to achieve optimal performance.
- Operational performance assessment of the fielded system compared to the projected performance based on the aforementioned trade study results.
- Program management support to the assigned tasks as necessary.

The estimated value for this requirement is $5.95 million. The period of performance is five years, in the form of one base year with four one-year options.

4. Identification of the exception to fair opportunity and supporting rationale and a demonstration of the proposed contractor's unique qualifications to justify use of the cited exception:

The regulatory authority justifying exception to fair opportunity is FAR 16.505 (b) (2) (i) (B), which states, "Only one awardee is capable of providing the supplies or services required at the level of quality required because the supplies or services ordered are unique or highly specialized."

NASA HQs SCaN Office plans to continue the free space optical communications effort it started five years ago. In its next generation of Tracking and Data Relay Satellites (TDRS) NASA will put optical communications links onboard. In order to properly develop, test, and operate optical communications links considerable experience in the following areas is required: (1) collection and archival of Geostationary Operational Environment Satellite (GOES) and international geostationary imagery and proprietary cloud analysis, (2) cloud coverage simulation tasks, (3) ground station network optimization tasks, (4) operational concepts simulation tasks, (5) field campaigns to validate studies, (6) cloud analysis and forecasting, and (7) program support tasks.

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NGSC has developed and enhanced these capabilities under the U.S. Government's free space optical communications (FSOC) programs. More specifically, these unique state-of-the-art capabilities held by NGSC include the following:

- NGSC's capability centers on nearly 150 Terabytes of data collected over the last 19 years which is relevant to optical communications and the work that this effort requires.

- The cloud mask generator (CMG) database consists of cloud depiction data collected over the last 20 years, at a 4 km, 15 minute resolution. The CMG algorithm uses multi-spectral imagery from the GOES and sophisticated remote sensing algorithms to determine the probability of clouds for each satellite pixel. Under the current free space optical communications contract, NGSC has developed a 1km version of the CMG that runs in real-time which supported the Lunar Laser Communication Demonstration (LLCD). It is anticipated that SCaN will utilize this same capability for the upcoming Laser Communications Relay Demonstration (LCRD).

- The CMG serves as input to the Lasercom Network Optimization Tool (LNOT), which was developed by NGSC in order to identify specific candidate ground stations to be used in a high availability FSOC network. Under the current free space optical communications contract, NGSC has enhanced LNOT by incorporating many other Concept of Operations (CONOPS) including low Earth orbit (LEO), medium Earth orbit (MEO) and Deep Space scenarios.

- LNOT provides a climatological assessment of the performance of a free space optical communications system based on clouds and optical turbulence. What it does not provide is the ability to determine how links are established and maintained in an operational environment. NGSC developed the Lasercom Simulator (LSIM) to help make decisions that mitigate the effects of the atmosphere. This will be crucial for next generation TDRS optical links.

- NGSC has invested heavily in the development of two state-of-the-art computational labs in order to specifically support free space optical communications programs.

  - NGSC's Sleet Lab is used to support unclassified processing for various customers. The lab includes custom computational gear used specifically for data collection and various risk reduction analyses, trade studies, and simulations.

  - The NGSC Virgo supercomputing cluster is used to support free space optical communications studies of atmospheric turbulence and numerical cloud prediction.

- The NGSC team consists of experts in the fields of atmospheric science and high performance computing and has participated in the development and constant upgrading of all the tools currently being used. As more information is learned new and better tools will be developed.

5. Determination by the contracting officer that the cost to the Government will be fair and reasonable:

This order will be placed against an Alliant Governmentwide Acquisition Contract (GWAC) using the procedures in FAR 16.505 (b), Orders under multiple-award contracts. The contractor will be required to provide a detailed cost proposal. The proposed rates will be compared with rates in the contract. The proposal will be evaluated to ensure the rates are reasonable and that the order represents the best value for the Government. At FAR 15.404-1 (a) (3), "Cost analysis shall be used to evaluate the reasonableness of individual cost elements when certified cost or pricing data are required. Price analysis should be used to verify that the overall price offered is fair and reasonable." Thus the contracting officer can conclude that the offer represents the best value (as defined in FAR 2.101), resulting in the greatest overall benefit in response to this requirement.

6. Any other facts supporting the justification.

NGSC has unique capabilities, which are in place and ready to use immediately to support FSOC2 trade studies to determine optimal ground station architectures and assess various operational concepts and all necessary prerequisite tasks. These capabilities are critical to reduce the risk associated with atmospheric impacts on free space optical communications. To attempt to redevelop the existing validated databases and modeling tools would pose a severe risk to NASA's budget and schedule. In order to continue the outstanding and uninterrupted service, it is in the best interest of the Government to continue with Northrop Grumman Systems Corporation as the contractor for this flagship effort.

7. A statement of the actions, if any, the agency may take to remove or overcome any barriers that led to the exception to fair opportunity before any subsequent acquisition for the supplies or services is made.

The data obtained from this effort will be used by NASA to determine the FSOC2 ground station locations. It is expected that upon the completion of this effort all ground station location analysis will be finalized. Therefore no subsequent acquisition of this type is planned.

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TECHNICAL DIRECTORATE:

I certify that the data presented in this justification document are complete and accurate.

Signature 02/05/2015
Date

CONTRACTING OFFICER:

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

Signature 2/5/15
Date

PROCUREMENT OFFICER:
(CONCURRENCE)

Signature for 2/24/15
Date

HEADQUARTERS' COMPETITION ADVOCATE:
(APPROVAL)

I determine that FAR 16.505 (b) (2) (i) (B) applies to this order.

Signature 3/13/15
Date