

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 4005/7 (Technical)	Title: Satellite Laser Ranging Planning and Support		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 400	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/25/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$91,230.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$422,854.00		
Prior Contract/Task: None				
Task Monitor (TM) RIVERS C LAMB		Date 07/12/2018 03:22 PM	Org Code 61A0	Phone 301.286.1128
RIVERS C LAMB				
Project Resource Analyst (PRA) Deysi A Padilla Reyes		Date 07/17/2018 12:49 PM	Org Code 1571	Phone 301.286.1149
Deysi A Padilla Reyes				
Branch Head (BH) STEPHEN M MERKOWITZ		Date 06/19/2018 09:51 AM	Org Code 61A0	Phone 301.286.9412
STEPHEN M MERKOWITZ				
Contract Resource Analyst (CRA) RONNETTE M BARNES		Date 07/18/2018 11:34 AM	Org Code 1571	Phone 301.614.5925
CHRISTINE M BAXLEY				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) BRAULIO V SANCHEZ		Date 07/18/2018 11:44 AM	Org Code 61A0	Phone 301.614.6113
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Contract Specialist (CSp) ELIZABETH D ABRAHAM		Date 07/25/2018 02:11 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Contracting Officer (CO) ELIZABETH D ABRAHAM		Date 07/25/2018 02:12 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes				Work Performed On-Site: Partial
Funding Information: 351080.02.02.02.07(SCEX22016D),351080.02.06.01.01.14.09(SCEX22017D),351080.02.06.01.01.14.09(SCEX22018D)				Government Furnished Property/Facilities: No
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: RIVERS C LAMB, Code 61A.1, Bldg 022, Room 130				

Statement of Work
SLR Planning and Support

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.:
4005/7

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:
Rivers Lamb/61A/6-1128

6. Description of Requirement to be Performed:

The objective of this task is analytical support of the NASA Satellite Laser Ranging (SLR) program in the areas of SLR data analysis, software development, assessment of SLR station performance, development of improved models for atmospheric propagation and interpretation of station calibration techniques and station biases, and science coordination and analysis functions for the NASA-led Central Bureau of the International Laser Ranging Service (ILRS). One representative attends and supports the monthly meetings of the Central Bureau of the ILRS.

When requested by SLR Operations manager:

- Participate in the ILRS Analysis Working Group and tiger teams established to handle unique analysis problems.
- Support changes or enhancements to the ILRS report card function on the ILRS website (normal maintenance/processing of the report card is no longer nominally covered by this task).
- Conduct special assessments of SLR station performance to investigate technical problems at the stations.
- Contribute to and support the publication of NASA SLR and ILRS reports highlighting the results of SLR analysis activity.
- Provide science-based recommendations and support to the global satellite laser ranging network.
- Support communications with Peru station.
- Collocation analysis and report; MOBLAS-6 vs new adjacent station during this period.

7. Task Documentation Requirements/Deliverable Items: Monthly report covering: technical status, problem areas, planned work. As requested deliverables: analysis/other reports, software.

8. Period of Performance: August 01, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required:
SME to Peru for one week.

10. Performance Standards: Improvements to software/models shall be delivered within 90 working days of initiation of request. Special assessments/reports of station performance shall be delivered within 30 working days of the occurrence of technical problems. Collocation reports can be delivered on best effort basis so as to keep the work hours nominal.

11. Other: NA

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020
Task Num/Mod Num: 5002/12 (Technical)	Title: Orbit Determination Toolbox (ODTBX)		Task Period: 08/01/2015 - 06/30/2019
Parent Task	Lower Subtasks: 0		
Task Type: Code 500	Flight: Non-Flight	Process Stage: Vendor_Proposal	Process Date: 03/19/2019
			Status: Awaiting Review
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$435,899.00	

Prior Contract/Task: None

Task Monitor (TM) JOEL J PARKER	Date 03/08/2019 02:34 PM	Org Code 5950	Phone 301.286.3604
JOEL J PARKER			
Project Resource Analyst (PRA) Patricia J Still	Date 03/08/2019 02:40 PM	Org Code 1593	Phone 301.286.8991
Patricia J Still			
Branch Head (BH) John C Adams	Date 03/08/2019 03:28 PM	Org Code 5950	Phone 301.286.8690
John C Adams			
Contract Resource Analyst (CRA) RONNETTE M BARNES	Date 03/11/2019 01:54 PM	Org Code 1571	Phone 301.614.5925
RONNETTE M BARNES			
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Contracting Officer Technical Rep. (COR) BRAULIO V SANCHEZ	Date 03/11/2019 02:07 PM	Org Code 61A0	Phone 301.614.6113
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Contract Specialist (CSp) ELIZABETH D ABRAHAM	Date 03/19/2019 02:16 PM	Org Code 210Y	Phone 301.614.6996
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Contracting Officer (CO) ELIZABETH D ABRAHAM	Date 03/19/2019 02:51 PM	Org Code 210Y	Phone 301.614.6996
Jonathon D Wingerberg			

Gov. Cost Estimate: [REDACTED] | Cost Estimate File Attached: **Yes** | Work Performed On-Site: **Partial**

Funding Information: **439432.07.01.15.08.02.01(EXCX22019D)** | Government Furnished Property/Facilities: **No**

Task Background Attached: **No**

Capital Asset Item: **No**

Contractor will develop specification or statement of work under this task for a future procurement: **No**

Deliver To: **JOEL J PARKER, Code 595.0, Bldg 011, Room S115**

Statement of Work

Task: Orbit Determination Toolbox
Task Order: 5002
Task Modification: 12

I. Summary of Changes in this Task Modification

Extending period of performance through June 30th, 2019. This is modification assumes that an existing \$8k of funding on the task will be planned for this work.

Summary of Work

This statement of work (SOW) describes the research, analysis, and engineering support necessary to develop an Orbit Determination Toolbox (ODTBX) for the NASA GSFC Navigation and Mission Design Branch (NMDB). ODTBX is an orbit determination analysis toolset based on Matlab and Java, intended to provide a much more flexible way to perform early mission analysis than is currently possible with existing tools. Matlab is the primary user interface, and is used for implementing new measurement and dynamic models from a library of base classes, rather than making a major software change every time a new mission proposal comes up, particularly one that implements new flight dynamics technologies. The toolset shall primarily serve the needs of conceptual mission studies, which are frequently performed for proposals, the Mission Design Lab, and during Phase A of approved missions. It shall be of particular utility to formation flying and exploration missions that make extensive use of novel combinations of onboard sensors. To enable the exchange of data with other flight dynamics tools, ODTBX is available to outside parties via a NASA Open Source Agreement (NOSA). The contractor shall facilitate this process, and if necessary, assign to NASA the copyright for any contributions to these tools and any other tools in the NMDB suite of advanced navigation, orbit prediction and determination, and error analysis capabilities, associated utilities and data simulation systems, and associated documentation. The contractor shall contractually firewall all of its related commercial activities from its support to this SOW. Alternatively, the contractor may make appropriate licensing arrangements with the GSFC Technology Commercialization Office for use of any software developed under this SOW that has not been released under NOSAs or other open-source licenses. However, if NASA does release certain software developed under this SOW under NOSAs or other open-source licenses, the contractor may use such software in any way permitted by such licenses.

The contractor shall provide all necessary support functions in this development effort, including but not limited to the following: documentation of algorithms, user instructions, and application program interfaces (API); acceptance testing and acceptance test case database management; maintenance of a server to host the development effort; and development and maintenance an online source code repository, an online bug/issue-tracking system, and a web page for announcements and distribution of the software.

The contractor shall expect to work with NASA as well as NASA's partners in other government agencies, industry, and academia in the accomplishment of the technical objectives of the task. As work results are evaluated, work priorities may change. The

contractor shall be expected to provide timely support of unplanned high-priority actions as circumstances dictate.

II. Period of Performance

The period of performance of this task is from August 1, 2015 to June 30, 2019.

III. Subtask Description

The contractor shall perform the following activities:

- a. Prioritize remaining maintenance items in consultation with the Task Monitor.
- b. Design, document, code, and acceptance-test software that resolves the prioritized list of maintenance issues. All software and documentation shall conform to the OD Toolbox user interface as exemplified by the existing OD Toolbox adaptors and estimator functions.
- c. Generate reports summarizing acceptance, regression, and validation results, and maintain a test case database in a form useful for regression testing of future software increments.
- d. Deliver a beta release of the OD Toolbox in the form of an installer package for Mac OSX, Windows, and Linux platforms. The install process shall not overwrite any existing OD Toolbox releases resident on user systems. Documentation of the procedure to generate the installer shall be included as part of OD Toolbox documentation.
- e. Maintain and follow a process plan consistent with CMMI Level 2. The contractor shall document the expected marginal cost of compliance with this requirement.
- f. Complete the measurement model interface prototype between ODTBX and GMAT. Use the prototype to process GMAT-derived ground station range and range-rate measurements using the ODTBX sequential estimator. The GMAT component shall interface with the GMAT measurement manager to return measurements and partials to the MATLAB environment at specified epochs. The corresponding ODTBX measurement function shall be consistent with the standard ODTBX calling signature. Task personnel may leverage the GMAT Application Program Interface (API) currently in development. Subtask deliverables shall include a written summary of the demonstration, as well as the associated GMAT and ODTBX script files and source code.
- g. Continue developing a suite of MATLAB-based utilities to use GEODYN binary partial files (measurement and dynamics) and the State Transition Matrix (STM) file for covariance analyses. The tool suite shall use existing functions to read the binary files into the MATLAB workspace and provide a mapping between the state-space indices and the parameters. Once in the workspace, the tool suite shall provide utilities to propagate an initial the covariance (provided by the user or derived from the GEODYN Normal Matrix output) to specified epochs using the STM or dynamics partials files. Optionally, the covariance matrix propagation may include the addition of process noise. The utilities shall also support measurement at specified epochs updates using the measurement partials provided by GEODYN. Task personnel shall

leverage existing ODTBX functionality where appropriate. Development efforts shall culminate in a demonstration using the OSIRIS-REx Orbit B scenario as an example. Subtask deliverables shall include a written summary of the demonstration, as well as the associated GMAT and ODTBX script files and source code.

- h. Investigate JAT functionality replacement using the GMAT API currently in development. Identify and document ODTBX dependencies on JAT functions. Work with the GMAT API Lead to identify GMAT components that should be exposed via the new GMAT API, including the Sandbox and new Estimation/Measurement framework. Demonstrate a possible replacement strategy by developing MATLAB prototype. The prototype shall perform a coordinate system and time system transformation in MATLAB using existing GMAT functionality.
- i. Migrate the existing ODTBX Bug Tracker to the GSFC/580 GitLab Appliance.
- j. Modify the OpenFrames API to compile and execute on MacOS, specifically as used with the Copernicus trajectory optimization software. Update OpenFrames' CMake-based build system for seamless use with Intel Fortran and Winteracter on MacOS, and document the build/install process on its SourceForge-based wiki. Work with the Copernicus TM and developers to ensure that OpenFrames issues related to compiling Copernicus on MacOS are addressed. Migrate the existing ODTBX Bug Tracker to the GSFC/580 GitLab Appliance.
- k. Continue to update the GMAT build system to incorporate new software dependencies.
- l. Provide GEODYN development support for the OSIRIS-REx mission. Implement and test various feature enhancements and bug fixes as needed by the OSIRIS-REx Flight Dynamics and Radioscience teams. The contractor shall coordinate with the task monitor and GEODYN development lead on prioritizing and scheduling specific task items.
- m. The contractor shall:
 - Update the ODTBX GPS Tools subsystem with the latest modifications from the GPS ACE project.
 - Design and implement modifications and abstractions to the ODTBX GPS Tools subsystem to allow for straightforward implementation of foreign GNSS models alongside existing GPS model.
 - Implement foreign GNSS models to the extent possible given available data, as funding allows, in the following priority order: Galileo, GLONASS, BeiDou, IRNSS, QZSS.

- Perform necessary design, implementation, test, documentation, and other steps consistent with normal ODTBX development practices to allow for full public open-source release.
- Work with members of the GSFC PNT-WG as necessary on all phases, including familiarization with existing design, design reviews, implementation of GNSS-specific models, identification of test cases, and integration of modified design into ongoing simulations.

IV. Deliverable Items and Schedules

At a minimum, the contractor shall deliver the items specified below.

<u>Deliverable</u>	<u>Due Date</u>
Completed GNSS Tools feature	June 30, 2019

V. Management Approach

a. Staff Allocation, Expertise, and Skill Mix

The contractor shall staff this work item with the appropriate skill mix and staffing level for the work.

b. Configuration Management

Configuration management shall be controlled through the ODTBX Configuration Control Board. The existing ODTBX internal and external repositories shall be used to store and maintain all source code and documentation.

c. Facilities

Appropriate IT devices to support the analyses, specification development, and report development are required. It shall be the contractor's responsibility to provide and set up local workstations and network connections at the contractor's off-site facilities as required, and to install any required tools and utilities on the contractor's equipment.

d. Risk Management and Best Practices

The contractor shall manage schedule, cost, and technical risk through monitoring and reporting of progress and performance metrics, identifying issues well in advance of negative consequences, recommending corrective action to the TM, and implementing corrective actions with the compliance of the TM.

e. Performance Metrics

The work performed for this task shall be evaluated based on technical merit by the Technical Monitor. The TM shall develop detailed performance metrics that shall reflect the contractor's performance in meeting research analysis, specific mission requirements, deliverables and delivery schedule, and the contractor's cost. Technical evaluation of the task performance is a subjective combination of performance metrics, technical quality of

deliverables, cost control, significant events, innovations and meeting requirements set forth in the SOW.

The primary performance tracking mechanism for this task shall be based on an Internet-based issue-tracking system. At each of the team's bi-weekly meetings, team members shall discuss the status of each issue in the system. As issues are closed, they shall each be multiplied by a scale factor (1-10) based on complexity and a running tally shall be kept. Thus, close-out of the tickets shall track value earned toward each ODTBX Release.

f. Government Furnished Facilities, Equipment, Software and Other Resources

The Government shall provide account and passwords to government-furnished workstations where existing versions of various relevant software packages shall be maintained. It shall be the contractor's responsibility to complete any GSFC required security-related training courses.

VI. Travel

The contractor shall travel to NASA Glenn Research Center for the SCaN SCENIC technical interchange meeting and demonstrate ODTBX functionality to GRC personnel.

VII. Work Location

This work shall be performed primarily at the contractor's facility, but the contractor may be required to perform some work at the Goddard Space Flight Center.

VIII. Reporting Requirements

The contractor shall report status in person and/or via teleconference to the TM or designated alternates on a bi-weekly basis. Reports shall include informal presentation of interim results, status of development activities, and action item status. The contractor shall provide all reports at least one day in advance of the bi-weekly meeting via email, and maintain an email distribution list with the concurrence of the TM. The contractor shall also support the TM in the preparation of status reviews for internal and external funding agencies. The contractor shall comply with any and all additional requests for status meetings and reports. The contractor shall deliver all documents in portable document format (PDF) electronic form to the GSFC NMDB online library, as directly by the TM.

IX. Security Requirements

This task shall comply with IT security requirements as documented in the FDF IT security plan for all systems located in the FDF. FDF systems shall be maintained under the FDF Sustaining Engineering Task. Systems located outside of the FDF shall be covered under the Code 590 security plan and the Code 590 sustaining engineering support or the contractor sustaining engineering support depending on system location.

X. Rights

This SOW shall adhere to the RIGHTS IN DATA – special works (FAR 52.227-17) as modified by NFS 1852.227-17.

XI. References

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6001/6 (Technical)	Title: ATLAS Receiver Algorithms Development and Testing		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 02/28/2019	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$82,549.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$2,122,214.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Jan L MCGARRY</u>	Date 02/15/2019 07:32 PM	Org Code 61A0	Phone 301.614.5867	
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Project Resource Analyst (PRA) <u>Ryan C Fiora</u>	Date 02/19/2019 09:13 AM	Org Code 1571	Phone 301.614.5691	
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Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 02/20/2019 10:44 AM	Org Code 1571	Phone 301.614.5925	
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I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 02/20/2019 10:48 AM	Org Code 61A0	Phone 301.614.6113	
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Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 02/27/2019 04:02 PM	Org Code 210Y	Phone 301.614.6996	
Yolanda A Williams				
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 02/28/2019 10:14 AM	Org Code 210Y	Phone 301.614.6996	
Jonathon D Wingerberg				
Gov. Cost Estimate: [REDACTED]	Cost Estimate File Attached: Yes		Work Performed On-Site: All	
Funding Information: 883151.05.05.11(SCEX22018D),883141.04.01.01(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Jan L MCGARRY, Code 61A.1, Bldg 022, Room 158				

ATLAS Receiver Algorithms Development and Testing
(GGSG3 6001/6 work added to mod 5 work: January 2019 through July 2019)
Jan McGarry / 61A

This task is for maintenance and upgrades of the ATLAS Instrument Receiver Simulator, for support in the final development and testing of the onboard ATLAS Instrument Receiver Algorithms, for support of the ICESat-2 Ground System (Instrument Science Facility) through the update and maintenance of the Parameter Update GUI (PUG), for determination of the final Rx Algorithm Parameter set, for full documentation of the Rx Algorithms testing and verification results, for archival of all Receiver Algorithms software and data, and for ATLAS Receiver Algorithms testing and performance assessment on-orbit.

- 1- Maintain and update the Rx Algorithm Simulator as needed: ongoing.
- 2- Update Rx Algorithm Parameter Update GUI (PUG) as needed.
- 3- Update Rx Algorithm documentation as needed.
- 4- Perform Rx Algorithms performance assessment during ATLAS Instrument Commissioning (October/November 2018) and document results (by May 2019).
- 5- Develop draft journal paper on Rx Algorithms design, pre-launch testing, and post-launch performance assessment (by July 2019).
- 6- Perform testing and optimization of the onboard Rx Algorithms as requested by the ICESat-2 Science Team (ADDED in mod 6).

Travel requirements:

- 1- 1 trip for 1 week for 1 person to attend ICESat-2 Science Team meeting.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6002/12 (Technical)	Title: SGSLR Design, Development and Testing		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 03/06/2019	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$338,733.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$5,589,389.24		
Prior Contract/Task: None				
Task Monitor (TM) <u>Jan L MCGARRY</u>	Date 02/26/2019 02:48 PM	Org Code 61A0	Phone 301.614.5867	
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Project Resource Analyst (PRA) <u>SHINA DAVE</u>	Date 02/26/2019 03:02 PM	Org Code 1552	Phone 301.614.6101	
SHINA DAVE				
Branch Head (BH) <u>STEPHEN M MERKOWITZ</u>	Date 01/30/2019 06:31 PM	Org Code 61A0	Phone 301.286.9412	
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Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 03/04/2019 08:25 AM	Org Code 1571	Phone 301.614.5925	
RONNETTE M BARNES				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 03/04/2019 08:56 AM	Org Code 61A0	Phone 301.614.6113	
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Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 03/05/2019 02:58 PM	Org Code 210Y	Phone 301.614.6996	
Yolanda A Williams				
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 03/06/2019 08:56 AM	Org Code 210Y	Phone 301.614.6996	
Jonathon D Wingerberg				
Gov. Cost Estimate [REDACTED] Cost Estimate File	Work Performed On-Site: Partial			
Attached: Yes				
Funding Information: 351080.02.06.01.01.06.04(SCEX22019D)	Government Furnished Property/Facilities: No			
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Jan L MCGARRY, Code 61A.1, Bldg 022, Room 158				

**Space Geodesy Satellite Laser Ranging System Design,
Development and Testing (GGSG3 6002/12 December 2018)
Task Order Statement of Work
Jan McGarry / 61A**

Subtask 1 of this task is for the design, development and testing of the Space Geodesy Project's Next Generation Satellite Laser Ranging Stations, the maintenance and use of the prototype Next Generation Satellite Laser Ranging System (NGSLR) for SGSLR testing and development, support for the 1.2 meter telescope maintenance and operation, support for the SGSLR labs (at the 1.2 meter telescope facility), and the interface to the International Laser Ranging community through the ILRS.

Subtask 2 was cancelled in early 2018. There is no longer a subtask task 6002.

Mod 12 adds characterization of the NGSLR telescope and additional SSRx activities related to the CY4 work which has a period of performance (POP) of August 1, 2018 through July 31, 2019. Mod 12 additions are highlighted in yellow and its period of performance is January 14, 2019 through July 31, 2019.

1. Add FAR clause 52.227-17

FAR clause 52.227-17, Rights in Data - Special Works is applicable to the SOW for this task.

2. Provide System Administration for all code 61A unix computers at GGAO

Provide the backup system administration support for all code 61A unix computers at GGAO and provide backups to these computers (as well as backups of selected Windows computers). Provide status of these efforts in monthly report. This is an ongoing effort.

3. Provide hardware & software sustaining engineering for NGSLR and the 1.2 meter telescope facility

Maintenance NGSLR in a mostly mothballed state (perform regular HVAC service and monitor the facility integrity). This includes procurement of parts as needed to fix problems. Report on activities in this area in monthly reports. This is an ongoing effort.

Provide a low level effort for maintenance of the 1.2 meter telescope hardware and software which involves fixing problems as they come up. Provide low level support to experiments using the facility. Provide status of activities in the monthly report. This is an ongoing effort.

4. Participate in the SGSLR design, development and documentation, and support of the SGP SGSLR reviews. This also includes development of the Test and Verification Plan, the Software and Hardware Development and Design Plans, and support of the Interface and Control Documents and the Operations Concept Document.

Participate as members of a larger SGSLR team to support the Government in the design and development of SGSLR systems 1 and 2. Support the development of the Operations Concept Document for SGSLR, develop of slides for the reviews, and participate in the Subsystem Engineering Peer Reviews (EPRs) and System Level Reviews, including the

Critical Design Review (CDR).

Support the Gimbal and Telescope Assembly (GTA) Technical Interface Meetings (TIMs), and acceptance testing of the GTAs both at Cobham and GGAO. Continue with the Optical Bench design.

Deliverables:

SGSLR documentation must be developed by System CDR.
System CDR: September 2018.

- 5. Develop the optical design for SGSLR. Substantially support the GTA reviews, TIMs and Acceptance testing at both the Factory and GGAO. As part of the larger SGSLR team support the Government in the development of the optical bench design.**

Deliverables:

Optical design completed and documented by SGSLR CDR.
Factory Acceptance Testing of the OTAs and GTAs.

- 6. Build the prototype SGSLR optical bench at a laboratory on the Goddard Space Flight Center.**

Deliverables:

Prototype Optical Bench initial build by July 2019.

- 7. Lead the SGSLR software design and development effort. Produce the documented design at the level required for the SGSLR CDR.**

Deliverables:

Build for GTA FAT/SAT: September 2018
 - to include software interface with GTA, dome simulator, timing, MET.
 Operational Build 0.5: August 2019
 - to support the start of Integration and Testing
 Continue SGSLR software and computer architecture design: ongoing
 Computer and Software Subsystem review: at CDR.
 Design documentation: at CDR.

- 8. Develop the Closed Loop Tracking part of the SGSLR Receiver System and support the SGSLR team in integrating the receiver into the SGSLR system. Document the receiver subsystem and support the reviews.**

Procure a 10 x 10 pixelated MCP PMT detector to be used in the SGSLR Receiver Subsystem. (mod 11)

Complete the design for the Constant Fraction Discriminators (CFDs) for use with the MCP PMT array. Build at least one CFD for testing with the NGSLR single anode MCP PMT. (mod 12)

Complete SensL array testing and characterization. (mod 12)

Finalize and document the interface design between the operational SSRx and the SGSLR computer and software subsystem, the T&F subsystem, and the Ranging Control Electronics Instrumentation. (mod 12)

Design and generate a basic simulator that sends to the SGSLR software a non-random start signal and return signal in the center pixel of the array along with the corresponding event times. This basic simulator must deliver the same form and format as that of the actual operation SSRx system, including any histograms. (mod 12)

Deliverables: (mod 12)

Complete SensL array testing and characterization: February 2019

Complete the interface design between SSRx and SGSLR system: March 2019

Complete the design of the CFD and build one for the single anode MCP PMT: April 2019

Develop basic software simulator (source and executable): May 2019

9. Support funded experiments at 48" telescope and any SGSLR testing needed at 48"

Deliverables:

Support experiments such as MARLI at the 48" (for setup and training).

Support SGSLR testing at the 48" facility, including lab setup and testing, and use of the telescope for testing (star tests, satellite tracking): ongoing work.

10. Interact with the international SLR community to ensure SGSLR is in sync with the global SLR direction.

Participate in the ILRS Standing Committees and Workshops: ongoing work.

Support the interface with the ILRS stations in support of ICESat-2 tracking.

11. Perform survey work at SGP sites, including GGAO.

Perform surveys as needed by Space Geodesy Project.

12. Characterize the NGSLR telescope in the lab and determine, to the best extent possible, the imaging/focusing problems seen during past operations. Make whatever corrections are possible and needed to support the SGSLR testing. (mod 12)

Deliverables: (mod 12)

Characterize and provide report on characterization and problems of the NGSLR telescope: February/March 2019.

Correct telescope problems and make telescope available for use in SGSLR: April 2019.

Travel requirements:

- 1- Five trips of 1 week each for 1 person from University of Texas to NASA/GSFC for SGSLR software meetings and reviews (SGSLR RAT software developer).
- 2- Travel to GTA vendor: 7 trips for 1 week each to Cobham in Lansdale PA for work in preparation for and performance of the Factory Acceptance Testing (SGSLR Software Lead).

- 3- Travel to GTA vendor: 2 trips for 1 week each to Cobham in Lansdale PA for work in preparation for and performance of the Factory Acceptance Testing (SGSLR Optics Lead or Engineer).
- 4- Travel to Telescope vendor: 2 trips for 7 days each to Maui, Hawaii for verification of telescope build and witnessing of the acceptance testing of the telescope (SGSLR Optics Lead or Engineer).

End of Task Order Statement of Work

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020
Task Num/Mod Num: 6003/10 (Technical)	Title: Crustal Dynamics Data Information System (CDDIS) Support		Task Period: 08/01/2015 - 07/31/2019
Parent Task	Lower Subtasks: 0		
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/13/2018 Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$809,836.00	
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$3,346,995.00	
Prior Contract/Task: None			
Task Monitor (TM) <u>CAREY E NOLL</u>	Date 07/10/2018 03:07 PM	Org Code 61A0	Phone 301.614.6542
CAREY E NOLL			
Project Resource Analyst (PRA) <u>Nicole Ayala</u>	Date 07/11/2018 08:15 PM	Org Code 61A.0	Phone 301.286.7109
Nicole Ayala			
Branch Head (BH) <u>Scott B Luthcke</u>	Date 06/20/2018 11:57 AM	Org Code 61A0	Phone 301.614.6112
Scott B Luthcke			
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 07/12/2018 11:21 AM	Org Code 1571	Phone 301.614.5925
RONNETTE M BARNES			
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.			
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 07/12/2018 02:59 PM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ			
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 07/13/2018 03:03 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO			
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 07/13/2018 03:09 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO			
Gov. Cost Estimate: [REDACTED] Cost Estimate File	Work Performed On-Site: Partial		
Attached: Yes			
Funding Information: 656052.04.01.13(scex22018d)	Government Furnished Property/Facilities: No		
Task Background Attached: No			
Capital Asset Item: No			
Contractor will develop specification or statement of work under this task for a future procurement: No			
Deliver To: CAREY E NOLL, Code 61A.0, Bldg 034, Room W242			

Statement of Work Format

Crustal Dynamics Data Information System (CDDIS) Support

1. Contractor: SGT, Inc.	2. Contract No.: NNG15HZ37C	3. Task Order No.: 6003 CY4 Initial TO
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4. Job Order Number/Appropriation: 656052.04.01.13/ SCEX22018D	5. TM Name/Code/Phone: Carey Noll/4-6542
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6. Description of Requirement to be Performed:

Crustal Dynamics Data Information System (CDDIS) Support

The contractor shall support the Crustal Dynamics Data Information System (CDDIS), managed by the Geodesy and Geophysics Laboratory (Code 61A).

The CDDIS staff is tasked by the geodynamics community to assist researchers with their data requirements. The data services of the CDDIS consist primarily of receiving and archiving space geodesy, geodynamics, and geophysics-related data, derived products, and information on-line and cataloging these data in the CDDIS database. The CDDIS is responsible for the dissemination of these data to NASA investigators and scientists participating in global geodetic and geophysics programs.

A majority of the data processing efforts, including data verification, distribution, reformatting, and special requests, will be performed on the CDDIS servers. These processes include special programs to read received data, summarize their contents, validate data contents, reformat the data if required, extract and store both file and content metadata, collect archive and distribution metrics, and archive the data to the appropriate disk area.

The CDDIS also operationally supports many international programs within the International Association of Geodesy (IAG) such as the International GNSS Service (IGS) and its pilot projects and working groups, the International Laser Ranging Service (ILRS), the International VLBI Service for Geodesy and Astrometry (IVS), the International DORIS Service (IDS), the International Earth Rotation and Reference Systems Service (IERS), and the Global Geodetic Observing System (GGOS) and its Bureaus. The support of these programs requires timely availability of data holdings, typically within minutes, of receipt.

The CDDIS is one of twelve of NASA's Earth Observation System Data and Information System (EOSDIS) Distributed Active Archive Centers (DAACs) and participates in numerous EOSDIS mandated activities. The Earth Science Data and Information System (ESDIS) Project manages the science systems of EOSDIS.

7. Task Documentation Requirements/Deliverable Items:

- a. Process all incoming data files (posted to CDDIS incoming data server or retrieved from cooperating data centers), including GNSS (GPS, GLONASS, others) data, satellite and lunar laser ranging (SLR and LLR) data, VLBI experiment data, DORIS data, and derived products on a timely basis to the online CDDIS archive. Validate submitted data files (contents, file completion, correct compression, checksum, specific QC, and other checks as needed) and extract/create/load required metadata into the CDDIS databases. Efficiently monitor archive operations to ensure files are archived in a timely manner and that file contents are correct. Ensure timely archive of all data sets. Maintain the data archiving, processing, and validation/QC software on the CDDIS servers.
- b. Develop any new automated software to support the archiving and distribution of new data sets. Incorporate enhancement software as required. Develop procedures for reporting problems with errors in data ingest and maintain performance and error metrics on all incoming data.
- c. Process all incoming GNSS data (e.g., daily, hourly, and high-rate, RINEX V2 and V3), including data compression and decompression and data formatting to RINEX if necessary. Data must be made available to the user community within minutes of receipt for daily, hourly, and high-rate data files. Ensure latest versions of UNAVCO's teqc and GFZ's gfrnx software are utilized for data QC and summarization. Generate Data Holdings Files (DHF) of current GNSS data for the GPS Seamless Archive Center (GSAC) program on a daily basis and also for other GNSS data as required.
- d. Test and evaluate alternative GNSS data QC software that can be used with new versions of the RINEX format; implement any new software recommended for use in operations. Develop additional software as required to process data in RINEX V3, including new GNSS (Galileo, Compass, etc.) for supporting the

archive of multi-GNSS data.

- e. Develop procedures and required software for capturing and QC of real-time GNSS data streams into high-rate files. Evaluate and/or develop software for monitoring and capturing statistics for real-time data operations along with maintaining and publishing statistics as needed on public webpages.
- f. Process all laser ranging data (normal point and full-rate in CRD format) received from cooperating institutions (European Data Center) and the NASA SLR mission support contractor. Provide data quality and metadata information for all data processed. Load summary information into CDDIS databases. Check for duplicate passes and replacement data. Merge daily normal point and full-rate laser ranging data into monthly and yearly files ensuring older data are merged into monthly files automatically and appropriately.
- g. Process all DORIS data (in DORIS-specific and RINEX formats). Generate summary information and load metadata into CDDIS databases.
- h. Maintain and verify CDDIS databases using the query language and utilities of the MariaDB database software. Perform database administration and maintenance tasks as required. This activity includes development of backup and restore procedures, optimization and updating queries, and database design as needed to incorporate new data collections.
- i. Attend and participate in designated ESDIS meetings, telecons, and working groups as directed by CDDIS government staff and provide timely feedback on topics of discussion.
- j. Participate in discussions on ESDIS metadata evolution to the Unified Metadata Model (UMM) utilizing the Common Metadata Repository (CMR). Coordinate with government staff on updates required by CMR. Coordinate update to CDDIS metadata with Global Geodetic Observing System (GGOS) portal requirements.
- k. Continue development and implementation of recommendations for modifications to CDDIS metadata by coordinating with ESDIS and CMR to ensure inclusion of CDDIS metadata in CMR. Review current accepted standards for metadata to align CDDIS metadata with these standards.
- l. Develop improved metrics collection, processing, and delivery as required by the EOSDIS Metrics System (EMS) and its evolution within the CMR.
- m. Continue development of software for archiving VLBI data and derived products utilizing existing CDDIS archiving procedures.
- n. Continually evaluate CDDIS archive operations and introduce efficiencies in processing software and database operations as appropriate. Incorporate new QC requirements into operations software. Transition software for operations on new CDDIS server environments as needed.
- o. Develop and maintain software/applications for transitioning incoming ftp services to web services, ensuring secure upload of user files to CDDIS incoming servers. Utilize ESDIS User Registration System to authenticate data supplier credentials.
- p. Maintain CDDIS web applications, ensuring consistent and secure operations. Maintain a list of all web application libraries and develop procedures to ensure that all web-based software is continually monitored for security issues and updated in a timely manner. Ensure all web applications are developed and maintained with capabilities to support all four techniques (GNSS, SLR, VLBI, and DORIS).
- q. Provide programming support for secure implementation of the GPS Seamless Archive Center Web Services (GSAC-WS) tools in the CDDIS website. Coordinate with UNAVCO-led team on this effort.
- r. Maintain the CDDIS, ILRS, Space Geodesy, and LAGEOS mission web presence using NASA standards as appropriate. Modify and enhance websites as required. Incorporate ESDIS required information into websites as appropriate.
- s. Provide support for users accessing CDDIS. Utilize ESDIS tools and participate in ESDIS user support telecons. Utilize Earthdata support utilities to catalog and resolve incoming user questions.
- t. Generate weekly reports for CDDIS data management and users describing the activity of the project. Participate in weekly CDDIS staff meetings.
- u. Revise and enhance all CDDIS Standard Operating Procedures (SOP) to contain up-to-date instructions for all tasks performed by the CDDIS support staff.
- v. Utilize available ESDIS wiki's and other facilities (e.g., GIT) as appropriate for managing CDDIS tasks and software.
- w. Document all programs, procedures, and CDDIS system activities. All programs and scripts written to

support CDDIS activities should contain appropriate documentation within the code to aid in readability and use by other staff members or the ATR and will to the greatest extent possible utilize a software version control system to manage multiple software versions.

- x. Provide travel accommodations for 15 persons for 3 days to attend CDDIS User Working Group meeting at NASA GSFC.
- y. Promptly apprise CDDIS government staff of any problems in data, processing of data, security issues or any other problems with the various computer systems accessed by the support staff.

8. Period of Performance: August 01, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required:

Task may require participation in up to two 5-day international meetings and up to four 3 to 5-day domestic meetings at the discretion of CDDIS staff. Possible international meetings include 21st International Workshop on Laser Ranging in Canberra Australia, November 04-11, 2018 and 2018 IGS Workshop in Wuhan China October 29-November 02, 2018. Possible domestic meetings include ESIP Winter Meeting in Washington D.C., January 2019 (one to three persons), ESIP Summer Meeting in TBD U.S. location, summer 2019 (one person), ESDIS meeting Summer 2019 in TBD U.S. location, Fall 2018 AGU meeting in Washington D.C. (two persons).

10. Performance Standards:

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6005/4 (Technical)	Title: LVIS Data Analysis Support		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/30/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$200,925.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$1,039,958.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>JAMES B BLAIR</u> JAMES B BLAIR		Date 07/26/2018 11:53 PM	Org Code 61A0	Phone 301.614.6741
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala		Date 07/27/2018 09:36 AM	Org Code 61A.0	Phone 301.286.7109
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke		Date 07/17/2018 04:21 PM	Org Code 61A0	Phone 301.614.6112
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES		Date 07/27/2018 11:43 AM	Org Code 1571	Phone 301.614.5925
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 07/27/2018 12:45 PM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/30/2018 09:08 AM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/30/2018 09:10 AM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File	Work Performed On-Site: Partial			
Attached: Yes	Government Furnished Property/Facilities: No			
Funding Information: 509496.02.80.01.02(SCEX22018D)				
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: JAMES B BLAIR, Code 610.9, Bldg 033, Room F302				

Statement of Work
LVIS Data Analysis Support

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.:
6005-4

4. Job Order Number/Appropriation:
509496.02.80.01.02/SCEX22018D

5. TM Name/Code/Phone:
J. Bryan Blair / 61A / 4-6741

6. Description of Requirement to be Performed:

This task is intended to provide mission planning, field operations support, and data processing and analysis of high altitude, airborne lidar data sets from NASA's Land, Vegetation, and Ice Sensor (LVIS) and other Digital Elevation Models (DEMs) for Solid Earth, Terrestrial Ecology, Cryospheric, and other science applications. Much of the work comprising this task is research and development in nature and cannot be entirely specified in advance. The support shall include instrument support, and data production. Support will be provided for, but not limited to, the following specific tasks:

- 1) Support LVIS data analysis and mission planning as required.
- 2) Provide data processing and analysis of high altitude, airborne lidar data sets for Solid Earth, Terrestrial Ecology, and Cryospheric science using the LVIS data sets.
- 3) Identify, obtain, process, display, and study of a variety of remotely sensed imagery and geophysical data in support of LVIS data analysis and performance verification.

Additional items to be perform by subcontractor [REDACTED]

- 1) LVISCam upgrades - Modifications to [REDACTED] existing software package "Aware Data Acquisition" to add support for multiple camera previews and data archival. Integrate software package and new cameras with LVIS and Applanix POS/AV 610. (50 hours)
- 2) Curiosity Rover and MARDI support - Stereo DEM generation and error analysis support of MARDI camera data. (50 hours)
- 3) Tightly coupled imagery and LVIS simulation - Simulation and Experimentation with hybrid approach to processing LVIS data and stereo imagery. Evaluate resolution and depth accuracy requirements under typical flight profiles. (100 hours)

7. Task Documentation Requirements/Deliverable Items:

1. Support for LVIS data analysis as needed.
2. Contribute graphics and data analysis results to mission documents, papers, and presentations.
3. Provide timely support
4. Provide timely analysis support and analysis utility software development.
5. Generate high resolution maps to support field work planning and validity of proposed measurement locations
6. Provide analysis support for high resolution topography development
7. Results of [REDACTED] activities include reports, test results, and error analysis.

8. Period of Performance: August 01, 2015 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required:
None

10. Performance Standards:

- 1) Delivery schedule conformance as outlined by work plans coordinated with the ATR on a weekly basis or as necessary.
- 2) Meeting required functionality and providing the necessary capabilities.
- 3) Flexibility of Design
- 4) Responsiveness to change in requirements.
- 5) Trouble shooting and problem solving.
- 6) System Performance as tested with or simulated data.
- 7) Regular communication of progress through informal communication, weekly planning meetings, monthly reports and formal project reviews.
- 8) Efficiency in the use of resources.

11. Other: None

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6006/3 (Technical)	Title: LVIS Facility Development	Task Period: 08/01/2016 - 07/31/2019		
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/27/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$222,511.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$1,487,676.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/24/2018 10:06 AM	Org Code 61A0	Phone 301.614.6112	
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala	Date 07/25/2018 09:39 AM	Org Code 61A.0	Phone 301.286.7109	
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/17/2018 04:21 PM	Org Code 61A0	Phone 301.614.6112	
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.	Date 07/25/2018 11:25 AM	Org Code 1571	Phone 301.614.5925	
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ	Date 07/26/2018 11:18 AM	Org Code 61A0	Phone 301.614.6113	
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 02:39 PM	Org Code 210Y	Phone 301.614.6996	
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 02:42 PM	Org Code 210Y	Phone 301.614.6996	
Gov. Cost Estimate: [REDACTED] Cost Estimate File	Work Performed On-Site: Partial			
Attached: Yes	Government Furnished Property/Facilities: No			
Funding Information: 509496.02.80.01.02(SCEX22018D)				
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Scott B Luthcke, Code 61A.0, Bldg 034, Room S296B				

Statement of Work Format

Land, Vegetation and Ice Sensor (LVIS) Flight Facility

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.: 6006
Mod 3

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:
Scott B. Luthcke Code 698 301-614-6112

6. Description of Requirement to be Performed:

This task is intended to provide algorithm and software development, as well as performance analysis support, for the Land, Vegetation and Ice Sensor (LVIS) facility. In particular this task covers the design, development, testing, validation and verification of the LVIS facility data processing system, VEGAS. The system development includes all functions to go from L0 data to L2 data in a highly automated process, and specifically includes all analysis and data generation functions, database, archival and job management, systems administration and data distribution. The VEGAS system development details and schedule are contained in the PDR/CDR chart package. The development work encompassed by this task is of a very timely nature and the schedule must be adhered to. The support includes software development, maintenance and modification as well as data analysis for geodetic research. Some of the work comprising this task is research and development in nature and cannot be entirely specified before hand. Therefore, it is imperative that the support provided be in direct response to the ATR's initiation and direction. Support will be provided for, but not limited to, the following specific tasks:

- 1) Development includes high accuracy position and orientation solutions from GNSS and INS solutions.
- 2) Development includes high accuracy geolocation and instrument parameter calibration.
- 3) Development includes high accuracy and highly efficient waveform processing and analysis.

7. Task Documentation Requirements/Deliverable Items:

1. Deliver software elements on schedule (agreed upon with ATR and project timeline)
2. Test and evaluate new/modified software elements.
3. Adhere to development schedule based on project development and other considerations.
4. Maintain internal software documentation and continue to provide function documentation through user initialized "man pages"
5. Maintain software revision control and ensure necessary backups to protect against a loss of computers or disks
6. Maintain portability to UNIX platforms
7. Contribute (where appropriate) to mission documents, papers and presentations.
8. Provide timely support and adhere to mission development and operational delivery schedule and maintain/modify software as necessary.
9. Provide timely analysis support and analysis utility software development
10. Provide hardware and software systems maintenance

8. Period of Performance: August 01, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required: None

10. Performance Standards:

1. Delivery schedule conformance as outlined by work plans coordinated with the ATR on a weekly basis or as necessary.
2. Meeting required functionality and providing the necessary capabilities.
3. Flexibility of design.
4. Responsiveness to change in requirements.
5. Trouble-shooting and problem solving.
6. System performance as tested with real or simulated data.
7. Regular communication of progress through informal communication, weekly planning meetings, monthly reports and formal project reviews.

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6007/5 (Technical)	Title: Global Ecosystem Dynamics and Infrastructure (GEDI) Mission Support		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/30/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$980,858.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$2,726,586.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/25/2018 12:51 PM	Org Code 61A0	Phone 301.614.6112	
Project Resource Analyst (PRA) <u>Christopher R Caldwell</u> Christopher R Caldwell	Date 07/25/2018 03:37 PM	Org Code 1559	Phone 301.286.2811	
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/12/2018 03:07 PM	Org Code 61A0	Phone 301.614.6112	
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES	Date 07/27/2018 07:36 AM	Org Code 1571	Phone 301.614.5925	
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ	Date 07/27/2018 09:39 AM	Org Code 61A0	Phone 301.614.6113	
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/30/2018 10:52 AM	Org Code 210Y	Phone 301.614.6996	
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/30/2018 10:54 AM	Org Code 210Y	Phone 301.614.6996	
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes	Work Performed On-Site: Partial			
Funding Information: 306615.04.02.01(SCEX22017D),306615.04.02.01(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Scott B Luthcke, Code 61A.0, Bldg 034, Room S296B				

Statement of Work Format

Global Ecosystem Dynamics and Inventory (GEDI) Mission Support

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.: 6007
Task 6007 Mod. 5

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:
Scott B. Lutheke Code 698 301-614-6112

6. Description of Requirement to be Performed:

This task is intended to provide support for mission performance, sensor performance and product performance and simulation analysis, as well as development and operations of the GEDI L0- L2 ground processing system. This includes the development, testing and operations of the Science Operations Center (SOC), which includes the Science Data Processing System (SDPS) and the Science Planning System (SPS). The task includes mission observation performance analysis and simulations to optimize data collection and sensor selection and placement as well as the development of the SOC systems to produce, validate, archive and distribute all science data products. The development of the system will adhere to mission schedule and standards. The task provides support for all mission development, review, and ground and mission testing as well as operations. The SOC will support the precise positioning and pointing of the GEDI laser beams from the analysis and reduction of GPS tracking data, Gyro data, Star-Tracker data, as well as the laser altimetry data. The task includes systems engineering and project management support to successfully build, test and operate the SOC systems, including the SDPS and SPS. This task includes GEODYN maintenance and development as required by the GEDI SOC.

7. Task Documentation Requirements/Deliverable Items:

1. Deliver new/modified software elements following mission schedule.
2. Test and evaluate new/modified software elements to mission standards supporting ground and mission testing.
3. Support timely analysis and adhere to schedule.
4. Maintain internal software documentation and continue to provide function documentation
5. Maintain software revision control and ensure necessary backups to protect against a loss of computers or disks
6. Maintain portability to UNIX platforms
7. Contribute (where appropriate) to mission documents, papers and presentations.
8. Provide timely support and adhere to operational delivery schedule and maintain/modify software as necessary.
9. Provide timely analysis support and analysis utility software development
10. Maintain hardware and software systems

8. Period of Performance: August 1, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required: None

10. Performance Standards:

1. Delivery schedule conformance to mission schedule and coordinated with the ATR on a weekly basis or as necessary.
2. Meeting required functionality and providing the necessary capabilities.
3. Flexibility of design.
4. Responsiveness to change in requirements.
5. Trouble-shooting and problem solving.
6. System performance as tested with real or simulated data.
7. Regular communication of progress through informal communication, weekly planning meetings, monthly reports and formal project reviews.
8. Efficiency in the use of resources

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020
Task Num/Mod Num: 6008/4 (Technical)	Title: Earth Surface Mass	Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0		
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/27/2018 Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$329,273.00	
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$1,453,979.00	
Prior Contract/Task: None			
Task Monitor (TM) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/24/2018 10:07 AM	Org Code 61A0	Phone 301.614.6112
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala	Date 07/25/2018 09:41 AM	Org Code 61A.0	Phone 301.286.7109
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/03/2018 04:02 PM	Org Code 61A0	Phone 301.614.6112
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.	Date 07/25/2018 11:22 AM	Org Code 1571	Phone 301.614.5925
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ	Date 07/26/2018 11:18 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 05:05 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 05:07 PM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes	Work Performed On-Site: Partial		
Funding Information: 967701.02.03.01.72(SCEX22018D)	Government Furnished Property/Facilities: No		
Task Background Attached: No			
Capital Asset Item: No			
Contractor will develop specification or statement of work under this task for a future procurement: No			
Deliver To: Scott B Luthcke, Code 61A.0, Bldg 034, Room S296B			

Statement of Work Format

Earth Surface Mass and Elevation Change from Gravimetry and Altimetry

1. Contractor: SGT, Inc.

2. Contract No.:

NNG15HZ37C

3. Task Order No.: 6008

07/03/18 Task Mod. 4

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:

Scott B. Luthcke Code 61A 301-614-6112

6. Description of Requirement to be Performed:

This task is intended to provide support for the processing and analysis of satellite and airborne data for earth surface mass balance and elevation change research. Specifically, the work encompasses, but is not limited to, the detailed processing of GRACE, ICESat, and Operation Ice Bridge (OIB) data for the purposes of measuring earth surface mass balance at high spatial and temporal resolution. In addition, this task shall support the integration and analysis of surface mass balance data, dynamics data from SAR, and model data. Furthermore, this task shall provide data simulation and performance analysis for future missions such as ICESat-II and GRACE-FO. The task may also support processing and integration of Cryosat data. The support includes data analysis and software development, maintenance and modification. This support shall be provided for existing missions as well as new and proposed missions. Support shall be provided for, but not limited to, the following specific tasks:

1. Develop algorithms and software for the processing of GRACE, ICESat and SLR data, and the analysis of earth surface mass balance solutions.
2. Integration and analysis of surface mass balance data, dynamics, model data, Cryosat and GPS data.
3. Future mission data simulation and performance analysis for Decadal Survey Mass Change designated observable.
4. Support GRACE, ICESat, GRACE-FO, and SLR data processing.
5. Data reduction of GRACE and GRACE-FO GPS tracking for precise positioning and inclusion of the GPS tracking data as part of a combination mascon solution along with the GRACE KBRR.
6. Data reduction of SLR tracking data to the major geodetic satellites for inclusion of the SLR tracking data as part of a combination mascon solution along with the GRACE and GRACE-FO KBRR and GPS data.
7. Support new and proposed mission data processing and analysis including future lidar and gravity missions.
8. Support cluster computing, optimization of software and general Xserve cluster maintenance as needed to support these studies
9. Hardware and software maintenance

7. Task Documentation Requirements/Deliverable Items:

1. Deliver new/modified software elements on schedule (agreed upon with ATR and project timeline)
2. Test and evaluate new/modified software elements.
3. Support timely analysis and adhere to schedule.
4. Maintain internal software documentation and continue to provide function documentation
5. Maintain software revision control and ensure necessary backups to protect against a loss of computers or disks
6. Maintain portability to UNIX platforms
7. Contribute (where appropriate) to mission documents, papers and presentations.
8. Provide timely support and adhere to operational delivery schedule and maintain/modify software as necessary.
9. Provide timely analysis support and analysis utility software development

8. Period of Performance: August 1, 2018 to July 31, 2019

9. Travel, Materials, Etc. Known to be Required:

One (1) week-long international trip to the GRACE ST meeting in Germany.
One (1) Domestic week-long conference trip to the AGU in Washington, DC.

10. Performance Standards:

1. Delivery schedule conformance as outlined by work plans coordinated with the ATR on a weekly basis or as necessary.
2. Meeting required functionality and providing the necessary capabilities.

3. Flexibility of design.
4. Responsiveness to change in requirements.
5. Trouble-shooting and problem solving.
6. System performance as tested with real or simulated data.
7. Regular communication of progress through informal communication, weekly planning meetings, monthly reports and formal project reviews.
8. Efficiency in the use of resources

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6009/6 (Administrative)	Title: ICESat-2 POD PPD Geolocation		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 03/04/2019	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$0.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$2,001,965.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Scott B Luthcke</u> Scott B Luthcke		Date 02/28/2019 09:25 AM	Org Code 61A0	Phone 301.614.6112
Project Resource Analyst (PRA) <u>Ryan C Flora</u>		Date N/A	Org Code 1571	Phone 301.614.5691
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke		Date 02/28/2019 01:12 PM	Org Code 61A0	Phone 301.614.6112
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.		Date 03/04/2019 08:27 AM	Org Code 1571	Phone 301.614.5925
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 03/04/2019 08:57 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> ELIZABETH D ABRAHAM		Date 03/04/2019 10:54 AM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> ELIZABETH D ABRAHAM		Date 03/04/2019 10:54 AM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: No		Work Performed On-Site: Partial		
Funding Information: 883151.09.03.02(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6010/4 (Technical)	Title: ICESAT-2 CAMS	Task Period: 08/01/2015 - 01/31/2020		
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 03/06/2019	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$638,304.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$2,048,560.00		
Prior Contract/Task: GGSG3 - Task 6010				
Task Monitor (TM) <u>Scott B Luthcke</u>	Date 02/28/2019 09:26 AM	Org Code 61A0	Phone 301.614.6112	
Scott B Luthcke				
Project Resource Analyst (PRA) <u>Ryan C Fiora</u>	Date 02/28/2019 09:58 AM	Org Code 1571	Phone 301.614.5691	
Ryan C Fiora				
Branch Head (BH) <u>Scott B Luthcke</u>	Date 12/20/2018 03:51 PM	Org Code 61A0	Phone 301.614.6112	
Scott B Luthcke				
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 03/04/2019 08:26 AM	Org Code 1571	Phone 301.614.5925	
RONNETTE M BARNES				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 03/04/2019 08:56 AM	Org Code 61A0	Phone 301.614.6113	
BRAULIO V SANCHEZ				
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 03/05/2019 10:54 AM	Org Code 210Y	Phone 301.614.6996	
Yolanda A Williams				
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 03/06/2019 08:59 AM	Org Code 210Y	Phone 301.614.6996	
Jonathon D Wingerberg				
Gov. Cost Estimate: [REDACTED] Cost Estimate File	Work Performed On-Site: Partial			
Attached: Yes				
Funding Information: 883151.04.07.04(SCEX22019D)	Government Furnished Property/Facilities: No			
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Scott B Luthcke, Code 61A.0, Bldg 034, Room S296B				

Statement of Work Format

ICESat-2 Constraint Analysis & Monitoring System

1. Contractor: SGT, Inc.

2. Contract No.:

NNG15HZ37C

3. Task Order No.:

Task Mod #4 (Task 6010)

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:

Scott B. Luthcke Code 61A 301-614-6112

6. Description of Requirement to be Performed:

This task is intended to provide algorithm and software development, performance analysis, and operations support for the sustained engineering and operations of the ICESat-2 mission Constraint Analysis & Monitoring System (CAMS). In addition to the s support, the task also includes the systems engineering and project management to successfully provide continued engineering support and operations. This task includes all necessary support to operate the CAMS under the current CAMS SOW. The task includes support for all operations, scheduling, staffing, reporting, meetings, and technical engineering modifications to respond to mission issues and changes.

An important aspect of the work effort is to ensure the CAMS system meets new and recent levied requirements which include: (1) generate and provide rapid and predicted orbit and attitude data daily for use in the generation of the quicklook science data products, (2) shall generate the ILRS Go/NoGo Flag to notify the laser ranging stations when it is acceptable to lase ICESat-2, (3) shall generate a 5 day predictive orbit for the ILRS laser ranging stations in the Consolidated Prediction Format (CPF), (4) shall generate a report providing implementation status of activities within the science and ATLAS instrument plans. In addition there is a new operational constraint when the MOC needs a split ATS load due to CARA alert, but also when an SAT needs to be revised and uploaded. These issues need to be resolved with the MOC and PSO and CAMS needs to address this new requirement(s).

7. Task Documentation Requirements/Deliverable Items:

- 1) Deliver new/modified software elements on project schedule.
- 2) Test and evaluate new/modified software elements and support mission and ground systems testing.
- 3) Maintain internal software documentation and continue to provide function documentation through user initialized "man pages"
- 4) Maintain software revision control and ensure necessary backups to protect against a loss of computers or disks
- 5) Contribute (where appropriate) to mission documents, papers and presentations.
- 6) Provide timely support and adhere to mission development and operational delivery schedule and maintain/modify software as necessary.
- 7) Provide timely analysis support and analysis utility software development
- 8) Hardware and Software systems maintenance
- 9) Provide sustaining engineering
- 10) Support all aspects of operations and engineering analysis

8. Period of Performance: February 01, 2019 to January 31, 2020

9. Travel, Materials, Etc. Known to be Required: None

10. Performance Standards:

- 1) Delivery schedule conformance as outlined by the mission schedule and coordinated with the ATR on a weekly basis or as necessary.
- 2) Meeting required functionality and providing the necessary capabilities.

- 3) Flexibility of design.
- 4) Responsiveness to change in requirements.
- 5) Trouble-shooting and problem solving.
- 6) System performance as tested with real or simulated data.
- 7) Regular communication of progress through informal communication, weekly planning meetings, monthly reports and formal project reviews.
- 8) Continued professional operations support including adhering to all operations schedules, attending required meetings, and responding to mission anomalies, and ensuring staffing as necessary to support full mission operations.

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6017/8 (Technical)	Title: ICESat-2 Project Science Office Support		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 09/04/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$18,032.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$4,044,575.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>THOMAS A NEUMANN</u> THOMAS A NEUMANN		Date 08/28/2018 08:29 PM	Org Code 6150	Phone 301.614.5923
Project Resource Analyst (PRA) <u>Ryan C Fiora</u> Ryan C Fiora		Date 08/29/2018 09:26 AM	Org Code 1571	Phone 301.614.5691
Branch Head (BH) <u>THORSTEN MARKUS</u> THORSTEN MARKUS		Date 08/06/2018 10:59 AM	Org Code 6150	Phone 301.614.5882
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.		Date 08/31/2018 11:36 AM	Org Code 1571	Phone 301.614.5925
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 08/31/2018 11:42 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 09/04/2018 02:30 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 09/04/2018 02:32 PM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes		Work Performed On-Site: All		
Funding Information: 883151.04.01.01(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: THOMAS A NEUMANN, Code 615.0, Bldg 033, Room A220				

Statement of work

Title: ICESat-2 Project Science Office Support

Objective: The purpose of this task is to provide science and analysis services in support of the ICESat-2 Project Science Office in the Cryospheric Sciences Laboratory, Code 615.

Technical Requirements: Analyze ATLAS data and the design of the ICESat-2 standard data products. The performance of this task may require discrete studies in areas including, but not limited to: surface-slope / laser-return relationships, laser transmitter / receiver / optics characterizations, atmospheric dynamics, spacecraft attitude estimation, land surface topography, ocean topography, developing and documenting optimal geophysical corrections to precision altimetric data.

Analyze test data collected prior to ICESat-2 launch, specifically that generated by the MABEL and SIMPL instruments, and any simulated data generated by the ATLAS integration and test team. Analysis will guide the optimal processing of ATLAS data in terms of the ICESat-2 data products for the global geolocated photon cloud, ice sheet elevation, sea ice freeboard, cryospheric surface roughness, surface slope and optical depth of the atmosphere to yield optimal elevation change detection strategies. The performance of this task will require statistical analysis of existing and synthetic data sets and algorithm development to derive elevation and elevation change estimates.

Post-launch, the task will focus on the evaluation and fine tuning of the on-orbit data products, such as ATL03, the Global Geolocated Photon Cloud product. Development and implementation of automated analysis tools will also be a primary activity immediately prior to and following launch.

Some other specific tasks are to:

examine and develop surface finding algorithms using MABEL and other airborne photon-counting lidar instruments. Evaluate surface-finding algorithms generated by other members of the ICESat-2 Science Definition Team. Documentation of these algorithms and maintenance of these documents.

Maintain the ICESat-2 website, provide updates as needed.

Provide ad-hoc support to the Project Science Office, such as visualizations of photon-counting data, or planned orbits / ground tracks.

Assist the Project Scientists in the development of the ICESat-2 L2a Algorithm Theoretical Basis Document (ATBD). Document algorithms for the geolocated

photon data product including, but not limited to, all geophysical corrections, and ATLAS-specific parameters such as the instrument impulse response.

Develop visualization and analysis tools in collaboration with the ISF to examine the stability of the ATLAS instrument on-orbit. For example, develop software to use the transmitter echo to track changes in the timing stability of the ATLAS instrument; exploit other housekeeping data as appropriate to monitor the impact of both the transmitted and received energy on the ICESat-2 science data products.

Assist the PSO and Science Definition Team in the evaluation of the SIPS implementation of, and testing of, the ATBDs. This will require thorough understanding of the ATBD document(s), familiarity with the high-level code to generate the necessary parameters, and a dogmatic appreciation for version and revision control of both the ATBD as well as the high-level code.

Assist the PSO in evaluating and implementing firn densification models to convert measured elevation change into mass change of the ice sheets.

Assist the PSO in testing updates to the data product algorithms via the scheduling and data management system. Use of this system will be a key component of testing and updating new versions of the data products after launch.

Assist the PSO in procuring contract services to support ICESat-2 launch activities. Among such tasks are to assist with the rental of facilities, as needed, for communications events in and around Santa Ynez, CA to publicize ICESat-2. Details of such rentals will be coordinated with the PSO.

Deliverables and Reporting:

Monthly reporting on progress made and upcoming work.

Travel Required:

Up to 4 people to the off-site ICESat-2 science definition team meeting, Pasadena, CA, for approximately 3 days.

IT Procurements:

The prime contractor will provide desktop systems for the group. All procurements will be made in accordance with the NASA IT procurement guidelines.

Contract: Geophysics, Geodynamics, and Space Geodesy (GGSG)		Contract Num: NNG11HP14C		Period: 07/01/2011 - 07/31/2015	
Task Num/Mod Num: 6018/5 (Administrative - CO)		Title: Mission Planning and Data Reduction		Task Period: 08/01/2012 - 07/31/2015	
Parent Task		Lower Subtasks: 0			
Task Type: Code 600		Flight: Non-Flight	Process Stage: CO_Award	Process Date: 07/20/2018	Status: In-process
Total Estimated Cost: ██████████		Total Maximum Fee: ██████████	Task Order Total Cost(Total Est Cost + Total Max Fee): \$334,036.00		
Prior Contract/Task: None					
Task Monitor (TM) DAVID D ROWLANDS		Date N/A	Org Code 61A0	Phone 301.614.6110	
Project Resource Analyst (PRA) Lisa M Grochola		Date N/A	Org Code 1571	Phone 301.286.5072	
Branch Head (BH) HERBERT FREY		Date N/A	Org Code 6980	Phone 301.614.6468	
Contracting Officer Technical Rep. (COR) BRAULIO V SANCHEZ		Date N/A	Org Code 61A0	Phone 301.614.6113	
Contracting Officer (CO) ANN L KEARNEY		Date	Org Code 210Y	Phone 301.286.4842	
Gov. Cost Estimate: ██████████		Cost Estimate File Attached: No		Work Performed On-Site: None	
Funding Information: 408256.04.01.02.02(SCEX22014d)		Government Furnished Property/Facilities: No			
Task Background Attached: Yes					
Capital Asset Item: No					
Contractor will develop specification or statement of work under this task for a future procurement: No					
Deliver To: DAVID D ROWLANDS, Code 61A.0, Bldg 034, Room W292					

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6019/6 (Technical)	Title: ICESat-2 Instrument Support Facility		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/25/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$1,218,791.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$5,779,966.00		
Prior Contract/Task: None				
Task Monitor (TM)				
THOMAS A NEUMANN		Date 07/12/2018 03:52 PM	Org Code 6150	Phone 301.614.5923
THOMAS A NEUMANN				
Project Resource Analyst (PRA)				
Ryan C Fiora		Date 07/12/2018 03:54 PM	Org Code 1571	Phone 301.614.5691
Ryan C Fiora				
Branch Head (BH)				
THORSTEN MARKUS		Date 06/26/2018 08:56 AM	Org Code 6150	Phone 301.614.5882
THORSTEN MARKUS				
Contract Resource Analyst (CRA)				
RONNETTE M BARNES		Date 07/13/2018 03:09 PM	Org Code 1571	Phone 301.614.5925
RONNETTE M BARNES				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR)				
BRAULIO V SANCHEZ		Date 07/13/2018 03:10 PM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ				
Contract Specialist (CSp)				
ELIZABETH D ABRAHAM		Date 07/25/2018 10:32 AM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Contracting Officer (CO)				
ELIZABETH D ABRAHAM		Date 07/25/2018 10:35 AM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Gov. Cost Estimate: [REDACTED]		Cost Estimate File		
Attached: Yes		Work Performed On-Site: All		
Funding Information: 883151.09.02(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: THOMAS A NEUMANN, Code 615.0, Bldg 033, Room A220				

Statement of Work

Title: ICESat-2 Instrument Support Facility (ISF)

Objectives: This task provides the ICESat-2 Instrument Support Facility in support of the Cryospheric Sciences Laboratory, Code 615. The purpose of the ISF is to monitor, maintain and operate the ATLAS instrument during the ICESat-2 mission.

Technical Requirements:

Technical requirements include, but are not limited to:

1. Install, operate and maintain all hardware and system software associated with the ISF. This includes systems administration, system performance tuning and system backups.
2. Develop and maintain the instrument monitoring, performance trending, and activity planning software and procedures.
3. Provide System Test Engineer to perform system tests on each ISF software release including acceptance testing and documentation of all changes to the ATLAS I&T procs adapted for use in the ISF ITOS systems. Comply with test engineering requirements from NPR 7150.2A. Support DRB/CCB resolution of software problem reports.
4. Support ground system and mission readiness testing (GRTs / MRTs).
5. Monitor the health and status of ICESat-2/ATLAS during on-orbit operations; monitor status of the ICESat-2 spacecraft; and perform ICESat-2/ATLAS activity planning.
6. Provide accurate and timely support of real-time instrument operations for ICESat-2/ATLAS.
7. Provide leadership of systems testing and development including tracking subsystem development metrics per release, leading up to code, design and unit test reviews, developing and completing Test Readiness Review packages and tracking DRs to closure. Support of major mission-level review such as the Operations Readiness Review is required.
8. Provide Systems Engineering and Test support for adaptation of the ATLAS provided STOL command procedures for use in the ISF. This function includes testing on FLATLAS and the OOS and support of the GRTs and MRTs using the ISF. Documentation of the STOL procedures and creation of the detailed ATLAS Flight Operations Procedures documents is required.

Travel Required:

Local trips from NASA/WFF to NASA/GSFC or Dulles, VA Mission Operations Center facility. Approximately 10 trips/year with an overnight stay.

IT Procurements:

Desktop systems are provided by the prime contractor. All procurements will be made in accordance with the NASA IT procurement guidelines.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6021/5 (Technical)	Title: ICESat-2 Science Computing Facility		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/17/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$1,017,978.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$3,635,778.00		
Prior Contract/Task: None				
Task Monitor (TM) THOMAS A NEUMANN		Date 07/11/2018 08:28 AM	Org Code 6150	Phone 301.614.5923
THOMAS A NEUMANN				
Project Resource Analyst (PRA) Ryan C Fiora		Date 07/11/2018 10:51 AM	Org Code 1571	Phone 301.614.5691
Ryan C Fiora				
Branch Head (BH) THORSTEN MARKUS		Date 06/26/2018 08:56 AM	Org Code 6150	Phone 301.614.5882
THORSTEN MARKUS				
Contract Resource Analyst (CRA) RONNETTE M BARNES		Date 07/12/2018 01:06 PM	Org Code 1571	Phone 301.614.5925
RONNETTE M BARNES				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) BRAULIO V SANCHEZ		Date 07/12/2018 02:58 PM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ				
Contract Specialist (CSp) ELIZABETH D ABRAHAM		Date 07/17/2018 02:50 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Contracting Officer (CO) ELIZABETH D ABRAHAM		Date 07/17/2018 02:52 PM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO				
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes		Work Performed On-Site: All		
Funding Information: 883151.04.01.01(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: THOMAS A NEUMANN, Code 615.0, Bldg 033, Room A220				

Statement of Work

Title: The ICESat-2 Science Computing Facility

Objective: The goal of this task is to provide the ICESat-2 Science Computing Facility (SCF). The SCF has two primary purposes: provide the tools, software and hardware necessary to evaluate ICESat-2 data products prior to their release to the general public, and to provide the capability for accepting, evaluation and incorporating requests for off-pointing (targets of opportunity) into the science activity timeline for ICESat-2 operations.

Technical Requirements:

The SCF will be developed and implemented in FY 15/16, tested and deployed in FY16/17 to support a late-2018 launch of ICESat-2. The SCF will operate throughout the life of the mission, currently estimated as 3 years plus 60 days, and should operate 24x7 supported by 8x5 staffing.

Some specific tasks include, but are not limited to:

1. Work closely with the Project Science Office (PSO) to define the requirements for visualization, processing and analysis tools needed evaluate ICESat-2 altimetry data and the standard data products.
2. Interact with algorithm leads and the PSO and wider science community to design appropriate evaluation and quality assessment tools and metrics for each of the ICESat-2 data products. Some of these tools will be automated (e.g. alert the PSO via email when the ATL03 geolocation quality flag > 10 over a 60-second span with a data granule), while others will be more interactive (e.g. extract all ATL06 elevation data within a particular lat, long box and generate plots of elevation vs. time along track on a password-protected website). Develop tools necessary to share the evaluation / quality assessments with the algorithm leads.
3. Participate in meetings between the PSO and the National Snow and Ice Data Center (NSIDC), and at times, represent the PSO in said meetings.
4. Work with the NSIDC to identify and evaluate HDF5 subsetting tools for use by both NSIDC and the SCF to meet users' data visualization needs. If necessary, assist in developing said tool.
5. Participate in meetings with the ISF to allow the SCF to serve as a conduit for ISF-led analyses to the wider Science Team; for example trending of ATLAS instrument parameters.
6. Work with the CAMS and ISF to establish weekly science plans, which include off pointing to targets of opportunity (TOO).
7. Support the TOO Review Board with visualization tools to evaluate TOO requests.
8. Design and implement data distribution capabilities to the Science Team and their designees (including the capability for data subsetting).

9. Provide web-accessible interface for evaluation and tracking of submitted Target of Opportunity (TOO) requests.
10. Maintain industry best-practices for analysis tools using primarily the Python programming language, and database management. Maintain industry best-practices for development of web interfaces. This should include technical training, such as Drupal, as requested by the PSO.
11. Other ODCs may include software purchases such as maintenance and acquisition of such industry-standard software as Jira, Confluence, Accurev and Navicat.
12. Development and maintenance of documentation and version control for software developed under this task.
13. Support testing and documentation of the SCF elements (scripting, web interface, subsetting, visualization).

Deliverables / Reporting:

Provide monthly reports on work completed and upcoming work for the next month. Alert the PSO to potential difficulties or risks.

Travel Required:

Up to three persons, two day off-site meetings at the NSIDC (Boulder, CO), up to 3 times per year.

IT Procurement:

The prime contractor will supply desktop computing facilities. All IT procurement will adhere to NASA procurement guidelines.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6025/5 (Technical)	Title: Sea Level and Tides		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/26/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$150,000.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$724,581.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>RICHARD D RAY</u> RICHARD D RAY		Date 07/23/2018 11:30 AM	Org Code 61A0	Phone 301.614.6102
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala		Date 07/23/2018 12:55 PM	Org Code 61A.0	Phone 301.286.7109
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke		Date 07/12/2018 03:07 PM	Org Code 61A0	Phone 301.614.6112
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES		Date 07/24/2018 08:28 AM	Org Code 1571	Phone 301.614.5925
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 07/24/2018 10:09 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/26/2018 03:51 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/26/2018 03:57 PM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File		Work Performed On-Site: Partial		
Attached: Yes				
Funding Information: 953005.02.01.01.12(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: RICHARD D RAY, Code 61A.0, Bldg 034, Room W296				

Statement of Work Format

Sea Level and Tides

1. Contractor: SGT, Inc.

2. Contract No.:

NNG15HZ37C

3. Task Order No.: 6025

Mod. 5

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:

R. Ray / 61A / x4-6102

6. Description of Requirement to be Performed:

Primary goal of this task is the construction of state-of-the-art satellite altimeter datasets to be used in determining and analyzing global sea level and oceanic tides. Emphasis is given to the NASA/CNES satellites, TOPEX/ Poseidon, Jason-1, Jason-2 and Jason-3, but other altimetric missions such as GFO, ERS, Geosat, and Envisat should also be incorporated into consistent databases. Tide gauge data shall be used to assess the accuracies of task products, both sea level and tides, and to monitor drifts in altimetric systems. Other datasets shall be developed as needed, such as atmospheric water vapor datasets to monitor satellite radiometer drifts or sea-surface temperature datasets to correlate with tidal signals. Results of these investigations shall be clearly demonstrated, and material prepared for publication and dissemination to the wider oceanographic and geodetic communities.

7. Task Documentation Requirements/Deliverable Items:

Periodic updates and deliveries to the ATR of Topex, Jason-1, Jason-2, Jason-3 altimeter data with latest corrections and adjustments, but without tide corrections.

Update estimation of global mean sea level time series, as new Jason-2 and Jason-3 data arrive and as new revisions to older data are available. These will be delivered to JPL PODAAC for use on the NASA sea level website.

Provide documentation of all data delivered and (as results become available) write scientific papers based on new sea-level analyses.

Reprocess historical Geosat altimeter data, in a form for use by GMAO assimilation.

Analyze accuracies of sea-level and tidal data by comparing with various in-situ datasets.

8. Period of Performance: August 01, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required:

Travel may be required, to meetings of the NASA Sea-Level Change Team, as well as to present scientific results at meetings such as the American Geophysical Union.

10. Performance Standards:

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6026/5 (Technical)	Title: MEaSURES Altimetry		Task Period: 08/01/2015 - 01/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/27/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$150,000.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$1,029,601.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>RICHARD D RAY</u> RICHARD D RAY		Date 07/23/2018 11:33 AM	Org Code 61A0	Phone 301.614.6102
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala		Date 07/23/2018 01:49 PM	Org Code 61A.0	Phone 301.286.7109
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke		Date 07/12/2018 03:07 PM	Org Code 61A0	Phone 301.614.6112
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.		Date 07/24/2018 09:55 AM	Org Code 1571	Phone 301.614.5925
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 07/24/2018 10:09 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/27/2018 10:27 AM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/27/2018 10:29 AM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File		Work Performed On-Site: Partial		
Attached: Yes				
Funding Information: 953005.02.01.01.12(SCEX22018D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: RICHARD D RAY, Code 61A.0, Bldg 034, Room W296				

Statement of Work Format
MEASURES Altimetry Processing

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.: 6026
Mod. 5

4. Job Order Number/Appropriation:

5. TM Name/Code/Phone:
R Ray / 61A / 4-6102

6. Description of Requirement to be Performed:

The purpose of this task is to provide the scientific community with improved and homogeneous satellite altimeter climate data records, for historical and currently operational satellites. The improvements shall come from the use of improved and consistent orbits (after they have been tested and evaluated) and from improved geophysical modeling of geophysical corrections and calibration of the altimeters and radiometer data.

Improvements are to be documented and products are to be made available to the scientific community via JPL's PODAAC data center.

7. Task Documentation Requirements/Deliverable Items:

Periodic deliveries of updated Jason-2 and J-3 altimeter data to the ATR and to PODAAC.
Updated deliveries of historical altimeter data from Topex, GFO, and Jason-1.
Prepare or update documentation of all data delivered to PODAAC.
Process certain new non-NASA satellite altimeter data, including SARAL/AltiKa.
Implement new ionospheric corrections for single-frequency altimeters as appropriate.
Evaluate and implement new sea-state bias corrections.

8. Period of Performance: August 01, 2018 through January 31, 2019

9. Travel, Materials, Etc. Known to be Required:

Travel will likely be required to several meetings related to satellite altimetry, especially:

- 1) Ocean Surface Topography Science Team (OSTST) meeting in Sept. 2018.
- 2) AGU, Washington D.C., 2018.

Travel will be required to keep informed of the latest developments in altimetry and to present papers/posters related to the MEaSURES altimetry project.

10. Performance Standards:

11. Other:

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6029/9 (Technical)	Title: Surface temperature and albedo		Task Period: 08/01/2015 - 07/31/2019	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/09/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$95,090.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$588,698.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Melinda A Webster</u> Melinda A Webster		Date 07/03/2018 09:43 AM	Org Code 6150	Phone 301.614.5507
Project Resource Analyst (PRA) <u>Ryan C Fiora</u> Ryan C Fiora		Date 07/03/2018 10:31 AM	Org Code 1571	Phone 301.614.5691
Branch Head (BH) <u>THORSTEN MARKUS</u> THORSTEN MARKUS		Date 06/26/2018 10:06 AM	Org Code 6150	Phone 301.614.5882
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> CHRISTINE M BAXLEY <small>I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.</small>		Date 07/06/2018 10:35 AM	Org Code 1571	Phone 301.614.5925
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> EVAN D HOFFMAN		Date 07/06/2018 08:38 PM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/09/2018 05:22 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/09/2018 05:25 PM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes		Work Performed On-Site: All		
Funding Information: 281945.02.03.08.25(SCEX22018D)		Government Furnished Property/Facilities: Yes		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Melinda A Webster, Code 615.0, Bldg 033, Room A211				

Statement of Work

Title: Surface Temperature and Albedo

SGT Contract No. NNG15HZ37C

Task Order No. 6029

Task Monitor/Code/Phone: M. Webster/Code 615/301-614-5507

Description of Requirement to be Performed: The key requirement is programming and analysis support in the development and creation of a high quality satellite data sets on surface temperature, albedo, cloud cover and ocean color in the polar and adjacent regions. Historical Aqua/MODIS shall be processed and a weekly data set of the various variables shall be created for the period 2000 to the present. NOAA/AVHRR data shall be analyzed during the same period and made consistent with MODIS data by making adjustments in calibration, cloud masking technique and atmospheric correction. Similar adjustments shall be applied to the rest of the AVHRR data to generate a longer time series from 1981 to the present. Accuracy shall be optimized through comparative analysis with in situ data. Comparative studies with Landsat 8 and VIIRS data as well as re-analysis data shall be done with a view of assessing and further improving the quality and usefulness of AVHRR data. Similar work shall be done in the processing of SeaWiFS and other ocean color data. In addition, a new cloud masking technique that takes advantage of CloudSat and CALIPSO data shall be developed to enhance the quality of surface temperature, albedo and ocean color data and to improve the accuracy of the cloud cover statistics. Sea Surface Temperature data from AMSR-E and AMSR2 shall also be analyzed and compared with MODIS and AVHRR data. Finally, this task shall continue with its current support for the Distributed Biological Observatory (DBO) project by providing updated satellite data to the scientists through the Neptune/GSFC website. The employee will work with personnel in the Cryospheric Sciences Lab and the Hydrological Sciences Lab as well as engineers in Code 553 to also process Quantum Well Infrared Photodetector (QWIP) and KT-15 IR data obtained from the P-3 aircraft SnowEx mission in Colorado in February 2017. The employee will also align video camera footage with the QWIP imagery. He/she will provide calibrated KT-15 and QWIP data from the aircraft overflights of SnowEx study areas to Lab personnel.

This task is being extended in order to ensure completion of the aforementioned project.

Task Documentation/Deliverable Items and Delivery Schedule: A detailed description of the data set and the technique for retrieving geophysical products shall be done and submitted at the end of the period of performance or as requested by the ATR.

Period of Performance: August 1, 2018 through July 31, 2019

Travel, Materials, Etc. Known to be Required: None

Other: None

Performance Standards: Changes in the software shall be discussed with the ATR before implementation. High quality graphics of finished products suitable for publication and presentation shall be provided to the ATR.

Contract: Geophysics, Geodynamics, and Space Geodesy (GGSG)		Contract Num: NNG11HP14C	Period: 07/01/2011 - 07/31/2015	
Task Num/Mod Num: 6030/4 (Replanning)	Title: Geodynamo and Planetary dynamos		Task Period: 08/01/2012 - 07/31/2015	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 01/27/2017	Awarded To: Stinger Ghaffarian Technologies (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): (\$39,414.00)		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$279,692.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>Weijia Kuang</u> Weijia Kuang		Date 01/26/2017 02:30 PM	Org Code 61A0	Phone 301.614.6108
Project Resource Analyst (PRA) <u>Lisa M Grochola</u> Lisa M Grochola		Date 01/26/2017 02:45 PM	Org Code 1571	Phone 301.286.5072
Branch Head (BH) <u>Scott B Luthcke</u>		Date	Org Code 61A0	Phone 301.614.6112
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>		Date	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> ELIZABETH D ABRAHAM		Date 01/27/2017 01:07 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ANN L KEARNEY</u> ANN L KEARNEY		Date 01/27/2017 01:16 PM	Org Code 210Y	Phone 301.286.4842
Gov. Cost Estimate: [REDACTED]	Cost Estimate File Attached: No	Work Performed On-Site: All		
Funding Information: 281495.02.47.02.53(SCEX22014D)		Government Furnished Property/Facilities: Yes		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: Weijia Kuang, Code 61A.0, Bldg 034, Room W284				

Task 6030. Reference Frame: DORIS Analysis Center and ITRF

This task supports the analysis of tracking data for the terrestrial reference frame in particular the analysis of DORIS data as part of the NASA GSFC contribution to the International DORIS Service.

In the coming task year, we will focus on:

- (1) Continue routine processing of DORIS data and submit the quarterly SINEX solutions to the IDS combination center.
- (2) Update the processing standards to a more up-to-date background force model (especially static and time-variable gravity model) to simplify the processing.
- (3) Work with NASA to implement the processing of the newer satellites (Sentinel-3A, 3B) in the processing chain.
- (4) With the NASA ATR, Implement test SINEX solutions that help to validate improvements or changes in the DORIS processing.
- (5) Process SLR data as needed to support the DORIS processing, in particular to validate the DORIS orbits, and intercompare DORIS+SLR orbits to the DORIS-only orbits.

- (6) With the NASA ATR, consider how the long and complicated processing chain can be simplified and made more efficient and easier to run. This should start with making a list or flowchart of the processing steps.

- (7) When the new MacPro workstation is made operational (snowmass3.gsfc.nasa.gov) work with the ATR to transition the process of the old machine (snowmass.gsfc.nasa.gov) with a goal to decommission the old machine as soon as it is practical.

Deliverables:

- (1) SINEX files for the GSC Analysis center submitted quarterly.
- (2) Delivery of Test solutions as needed to the IDS Combination Center
- (3) Prepare a DORISReport for dissemination to the community to describe the quarterly deliveries.
- (4) Provide summary materials as part of the GSC presentation to the DORIS AWG meeting in Munich, April 4, 2019.

Period of Performance August 1, 2018 – July 31, 2019.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6031/6 (Technical)	Title: Precise Orbit Determination for Jason2, Jason-3, Jason-1, and TOPEX		Task Period: 08/01/2015 - 12/31/2018	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/27/2018	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost:	Current Mod Max. Fee:	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$73,158.00		
Total Estimated Cost:	Total Maximum Fee:	Task Order Total Cost (Total Est Cost + Total Max Fee): \$538,444.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>FRANK G LEMOINE</u> FRANK G LEMOINE	Date 07/18/2018 05:29 PM	Org Code 61A0	Phone 301.614.6109	
Project Resource Analyst (PRA) <u>Nicole Ayala</u> Nicole Ayala	Date 07/23/2018 01:45 PM	Org Code 61A.0	Phone 301.286.7109	
Branch Head (BH) <u>Scott B Luthcke</u> Scott B Luthcke	Date 07/03/2018 01:04 PM	Org Code 61A0	Phone 301.614.6112	
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> RONNETTE M BARNES I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.	Date 07/24/2018 08:33 AM	Org Code 1571	Phone 301.614.5925	
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ	Date 07/24/2018 10:10 AM	Org Code 61A0	Phone 301.614.6113	
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 10:53 AM	Org Code 210Y	Phone 301.614.6996	
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO	Date 07/27/2018 10:54 AM	Org Code 210Y	Phone 301.614.6996	
Gov. Cost Estimate: [REDACTED] Cost Estimate File Attached: Yes	Work Performed On-Site: Partial			
Funding Information: 066344.02.01.02.47(SCEX22018D),066344.02.01.02.47(SCEX22019D)	Government Furnished Property/Facilities: No			
Task Background Attached: Yes				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: FRANK G LEMOINE, Code 61A.0, Bldg 034, Room W288				

Task 6031, Mod 6

Precise Orbit Determination for Jason2, Jason-3, Jason-1, and TOPEX

The purpose of this task is to perform precise orbit determination for TOPEX/Poseidon, Jason1, Jason-2, and Jason-3 using SLR, DORIS, GPS, and Altimeter Crossover data. Orbits shall be computed that generally conform to the IERS2014 standards, use the reference frames or relevant updates (c.f. ITRF2014), new geopotential models that incorporate GRACE and GOCE data, the application of new ocean tide models for modeling dynamical ocean tide perturbations and ocean loading, and updated modeling of time-variable gravity. The new model updates shall include LRA phase map corrections for the Jason satellites. Orbits for Jason-1,2,3 shall be inter-compared internally and also with orbits of other analysis centers. The DORIS processing shall use the RINEX data standard rather than V2.2, and implement any improvements to the USO model that might account for perturbations caused by radiation exposure in the South Atlantic Anomaly. GSFC-computed orbits shall be assessed using altimeter crossovers, orbit overlaps, high-elevation SLR data as well as the SLR data from the core stations of the ILRS tracking network.

Task Documentation and Performance Metrics:

- (1) Precise orbits for TP, Jason-1, Jason2, & Jason-3 using latest models including a time series of orbits for Jason-2 & Jason-3; (Continued delivery as needed of the current ITRF2014-based orbits, and make deliveries of orbits using updated standards).
- (2) Processing of Jason-3 SLR & DORIS/RINEX data and delivery of orbits to the OSTST.
- (3) Presentation and/or poster for OSTST meeting (Ponta Delgada, Azores, September 2018)

Period of Performance

August 01, 2018 to Dec 31, 2018

Travel Required:

- Travel to the OSTST meeting (Ponta Delgada, Azores, Portugal) is authorized (1 person), to attend the OSTST meeting in September 2018.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6032/3 (Technical)	Title: Operation IceBridge Project Science Analysis Support		Task Period: 08/01/2015 - 07/31/2018	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/20/2017	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$223,961.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$667,832.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>THOMAS A NEUMANN</u>		Date 07/11/2017 01:40 PM	Org Code 6150	Phone 301.614.5923
THOMAS A NEUMANN				
Project Resource Analyst (PRA) <u>Ryan C Fiora</u>		Date 07/11/2017 02:24 PM	Org Code 1571	Phone 301.614.5691
Ryan C Fiora				
Branch Head (BH) <u>THORSTEN MARKUS</u>		Date 06/19/2017 01:03 PM	Org Code 6150	Phone 301.614.5882
THORSTEN MARKUS				
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>		Date 07/11/2017 02:48 PM	Org Code 1571	Phone 301.614.5925
Lisa M Grochola				
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>		Date 07/12/2017 09:44 AM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ				
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>		Date 07/13/2017 05:17 PM	Org Code 210Y	Phone 301.614.6996
ELIZABETH D ABRAHAM				
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>		Date 07/20/2017 11:42 AM	Org Code 210Y	Phone 301.614.6996
ANN L KEARNEY				
Gov. Cost Estimate: [REDACTED] Cost Estimate File		Work Performed On-Site: All		
Attached: Yes				
Funding Information: 769134.02.04.03.27(SCEX22017D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: THOMAS A NEUMANN, Code 615.0, Bldg 033, Room A220				

GGSG3 Statement of Work – Task 6032/3

Title: Operation Ice Bridge Project Science Support

Objective: This task supports production of science data products from the IceBridge Project Science Office in direct support of the mission goals and Level 1 Science Requirements. Responsibilities include support in production of the sea ice thickness product, quality control and scientific evaluation of the data. Staff shall also conduct independent research using IceBridge data products.

Period of Performance: August 1, 2017 through July 31, 2018

Technical Requirements:

Technical requirements for this task include, but are not limited to:

1. Provide independent scientific analysis of Operation IceBridge data products, in particular analysis of laser altimetry waveform data, to satisfy IceBridge mission goals and to evaluate overall data quality and data continuity with ICESat, CryoSat-2 and ICESat-2 data sets.
2. Provide oversight and expert guidance for development and production of sea ice thickness product from Operation IceBridge.
3. Support development of new algorithms and new IceBridge data products.

Reporting:

Provide quarterly reports on work completed, and upcoming work. Scientific results to be published in peer reviewed literature and to be presented at scientific conferences.

Travel Required:

Annual travel to the Fall AGU meeting in New Orleans, LA. Annual travel to one IceBridge science team in Irvine, CA or similar location may also be required. If appropriate, travel to an Operation IceBridge field campaign or an international conference. Other travel as requested.

IT Procurements:

Desktop systems are provided by the prime contractor. All procurements shall be made in accordance with the NASA IT procurement guidelines.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020	
Task Num/Mod Num: 6033/4 (Technical)	Title: Operation IceBridge Project Management		Task Period: 08/01/2015 - 07/31/2018	
Parent Task	Lower Subtasks: 0			
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/24/2017	Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$326,065.00		
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost(Total Est Cost + Total Max Fee): \$875,845.00		
Prior Contract/Task: None				
Task Monitor (TM) <u>THOMAS A NEUMANN</u> THOMAS A NEUMANN		Date 07/18/2017 11:32 AM	Org Code 6150	Phone 301.614.5923
Project Resource Analyst (PRA) <u>Ryan C Fiora</u> Ryan C Fiora		Date 07/20/2017 11:30 AM	Org Code 1571	Phone 301.614.5691
Branch Head (BH) <u>THORSTEN MARKUS</u> THORSTEN MARKUS		Date 06/19/2017 01:04 PM	Org Code 6150	Phone 301.614.5882
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u> Lisa M Grochola		Date 07/20/2017 11:39 AM	Org Code 1571	Phone 301.614.5925
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.				
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u> BRAULIO V SANCHEZ		Date 07/20/2017 11:41 AM	Org Code 61A0	Phone 301.614.6113
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u> ELIZABETH D ABRAHAM		Date 07/21/2017 04:01 PM	Org Code 210Y	Phone 301.614.6996
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u> VICTOR S YOCCO		Date 07/24/2017 04:45 PM	Org Code 210Y	Phone 301.614.6996
Gov. Cost Estimate: [REDACTED] Cost Estimate File		Work Performed On-Site: All		
Attached: Yes				
Funding Information: 769134.02.04.03.27(SCEX22017D)		Government Furnished Property/Facilities: No		
Task Background Attached: No				
Capital Asset Item: No				
Contractor will develop specification or statement of work under this task for a future procurement: No				
Deliver To: THOMAS A NEUMANN, Code 615.0, Bldg 033, Room A220				

GGSG3 Statement of Work – Task 6033/4

Title: Operation Ice Bridge Project Management

Objective: This task supports project management for the IceBridge Project Science Office at Goddard directly related to meeting the mission's level 1 science requirements and mission goals.

Specific objectives are: Provide coordination between the IceBridge units including the instrument teams, university funded campaigns (UAF, ICECAP, U Colorado), aircraft operators, mission managers, and NSIDC. Support in compiling project documentation and project reports for tracking progress towards meeting the mission's level 1 science requirements. Tasking team members to help with report compilation.

Period of Performance: August 1, 2017 through July 31, 2018

Technical Requirements:

Technical requirements for this task include, but are not limited to:

- #1: Compile general project documentation such as flight statistics of all campaigns and deployment, number of participants in field, number of missions flown, list of publications, etc.
- #2: Develop mission plans for field deployments considering both operational and science aspects.
- #3: Help organizing annual science team meetings at Goddard and on the west coast (includes travel).
- #4: Help tracking and evaluating progress of the project towards meeting the level 1 science requirements.
- #5: Help evaluating overall integrity and quality of the IceBridge data delivered to NSIDC, in particular in regard to the level 1 science requirements. Oversee timely data delivery from instrument teams to NSIDC.
- #6: Help with financial and work planning of project science office and data products.
- #7: Support IceBridge coordination during deployments and in preparation for campaigns, including travel to aircraft operators and for field work.
- #8 Support similar functions for the ABOVE mission and related field campaigns.

Reporting:

Provide quarterly reports on work completed, and upcoming work.

Travel Required:

Travel in support of OIB field deployments. As in past years, the OIB deployment schedule and destinations are very fluid, and substantial flexibility is required. For the purposes of costing, I expect a fall deployment to Thule, Greenland (2 weeks), a fall deployment to Punta Arenas, Chile (2 weeks). In addition, the contractor shall

support the annual Science Team meeting, and we anticipate ~3 overnight trips to WFF in support of instrument integration. Other travel as requested.

IT Procurements:

Desktop systems are provided by the prime contractor. All procurements shall be made in accordance with the NASA IT procurement guidelines.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020
Task Num/Mod Num: 6040/5 (Technical)	Title: Numerical dynamo modeling and geomagnetic data assimilation		Task Period: 08/01/2016 - 07/31/2019
Parent Task	Lower Subtasks: 0		
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 09/07/2018
Awarded To: Stinger Ghaffarian Technologies Inc (SGT)			
Current Mod. Est. Cost: [REDACTED]	Current Mod Max. Fee: [REDACTED]	Current Mod Cost (Mod Est Cost + Mod Max Fee): \$185,612.00	
Total Estimated Cost: [REDACTED]	Total Maximum Fee: [REDACTED]	Task Order Total Cost (Total Est Cost + Total Max Fee): \$472,400.00	
Prior Contract/Task: None			
Task Monitor (TM) <u>Weijia Kuang</u>	Date 09/06/2018 12:28 PM	Org Code 61A0	Phone 301.614.6108
Weijia Kuang			
Project Resource Analyst (PRA) <u>Nicole Ayala</u>	Date 09/06/2018 12:40 PM	Org Code 61A.0	Phone 301.286.7109
Nicole Ayala			
Branch Head (BH) <u>Scott B Luthcke</u>	Date 08/10/2018 12:22 PM	Org Code 61A0	Phone 301.614.6112
Scott B Luthcke			
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 09/06/2018 03:09 PM	Org Code 1571	Phone 301.614.5925
RONNETTE M BARNES			
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.			
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 09/06/2018 03:35 PM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ			
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 09/07/2018 09:34 AM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO			
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 09/07/2018 09:36 AM	Org Code 210Y	Phone 301.614.6996
VICTOR S YOCCO			
Gov. Cost Estimate: [REDACTED] Cost Estimate File	Work Performed On-Site: All		
Attached: Yes			
Funding Information: 281945.02.47.03.70(SCEX22018D)	Government Furnished Property/Facilities: Yes		
Task Background Attached: Yes			
Capital Asset Item: No			
Contractor will develop specification or statement of work under this task for a future procurement: No			

Deliver To: **Weijia Kuang, Code 61A.0, Bldg 034, Room W284**

Statement of Work

Contractor shall provide support in numerical dynamo modeling and geomagnetic data assimilation in the areas of high-performance computation, algorithm development and implementation, data I/O interface, simulation results analysis, scientific proposals and mission support. Ongoing and new work includes improvement of MoSST core dynamics model, MoSST_DAS system, and applications of the models to geodynamo, planetary dynamo and geomagnetic data assimilation research. In particular, the following shall be done:

- (a) MoSST core dynamics model: improve the finite difference algorithm, and improvement of parallelization.
- (b) MoSST_DAS: support validation/implementation of variational assimilation component and SV assimilation function.
- (c) Present progress and results at national and international meetings as required; contribute to publications of scientific paper on peer-reviewed journals describing results; participate in proposals to NASA ROSES.

The following additional efforts are added to this task (for the remaining period of FY 2018):

- (a) Development of new GEMS driver for parallel ensemble simulation
- (b) Development of Python-based new GEMS driver for HEC systems
- (c) Development of new MoSST with improved CFL conditions

The following additional efforts are added to this task (for the period from 10/01/2018 to 07/31/2019):

1. Improve anelastic MoSST model, including implementation of compact finite difference algorithm to the momentum equation
2. Python-based driver for an ensemble of dynamo simulations (different from that for GEMS)
3. Improve scalability of new MoSST
4. Integration of new MoSST with GEMS, including new interface modules for EnKF component in GEMS.

Overall Progress

- a) Accomplishment of the three added tasks for the remaining period of FY 2018
- b) Accomplishment of the additional efforts for the period from 10/01/2018 to 07/31/2019.

Contract: Geophysics Geodynamics and Space Geodesy Support Services (GGSG3)		Contract Num: NNG15HZ37C	Period: 08/01/2015 - 07/31/2020
Task Num/Mod Num: 6047/3 (Technical)	Title: Space Geodesy Project (SGP) Information Technology (IT) Security Support		Task Period: 09/01/2017 - 07/31/2019
Parent Task	Lower Subtasks: 0		
Task Type: Code 600	Flight: Non-Flight	Process Stage: Fully_Awarded	Process Date: 07/05/2018 Awarded To: Stinger Ghaffarian Technologies Inc (SGT)
Current Mod. Est. Cost: ██████████	Current Mod Max. Fee: ██████████	Current Mod Cost(Mod Est Cost + Mod Max Fee): \$269,512.00	
Total Estimated Cost: ██████████	Total Maximum Fee: ██████████	Task Order Total Cost(Total Est Cost + Total Max Fee): \$434,395.00	
Prior Contract/Task: None			
Task Monitor (TM) <u>Benjamin P Michael</u>	Date 06/28/2018 05:36 PM	Org Code 61A0	Phone 301.614.5370
Benjamin P Michael			
Project Resource Analyst (PRA) <u>Deysi A Padilla Reyes</u>	Date 06/28/2018 05:48 PM	Org Code 1571	Phone 301.286.1149
Deysi A Padilla Reyes			
Branch Head (BH) <u>STEPHEN M MERKOWITZ</u>	Date 06/18/2018 12:10 PM	Org Code 61A0	Phone 301.286.9412
STEPHEN M MERKOWITZ			
Contract Resource Analyst (CRA) <u>RONNETTE M BARNES</u>	Date 06/29/2018 10:06 AM	Org Code 1571	Phone 301.614.5925
CHRISTINE M BAXLEY			
I hereby verify that the government cost estimate accompanied with this PR complies with GPR-5100.5B.			
Contracting Officer Technical Rep. (COR) <u>BRAULIO V SANCHEZ</u>	Date 06/29/2018 10:43 AM	Org Code 61A0	Phone 301.614.6113
BRAULIO V SANCHEZ			
Contract Specialist (CSp) <u>ELIZABETH D ABRAHAM</u>	Date 07/05/2018 10:21 AM	Org Code 210Y	Phone 301.614.6996
ELIZABETH D ABRAHAM			
Contracting Officer (CO) <u>ELIZABETH D ABRAHAM</u>	Date 07/05/2018 10:22 AM	Org Code 210Y	Phone 301.614.6996
ELIZABETH D ABRAHAM			
Gov. Cost Estimate: ██████████ Cost Estimate File	Work Performed On-Site: Partial		
Attached: Yes			
Funding Information: 351080.02.06.01.01.02.05(SCEX22018D)	Government Furnished Property/Facilities: No		
Task Background Attached: No			
Capital Asset Item: No			

Statement of Work Format

Space Geodesy Project (SGP) Information Technology (IT) Security Support

1. Contractor: SGT, Inc.

2. Contract No.:
NNG15HZ37C

3. Task Order No.: 6047
CY4 Initial TO

4. Job Order Number/Appropriation:
351080.02.06.01.01.02.05/SCEX22017D

5. TM Name/Code/Phone:
Benjamin Michael/4-5370

6. Description of Requirement to be Performed:

Space Geodesy Project (SGP) Information Technology (IT) Security Support & System Administrator Duties

The contractor shall support the Space Geodesy Project (SGP), managed by the Geodesy and Geophysics Laboratory (Code 61A).

The SGP is tasked by NASA headquarters to develop, build, install and operate a series of geodetic sites worldwide consisting of Satellite Laser Ranging (SLR), Very Long Baseline Interferometry (VLBI), and Global Navigation Satellite Systems (GNSS) systems. These systems supply science and engineering data for a myriad of science and operational needs including, earthquake displacements, gravity field science, precise orbit determination (POD), and international terrestrial reference frame (ITFR) development.

The contractor with direction from the SGP Information System Security Officer (ISSO) shall develop, implement and maintain a comprehensive IT security program covering all of the SGP assets in accordance with applicable Federal, NASA and Goddard Space Flight Center (GSFC) IT rules, policies and mandates. This shall include reviewing current SGP assets that are currently operating under disparate System Security Plans (SSP). Developing a program to migrate those assets to a comprehensive SGP SSP and implementing that program to move and maintain all SGP assets under a comprehensive SGP IT program.

7. Task Documentation Requirements/Deliverable Items:

- a. Implement and maintain an IT configuration management system using the Gemini software or other software as appropriate to ensure tracking of all Federal, NASA and GSFC mandated IT actions. Develop any custom scripts necessary to ensure the CM software meets the needs of the SGP project.
- b. Develop, implement and maintain a comprehensive SGP System Security Plan (SSP) that will encompass remote sites, both US based and foreign.
- c. Develop and maintain risk assessment reports (RAR), boundary diagrams, Interconnection Security Agreements (ISA) and any other required documentation for the SGP SSP.
- d. Develop and implement a plan to migrate the SLR worldwide operations from their current SSP to the new consolidated SGP SSP.
- e. Develop and implement a plan to migrate the current VLBI SSP to the new consolidated SGP SSP.
- f. Develop and implement a plan to migrate any remaining SGP development systems, i.e. Goddard Geophysical Astrophysical Observatory (GGAO) assets into the new SGP consolidated SSP.
- g. Develop Interconnection Security Agreements (ISA) as needed for all SGP IT activities.
- h. Serve as the SGP IT Security representative at SGP, GSFC and NASA IT security meetings with the ISSO or in lieu of the ISSO during his/her absence.
- i. Shall provide guidance and input to network engineers working on SGP networking to ensure present and future requirements for IT security are met as per the SGP SSP, GSFC and NASA IT requirements.
- j. Interact with contractors providing IT support and infrastructure to the SGP to ensure that they understand the requirements of the SGP SSP, GSFC and NASA IT security requirements and IT Security requirements as laid out in their contracts.
- k. Manage the yearly Audit and Assessment (A&A) SGP response to the GSFC assessment team. Prepare documentation as needed for the A&A, serve as the central point of contact along with the ISSO on all matters related to A&As, and ensure the SGP IT resources are compliant with the SGP SSP, GSFC, NASA and Federal IT requirements.
- l. Develop, implement and manage a plan for SGP to meet the Department of Homeland Security (DHS) requirements with their Continuous Diagnostic and Monitoring (CDM) initiative as it pertains to NASA and GSFC requirements at locations on the GSFC campus and at SGP sites both in the continental US (CONUS) and foreign locations.
- m. Serve as a central point of contact within SGP for all questions related to IT security, attending SGP meetings as required, providing feedback and solutions to IT security mandates from the center and

NASA HQ.

- n. Maintain membership in security mailing lists from GSFC and NASA to ensure latest threats are monitored and passed along to the SGP system administrators and SGP managers.
- o. Track SGP IT operating systems are being patched and updated as per the SGP SSP, GSFC and NASA requirements.
- p. Run SGP, GSFC, and NASA provided security assessment software on a regular basis to test SGP IT resources for vulnerabilities, open ports, misconfigured systems and other items as directed the ISSO and GSFC IT professionals.
- q. Maintain an inventory of the SGP IT hardware and software resources as part of the SGP SSP requirement.
- r. Generate weekly reports to the SGP ISSO and ISO describing current status, progress and activity of actions.
- s. Provide support to the ISSO on any requests from the NASA Security Operations Center (SOC), NASA IG, and other agencies in dealing with requests for data, vulnerabilities or dealing with compromised assets.
- t. Attend and participate in designated IT security meetings, telecons and working groups as directed by the SGP ISSO or ISO and provide timely feedback on topics of discussion.
- u. Revise and enhance all SGP IT security standard operating procedures (SOP) to contain up-to-date instructions for all tasks performed by SGP staff.
- v. Utilize all available GSFC, NASA and Federal IT wiki's and other facilities as appropriate to managing the SGP IT tasks and software.
- w. Conduct all required training to become and maintain as a NASA certified system administrator (SA).
- x. Shall function as the NASA designated SA for all IT equipment assigned by the SGP Information System Security Officer (ISSO) within the SGP enterprise.
- y. Contractor shall ensure all security patching and updates to IT equipment are conducted as laid out in NASA, GSFC and SGP directives
- z. Contractor shall work with the ISSO and the 600 Directorate Deputy Computer Security Engineers (DCSE) on IT security data calls for the agency, GSFC, and directorate.
- aa. Contractor shall work with the SGP engineering teams to setup IT baselines, patching schedules and configurations to meet user needs, NASA IT security and remote administration needs.
- bb. Contractor shall attend SA meetings as required by the division, directorate or GSFC.

8. Period of Performance: August 1, 2018 through July 31, 2019

9. Travel, Materials, Etc. Known to be Required:

10. Performance Standards:

11. Other: