

(Instructions and Distribution on Reverse)

1. CONTRACTOR: <b>SSAI</b>	2. CONTRACT NO.: <b>NNG12HP06C</b>	3. TASK/REVISION NO.: <b>CY4 0 08</b>
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4. JOB ORDER NO./PROJECT:	5. FLIGHT HARDWARE/SOFTWARE; CRITICAL GSA (IF, YES, OBTAIN BLOCK 16 CONCURRENCE): YES <input checked="" type="checkbox"/> NO	6. DESIGNATED FLIGHT ASSURANCE MGR.:
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7. DESCRIPTION OF WORK TO BE PERFORMED (OBJECTIVES OR RESULTS DESIRED):

**GMAO Operational Software Development, Test and Maintenance**

8. TASK DOCUMENTATION REQUIREMENTS/DELIVERABLE ITEMS:

**See Attached**

9. PERFORMANCE/MILESTONE SCHEDULE:

**January 20, 2015 – January 31, 2016**

10. QUALITY ASSURANCE REQUIREMENTS:

11. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:

12. OTHER (FUNDING, NTE, HOURS, ETC.):

Estimated Cost  
Fixed Fee  
Estimated Total Cost-Plus-Fixed Fee                    \$1,045,647

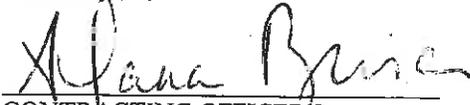
13. TASK ORIGINATOR/MONITOR/CODE/PHONE:  
**Gi-kong Kim**

14. BRANCH APPROVAL:	15. DIVISION CONCURRENCE:
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16. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE:  
**Stephen Cohn**

17. CONTRACTOR SIGNATURE:

18. THIS TASK ORDER IS ISSUED  
PURSUANT TO THE TERMS OF THE  
CONTRACT.

  
CONTRACTING OFFICER'S  
SIGNATURE/ DATE **Ayana A. Briscoe**  
**Contracting Officer**  
TYPED OR PRINTED NAME

Science Systems and Applications, Inc.  
NNG12HP06C  
Task Order Statement of Work

Task Order Number: CY4\_08 Mod0

Task Order Title: GMAO Operational Software Development, Test and Maintenance

1.0 Task Monitor (TM):

Name: Gi-kong Kim  
Organization: GMAO:GMAO  
Email Address: gi-kong.kim@nasa.gov

2.0 Description of Work to be Performed

Updates from CY3 (Mod 1) to CY4 are indicated in red.

The purpose of this task is to develop and maintain operational DAS software for delivery of GEOS data assimilation and forecast products in support of NASA Earth Science instrument teams and missions. In addition to the operational GEOS SW development, the contractor shall develop GEOS system test plans, test procedures and test reports for GEOS system verification, GEOS system validation, and GEOS system operational end-to-end testing. The operational GEOS system will remain operational throughout the task performance period. The operational GEOS forward processing will have a few separate streams; (1) FP-IT for EOS instrument teams, missions, and authorized users; (2) G5-CERES for the NASA CERES team; (3) FP for internal evaluation of the system, interaction with other modeling centers, and real time support for field campaigns; and (4) SMAP L-4 Analysis data production will start soon after the SMAP satellite launch in January 2015. The 30-year reanalysis using GEOS-5 in support of the MERRA project will continue during the task performance period. A MERRA follow-on reanalysis, MERRA2 that started in early 2014 will continue MERRA2 production for the historical period is expected to be completed in early 2015. The MERRA2 forwarding processing will continue indefinitely. The GEOS system is expected to be upgraded periodically, once or twice a year typically, to improve the scientific data quality. It is expected that each GEOS system upgrade will require GEOS data reprocessing for the EOS instrument teams. GMAO will provide real-time support for field campaigns, typically one or two a year. GMAO will implement a GEOS-5 operational system at NAS to serve as a backup for the real time system routinely run at GSFC/NCCS. The high performance computers (HPC) at NCCS used for the GEOS-5 data production may be replaced with a new architecture.

The following subtasks are to be performed for maintenance and development of the GEOS systems.

Specific operational SW development sub-tasks include:

(a) For the GEOS systems, the contractor will support the TM in defining the operational software requirements and producing a software architecture design based on requirements. For new operational software components, the contractor will conduct design walk-throughs, develop

operational software components and conduct software walk-throughs or inspections. The contractor will be responsible for development and maintenance of software components required to integrate upgrades to the GEOS systems into the operational environment. The contractor will be responsible for addressing operational software patches for GEOS systems. The typical codes to be developed are input data preprocessing, I/O routines including output data formatting (such as HDF-5) for external customers, job scheduling scripts, and data management scripts. When the HPC architecture at NCCS is changed, the contractor will be responsible for the development and testing all the operational system components to migrate the operational GEOS system to new HPC systems. The contractor will be responsible for completing the operational system migration. The contractor will provide technical summaries on development approach when requested to assist the Government in making critical development or management decisions.

(b) The contractor will be responsible for maintaining the GEOS-5 operational system that is being used for multi-year reanalysis or reprocessing assimilations. The contractor will work to clarify output streams, archival, and pickup/push for GES DISC, if necessary.

(c) The contractor will be responsible for providing job control/script, including user-friendly utilities for setting up the experiments and making post-processing more flexible. The contractor will provide assistance to scientific software developers on synchronizing with new releases of GEOS systems. The contractor will provide general support to GEOS data users, external or internal, in answering questions or solving technical problems related to the use of GEOS data.

(d) The contractor will maintain software development within the CVS software repository. The Contractor shall merge branches, integrate software components, and build the GEOS DAS for system verification (testing) and subsequent promotion of the system to Operations. The Contractor shall maintain the baselined GEOS DAS software versions in the CM repository following the approved CM procedure. The Contractor shall maintain and track all change documents, such as change requests and problem reports. The Contractor shall maintain and enhance, as needed, the structure of the baseline repository for development, testing, and Operations. The Contractor shall work with the government to perform backup procedures to ensure the availability of the most recent GEOS DAS release.

(e) The contractor will be responsible for maintaining and updating the file specification document that describes the format, frequency and fields in each of the data products.

(f) The contractor will support external elements such as the GES DISC, EOS instrument teams, and high resolution forecast data users testing by providing sample operational datasets. The contractor will provide support to GES DISC on the definition and implementation of modifications to the GMAO/DISC interface.

(g) The contractor will develop test plans to evaluate functional behavior and throughput performance of new releases of GEOS systems. The contractor will define test datasets, test targets and specific run-time configurations modifications for system verification, system validation and operational end-to-end tests. The testing will potentially include system verification, system validation, operational end-to-end tests, and system porting to changing

computer environment at NCCS. The scope of the testing activity should be reviewed periodically to see if there are additional test scenarios that would benefit the entire process. Based on test plan activities, the contractor will update job scripts to support test phases. The contractor will initiate all test phases and monitoring. The contractor will define procedures for monitoring extensive tests, system validation. The contractor will update the status of each experiment on the Intranet. The contractor will manage discrepancies encountered through each test phase via a discrepancy reporting process. The contractor will generate test reports corresponding to each test plan. These reports will capture which build of software was used to support each phase of testing, problems encountered and resolved during each phase of testing, and evaluation of functional behavior and throughput performance. For new releases that require a system validation, the Science Group will assess the scientific quality and provide a summary for inclusion in the test report.

(h) The contractor shall implement an operational GEOS-5 production system at NAS to serve as a backup for the GEOS-5 forward processing systems running at NCCS. This effort includes finalizing the system operations concept definition, operational SW development, and system testing for the operational capability.

(i) The contractor shall continue to develop the SMAP L-4 analysis capability. The system should be developed as defined in the SW architecture design document and according to the work schedule as specified in the SMAP SDS system development master schedule. The contractor shall provide support for the SMAP system level development activities as necessary. The contractor shall maintain the SMAP L-4 analysis operational system after the SMAP satellite launch.

(j) The contractor shall provide guidance to the GEOS data production team for improving the efficiency of the operations procedures and monitoring. The task team in an on-call capacity shall respond to problem reports from the GEOS data production team and help resolve technical problems to minimize the GEOS data production delays.

(k) The contractor will provide sub-task schedule details and updates to the TM for inclusion in high level schedule.

The Contractor shall locate, archive, prepare and provide GMAO data products and other ancillary data, e.g. data used for product verification or validation, to the GMAO data product users and developers whose data requests have been approved by the GMAO management.

(l) The Contractor shall log all the incoming data requests by the GMAO data users. The Contractor shall keep up-to-date information of the status of all the approved data requests. The GMAO data users will include both the scientists within the GMAO and external users. The Contractor shall assess the feasibility of meeting the data requests including effort required, HW resource required, and schedule to service the data request. The Contractor shall provide the results of the assessment to the Government to be used in making approval decision on the data requests. The Contractor shall prepare, format and package the requested data and make them accessible to the requester within the delivery schedule agreed with the requester.

(m) The Contractor shall obtain, catalog and maintain ancillary data identified by the Government to be used for science research, SW development, or product verification within the GMAO.

(n) The contractor will be responsible for maintaining SW utilities such as Semper-Py and QuADS to adapt to changing infrastructure, technology, and GEOS-5 system upgrades. The contractor will evaluate and evolve the utilities to improve their usability and performance. This will include a complete analysis and redesign/reengineer of the software (or portions thereof) to increase capabilities and ease of maintenance. The contractor will also maintain the post-processing functions such as data movement and data access tools that are required for GEOS-5 data distribution on the NCCS data portal.

### 3.0 Special Requirements

None

### 4.0 Performance/Milestone Schedule

The GMAO Contract Year 4 POP is February 01, 2015 - January 31, 2016

### 5.0 Deliverables/Reporting Requirements

Monthly report; new software components; DRs, PRs, and CRs; operational scripts for GEOS system releases; CVS tags for validation and operational DAS versions; GEOS system test plans; test reports; updates to the data products file specification documents

### 6.0 Other Information Needed for Performance of Task

**Travel Authorized:** 2 x 2-person 4-day domestic trips are expected. Local travel for training purposes, not to exceed 5 person-days, will be authorized at the request of the TM or the GMAO Chief.

### 7.0 Data Rights

N/A

### 8.0 Safety

Staff on this task will comply with federal, state, local, and center safety regulations. This will be accomplished through management emphasis, technical training, and personal responsibility. Staff will participate in safety orientation and training in accordance with the contract Safety and Health Plan, and work within the requirements of that plan.

### 9.0 Risk

Contractor shall provide ongoing risk assessment and mitigation in performance of the Task Order. Priorities shall be re-evaluated as appropriate with the TM. Cost and schedule

performance shall be assessed on a regular basis (no less frequently than monthly) and significant variations discussed and acted on in consultation with the TM and COTR.

#### 10.0 Proposed Cost and Fixed Fee

In accordance with Paragraph B.5, of the contract, propose the Cost and Fixed Fee amount.