NASA

GODDARD SPACE FLIGHT CENTER

STATEMENT OF SCOPE

FOR THE

REQUEST FOR INFORMATION (RFI)

PERTAINING TO THE

SOFTWARE ENGINEERING SUPPORT (SES) CONTRACT

SOFTWARE ENGINEERING DIVISION

September 10, 2008

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1   INTRODUCTION

1.1   BACKGROUND

The National Aeronautics and Space Administration (NASA) was established to plan, direct, and conduct aeronautical and space activities for peaceful purposes and to benefit all mankind. The operational aspects of NASA's work are divided among field installations around the country and involve research and development activities under the responsibility of six technical program offices at NASA Headquarters.

The Goddard Space Flight Center (GSFC) is located in Greenbelt, Maryland with facilities located at the Wallops Flight Facility, Wallops Island, VA, the Independent Verification and Validation Facility located in Fairmont, WV, and the Goddard Institute for Space Studies located in New York, NY. The GSFC is chartered to expand the knowledge of the Earth and its environment, the solar system, and the universe through observations from space. To this end, GSFC's primary emphasis is in scientific investigation, in the development and operation of space systems, and in the advancement of essential technologies. In accomplishing this responsibility, the GSFC has undertaken a broad program of scientific research, both theoretical and experimental, in the study of space phenomena and Earth sciences. The program ranges from basic research to flight experiment development and from mission operations to data analysis.

Within the GSFC, the Applied Engineering Technology Directorate (AETD) plans, organizes, and conducts a broad range of technical research and development activities in support of science applications. The AETD is responsible for providing engineering expertise and support in the formulation, design, development, non-flight fabrication, integration, test, verification, and operation of components, subsystems, systems, science instruments, and complete spacecraft for multiple projects. The specific components, subsystems, systems, and science instruments are ultimately integrated into the spacecraft to form a science observatory. It is these observatories that are launched to fulfill the mission of the GSFC. The AETD comprises five engineering divisions: the Mechanical Systems Division (MSD), the Software Engineering Division (SED), the Instrument Systems and Technology Division (ISTD), the Electrical Engineering Division (EED), and the Mission Engineering and Systems Analysis Division (MESA).

The Software Engineering Division (SED) is responsible for the engineering of software, data and information systems throughout all phases (formulation through on-orbit operations) of NASA programs and projects. These systems include: flight, ground, and science data software for spacecraft monitoring, control, on-orbit performance management and operations; spacecraft data processing and analysis, and information management; and science data analysis and management. The SED focuses on the development of reusable flight and ground architectures and frameworks to reduce mission cost, decrease development time, minimize

customer risk, and increase the scientific value of information products. The SED provides expertise in software systems engineering, secure environments, and the software product development lifecycle to ensure the delivery of reliable software, data and information systems solutions.

The Software Engineering Support (SES) Contract provides support for the core business of the Division which encompasses the design, development, test and deployment of software, data and information systems that support aerospace missions. The scope of the contract also includes support for Division managed development/test labs, test facilities, and the technical operations of the Division.

1.2 LOCATION OF WORK

The location of the work to be completed and described in this document are primarily in support of NASA/GSFC activities in Greenbelt, Maryland. The work may also include support for other NASA/GSFC facilities, including sites in Virginia, West Virginia and New Mexico; and in support of NASA-involved projects at other locations within the United States.

Each subtask request shall indicate the location of work and the split between on-site (GSFC-provided facility space) and off-site (customer-provided facility space). It is expected that over half of the work will be performed at the contractor's site.

1.3 CLEARANCES

Some secret, top secret, or Sensitive Compartmented Information (SCI) clearances may be needed. The expectation is for approximately 1% of the workforce plus a minimum of one available manager/supervisor to have a clearance as described above.

Expanded needs in this area shall be discussed in advance of the development of new tasks.

1.4 ORGANIZATIONAL CONFLICT OF INTEREST (OCI)

Several tasks may require OCI plans and agreements. The Contractor, including any subcontractors, shall be able to complete a task-specific OCI within 30 days from task submission by the government.

1.5 GOVERNMENT FURNISHED SERVICES

The Government shall provide the facilities for those functions performed on site. These facilities include office/cubicle space, laboratories, and all facilities required to perform the work defined in this document. Exceptions to this stipulation shall be documented in individual task orders.

1.6 APPLICABLE DOCUMENTS

NPR 7120.5B, "NASA Program and Project Management Processes and Requirements"

NPR 7150.2, "NASA Software Engineering Requirements"

1.7 REFERENCE DOCUMENTS

To be supplied.

2 TECHNICAL SCOPE

This section defines the types of technical tasks to be performed under the scope of the proposed contract. Individual government task orders shall specify the specific work to be performed. The organization of this section also represents the structure of the Work Breakdown Structure used in support of program tracking.

2.1 ENGINEERING STUDIES AND ANALYSIS

The Contractor may perform engineering studies and analysis for requirements definition, operations concept definition, systems engineering, trade studies, and system definition in support of efforts in the formulation, implementation, and/or operations phases. Tasks may cover a broad range of mission and system development domain areas.

2.2 FLIGHT SOFTWARE (FSW) SYSTEMS

The Contractor shall perform the planning, specification, design, development, testing and maintenance and sustaining engineering of flight software systems for instruments and spacecraft associated with in-house GSFC projects and other multi-center commitments in accordance with established organizational NPR 7150.2 and GSFC-STD-1000 compliance procedures and policies. The Contractor shall manage, refine, and extend the flight software infrastructure, products, plans, and processes related to new flight software developments, flight software reuse

libraries, flight software configuration management systems, flight software test, verification and validation systems, and flight software lessons learned databases. The contractor may develop simulation capabilities for all aspects of the flight software including, dynamic simulation, command and data handling simulation and science data simulation.

2.2.1 Mission Flight Software Development

The Contractor shall provide systems engineering and/or flight software systems management related tasks for GSFC managed spacecraft and instrument procurements. The Contractor shall provide flight software system engineering for the new spacecraft and/or new instrument proposals by conducting trade studies, documenting software systems architecture, requirements and interfaces.

2.2.2 Flight Software Development

The contractor shall provide flight software systems engineering, software engineering and development services to perform requirements analysis, design, development, integration, verification for spacecraft, science instruments, and flight hardware components.

2.2.3 Flight Software Verification and Validation

The Contractor shall support the flight software test program including build verification testing, system validation testing, and flight software test tools development for the mission. The contractor shall utilize flight software test-beds and simulators required for verification and validation of flight software related products.

2.2.4 Flight Software Maintenance and On-orbit Sustaining Engineering

The Contractor shall ensure the health and safety and successful science operations of each on-orbit spacecraft. This support includes on-orbit multi-mission flight software sustaining engineering, pre-launch flight software training and flight software maintenance preparations, and general Branch support. The contractor shall be required to analyze on-orbit anomalies, recommend and provide flight software solutions, provide consultation to the Flight Operations Team (FOT), prepare flight software patches, investigate and prototype agreed upon new technology initiatives, and provide a current archive of all flight software versions, associated tools, testbed software and databases for each supported mission. Currently the Flight Software Systems Branch supports twelve on-orbit missions and seven more in varying states of pre-flight readiness. The contractor shall also be assigned sustaining engineering responsibilities for several new missions during the contract period.

2.2.5 Flight Software High Fidelity Testbeds and Simulations

The contractor shall provide systems engineering and development services to perform requirements analysis, design, development, integration, verification for flight software test-beds and simulations.

2.2.6 Flight Software Infrastructure/Support

The contractor shall support identifying, developing, and deploying improved software engineering processes, along with supporting artifacts (policies, processes, procedures, standards, guidelines, templates, tools, etc.). The contractor shall assist Code 582 management in the continued development and operation of Branch standards, Configuration Control Board (CCB) and associated configuration management tools.

2.2.7 Flight Software Technology Development

The Contractor shall provide services for research, design, development, implementation, test, and analysis of flight software systems technologies.

2.3 GROUND SOFTWARE AND SYSTEMS

The Contractor may perform new or ongoing development and sustaining engineering of ground software and data systems. Contractor activities may include participation as a part of a mission's or project's data system development team. Ground systems development includes hardware integration, test, and deployment; and software design, development, test and deployment. The software may include commercial off-the-shelf (COTS), government off-the-shelf (GOTS), new development, or some combination of the aforementioned.

2.3.1 Ground Software Architectures

The contractor may enhance and extend government-developed architectures, such as the Goddard Mission Systems Evolution Center (GMSEC) architecture, to comply with evolving software engineering concepts, standards, and customer/mission requirements, to include new functions and capabilities, and to provide compatibility with external systems.

2.3.2 Ground Software Applications

The Contractor may perform the requirements analysis, design, implementation, verification, validation, documentation, and deployment into operations of hardware and software systems for mission ground software applications. The functions of these systems may include planning and scheduling, spacecraft command and control, event monitoring and assessment, automation, telemetry

trend analysis, and spacecraft performance analysis for instruments and spacecraft missions. The Contractor may also be required to ensure applications are compliant with the current GMSEC architecture.

2.3.3 Ground Software Sustaining Engineering

The Contractor may perform sustaining engineering of existing ground software systems and applications, including associated hardware and software, for systems that are in use at the start of the contract and those that are developed over the contract life. Existing ground software applications may include, but are not limited to, the Integrated Testing and Operations System (ITOS), the Advanced System Integration and System Test (ASIST) system, the Integrated Trending and Plotting System (ITPS), the Trending Analysis and Plotting System (TAPS), the Criteria Action Table (CAT), the GMSEC Reusable Analysis Event Toolkit (GREAT), the GMSEC Environment Diagnostic Analysis Tool (GEDAT), and the Automated Mission Planning System (AMPS).

2.4 SCIENCE SYSTEM DEVELOPMENT

The contractor may develop, implement and test science systems for operation, data processing, data management, data analysis, and/or data visualization. The contractor may provide science operations support for ongoing missions. The contractor may provide software and data systems engineering. Science systems development may include hardware integration, test and deployment, and software design, development, test and deployment. The software may include COTS, GOTS, new development, or some combination of the aforementioned.

2.4.1 Science Operations Systems

The contractor may design, develop, implement and test science data operations systems. This work may include science instrument command definition, processing, and upload; and user interfaces. This work may include the definition, acquisition, implementation and maintenance of the associated hardware and software.

2.4.2 Science Data Processing Systems

The contractor may design, develop, implement and test science data processing systems for level-0 and higher level products. This work may also include science data and metadata definition, algorithm development, user interfaces, distributed processing systems and environments. This work may include the definition, acquisition, implementation and maintenance of the associated hardware and software.

2.4.3   Science Data Management Systems

The contractor may design, develop, implement and test science data management systems for science data distribution and archive. This work may also include science data and metadata definition, data query systems, users interfaces, distributed data systems and environments. This work may include the definition, acquisition, implementation and maintenance of the associated hardware and software.

2.4.4   Science Data Analysis and Visualization Applications

The contractor may design, develop, implement and test science analysis and visualization systems. This work may also include science data query systems, user interfaces, algorithm development, distributed data systems and environments. This work may include the definition, acquisition, implementation and maintenance of the associated hardware and software.

2.4.5   Science Data Systems Engineering

The contractor may perform requirements analysis, software and data systems design, process planning, process control, and verification, validation, and testing of science systems.   This work may also include evaluation of generated data products and documentation, definition of functional, performance and external requirements, definition of the system architecture, developing detailed system designs, determining tasks and their priorities, and preparing for and participating in various system reviews.

The contractor may maintain existing and newly developed science data systems. This work may include the definition, acquisition, implementation and maintenance of the associated hardware and software.

2.5   SUPPORTING SERVICES

The contractor may perform engineering services to provide a diverse variety of services and tools to maintain and manage the secure Information Technology (IT) environment supporting research, engineering, and administrative information requirements. The contractor may develop and maintain testbed and operational labs in support of flight, ground, and science software based activities.

The contractor may also be required to support the design, development, test and deployment of web-based collaborative and knowledge management systems, CMMI compliance and improvement support, and network design and performance studies. The contractor may also support the prototyping, design, and implementation of collaborative computing environments.

The contractor may also provide configuration management support for all software systems and system administration activities. The contractor may support configuration management of:

- Flight Software
- Ground Software
- Simulation Software
- Testbed hardware and software
- Ground and Flight databases

The contractor may provide systems administration including backups, new product installation, platform maintenance, etc. for the following:

- Flight software development and maintenance facilities
- Ground software development and maintenance facilities
- Simulation software development and maintenance facilities
- Testbed hardware and software development and maintenance facilities

2.5.1 Software Process Improvement (SPI) Support

The contractor may provide support in developing and maintaining the CMMI Process Assets and Tool Library for GSFC and NASA, deploying process assets and tools through mentoring and software training programs, and implementing the Division measurement program.

2.5.2 Network Engineering Support

The contractor may provide network engineering support. The contractor may research, design, develop, test, evaluate, integrate, validate, and demonstrate information assurance solutions for end-to-end mission/project networks. Areas of investigation include network security, scheduling, cryptographic modernization and key management, and cross domain solutions to meet the demands of network centricity and to resolve issues regarding current technology and capability shortfalls.

The contractor shall perform network tests for latency and packet loss spanning across the network layers associated with the IP protocol in a mission and development lab environment.

2.5.3 Systems Administration and IT Security Support

The Contractor may provide systems administration and IT security supporting services as tasked. These services include system or software installation, setup, configuration or de-installation; IP management; account management; backup; and data removal/cleaning for computer systems in development facilities. Task activities may include the preparation, review, and updating of IT security procedures and processes to ensure consistency with NASA and GSFC guidelines,

the reporting of security compromises, and the identification and repair of security incidents and anomalies.

2.5.4 Software Engineering Support for Application Development

The Contractor may provide engineering studies and analysis for requirements definition, operations concept definition, systems engineering, trade studies, and system definition in support of efforts focused on developing web services for mission systems traditionally not web based. The Contractor may provide support to develop prototypes and demonstrate solutions to meet capability needs, ensuring the necessary IT security and usability constraints and requirements are met.

2.5.5 Infrastructure Support

The contractor may provide institutional type support to assist individual Branches within the Division in the areas of property management, facilities upgrade/maintenance, and conference and meeting support.

2.6 ADVANCED CONCEPTS

The Contractor may formulate and develop advanced technology concepts and the advancement of their associated technology readiness level (TRL). The Contractor may be required to plan and accomplish the infusion of the resulting technology into mission or project systems.

The contractor may design and develop advanced concepts for all aspects of mission including hardware, complex electronics and software solutions to meet highly complex mission objectives. The contractor may provide input into further development and enhancement of existing technologies including GMSEC and the Core Flight Executive/Core Flight System architectures. The contractor may develop state-of-the-art configuration and administration tools as a product line in support of advanced architectures.

The contractor may develop advanced operations concepts in support of highly efficient mission operations which may include flight, ground or a mixture of both implementations.

2.7 SYSTEM DEPLOYMENT

The contractor may deploy systems for missions and projects. This work may include closely coordinating with the mission or project to identify requirements, perform trade studies, configure/enhance existing systems, delivery, integration,

testing, documentation and training. Systems deployed may include commercial and government developed.

3   MANAGEMENT

The contractor shall perform all the necessary program management functions including technical and business management in order to plan, implement, track, report and provide services which shall be specified by the issuance of task orders. The contractor shall be capable of providing all personnel and other resources, except as otherwise specified in the contract, necessary to accomplish the functions described in this document.

4   WORK DISTRIBUTION

Based on in-house estimates, the table below illustrates the distribution of work for each of the Sections described in the Technical Scope above. These levels/numbers are estimates only for work distribution at the start of the contract. Distributions may change during the life of the contract.

WBS	TITLE	EXPECTED PORTION OF TOTAL EFFORT
2.1	Engineering Studies and Analysis	5%
2.2	Flight Software Systems	40%
2.3	Ground Software and Systems	15%
2.4	Science Systems Development	10%
2.5	Supporting Services	5%
2.6	Advanced Concepts	10%
2.7	System Deployment	15%
	TOTAL	100 %

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