

Test Facilities Operations, Maintenance & Engineering (TFOME)

Contents:

1.0	Introduction	4
1.1	Purpose of this Contract	4
1.2	Mission Description and Objectives	4
1.3	GRC Organization	4
1.3.1	Facilities, Test and Manufacturing Directorate	5
1.3.2	Plum Brook Station	5
1.3.3	Center Operations Directorate	6
1.3.4	Safety & Mission Assurance Directorate	6
1.3.5	Aeronautics Directorate	6
1.3.6	Space Flight Systems Directorate	6
1.3.7	Research and Engineering Directorate	7
1.4	Testing activities at GRC	7
2.0	Scope and Requirements	7
2.1	Contract Structure	8
2.1.1	Base	8
2.1.2	IDIQ	8
2.2	General Scope and Requirements	8
2.3	Test Facilities and Laboratories	11
2.3.1	Testing	14
2.3.1.1	Scope	14
a)	Test Pursuit and Planning	14
b)	Test Preparation	14
c)	Test Operations	15
d)	Post-test Activities	15
2.3.1.2	Requirements	16
a)	Test Pursuit and Planning	17
b)	Test Preparation	17
c)	Test Operations	18
d)	Post Test Activities	18
2.3.2	Maintenance	18
2.3.2.1	Scope	18
2.3.2.2	Requirements	20

TFOME-II SOW
August 8, 2014

2.4	Manufacturing.....	21
2.4.1	Scope	21
2.4.2	Requirements	22
2.4.2.1	Staff Augmentation on GRC Shop Floor	22
2.4.2.2	Surge Support Staff.....	22
2.4.2.3	Supply Manufactured Hardware.....	22
2.5	Lifting Devices and Equipment (LDE).....	23
2.5.1	Scope	23
2.5.2	Requirements	23
2.6	PBS Institutional Support.....	24
2.6.1	Scope	24
2.6.1.1	PBS Infrastructure and Institutional Systems Operations and Maintenance..	25
2.6.1.2	PBS Institutional Services	26
2.6.2	Requirements	27
2.6.2.1	PBS Infrastructure and Institutional System Operations and Maintenance....	28
2.6.2.2	PBS Institutional Services	28
3.0	Management and Administration	28
3.1	Work Identification and Planning	29
3.2	Work Control.....	30
3.3	Workforce	31
3.3.1	Contractor Licensing, Certification, and Specific Experience Requirements.....	31
3.3.2	Safety POC	32
3.3.3	Critical Personnel Listing.....	32
3.4	Resource Management	33
3.4.1	Hours of Operation	33
3.4.2	Funding	33
3.4.3	Financial Reporting	33
3.4.4	Technical Reporting	34
3.4.5	Progress Review Meetings.....	34
3.5	Lifting Device and Equipment (LDE) Tracking and Reporting	34
3.6	Property Management	34
3.6.1	Government Furnished Property	34
3.6.2	Property Management.....	35
3.7	Procurements	35
3.7.1	Contractor Purchases.....	35
3.7.1.1	Approved Sources.....	36

TFOME-II SOW
August 8, 2014

3.7.1.2	Refunds.....	36
3.7.1.3	End of Contract	36
3.8	Information Technology (IT) Management	36
3.8.1	Information Technology Systems	36
3.8.2	IT Security	36
3.9	Quality Management and Control.....	37
3.10	Risk Management.....	37
3.11	Apprentice Program.....	37
4.0	Deliverables	37
5.0	Phase-In/Phase-Out.....	42
5.1	Joint Inventory	42
6.0	Abbreviations, Definitions and Acronyms.....	43
7.0	Attachments	45
7.1	Attachment B – FTMD/PBS Organizational Details and Functions	45
7.2	Attachment C – Representative Special Certifications and Training	45
7.3	Attachment D – Sample Test Facility Maintenance Tasks	45
7.4	Attachment E – Sample CMS Work Breakdown Structure	45
7.5	Attachment F – Plum Brook Station Master Building List	45
7.6	Attachment G – Purchases.....	45
7.7	Attachment P – Initial Government Furnished Equipment List	45
7.8	Attachment Q – Lifting Devices and Equipment	45
7.9	Attachment R – CMS Overview	45
7.10	Attachment S – Selected Documents from the GRC BMS Library	45

List of Figures:

Figure 1: Glenn Research Facility Top-Level Organization	5
Figure 2: Lewis Field Aero Test Facilities	12
Figure 3: Lewis Field Space Test Facilities	13
Figure 4: Plum Brook Station Test Facilities	13
Figure 5: GRC Manufacturing Competencies/Capabilities	22
Figure 6: Examples of Plum Brook Station Infrastructure and Institutional Systems	26

List of Tables:

Table 1: Test Facilities and Laboratories	11
Table 2: Lifting devices and equipment	23

1.0 Introduction

1.1 Purpose of this Contract

The National Aeronautics and Space Administration's (NASA) Glenn Research Center (GRC) requires a contractor to provide and manage the engineering and technician support, manufacturing and development support, and the operations, maintenance, inspection and certification support services needed to conduct aeronautic and space related testing in GRC test facilities and laboratories. The success of research and development activities at GRC depends on the safe, timely, efficient and quality completion of the work described herein.

This Statement of Work (SOW) is for Test Facility Operations, Maintenance, and Engineering services (TFOME) for GRC.

1.2 Mission Description and Objectives

GRC is a comprehensive, world-class research and development center for: Air-Breathing Propulsion; Communications; In-Space Propulsion and Cryogenic Fluids Management; Power, and Energy Storage and Conversion; Materials and Structures for Extreme Environments; and Physical Sciences and Biomedical Technologies in Space. Researchers from GRC, other NASA Centers, other government agencies, and private industry utilize GRC laboratories and test facilities for their technology development and test programs. Further information on the GRC mission and its contribution to the NASA mission can be obtained from the web site <http://www.grc.nasa.gov>.

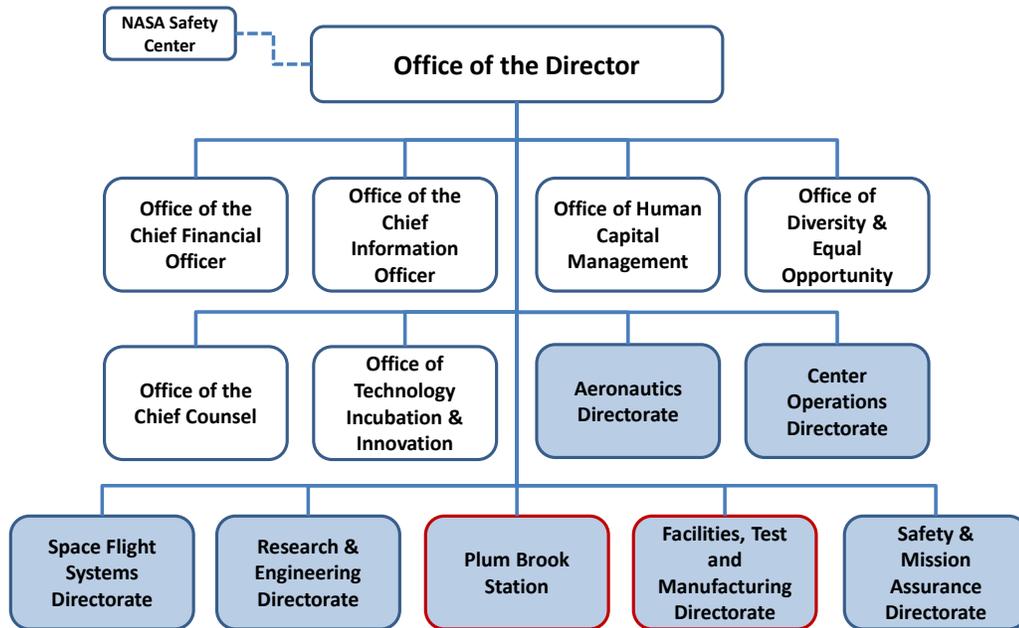
1.3 GRC Organization

GRC includes two distinct campuses, separated by about 60 miles. GRC Lewis Field (LF) and GRC Plum Brook Station (PBS) have a large inventory of ground test and laboratory facilities that support research and development activities related to GRC's core competencies.

At GRC, multiple organizations have responsibilities related to the management, operations, maintenance, and engineering of institutional and test facilities. These organizations work in a collaborative fashion with both internal and external customers to accomplish milestones across a variety of Aeronautics and Space Programs. The collective goal of these organizations is to ensure that the test and research facilities are safe to operate, are maintained and repaired properly, are cost effective, available as required to support the testing requirements, and are state-of-the-art in terms of their capabilities. **Figure 1** shows how the Glenn Research Center is organized. While TFOME contractor personnel will be required to interface and coordinate with nearly all of these organizations to effectively perform their work, the TFOME contract resides in the Facilities, Test and Manufacturing Directorate (FTMD) and the majority of the work is in direct support of FTMD and Plum Brook Station (PBS). These organizations are outlined in red below. However, all of the shaded organizations in **Figure 1** can be considered TFOME customers in that they do levy requirements for support on the

contractor. A brief description of each organization's functional responsibilities is included below.

Figure 1: Glenn Research Facility Top-Level Organization



1.3.1 Facilities, Test and Manufacturing Directorate

The Facilities Test and Manufacturing Directorate (FTMD) provides management of all institutional and test facilities, systems and infrastructure for GRC. Services include: engineering and design, systems operation, project management, technician support, construction management and quality assurance, and institutional system management, maintenance & repair. FTMD is responsible for overall coordination and integration of the Center's energy and environmental efforts. FTMD is also responsible for in house fabrication, manufacturing and management oversight of all outsourced fabrication and manufacturing. FTMD is responsible for the overall technical management of the TFOME contract. For more details about the organization and functional responsibilities of FTMD, see Attachment B.

1.3.2 Plum Brook Station

Plum Brook Station is responsible for the management, test engineering, technical support, and test operations and maintenance at PBS. In addition PBS has management responsibility for the institutional operations, and institutional maintenance and repair at PBS. PBS also performs financial management and contract management for the PBS portions of the contract in concert with the

FTMD. For more details about the organization and functional responsibilities of PBS, see Attachment B.

1.3.3 Center Operations Directorate

The Center Operations Directorate develops, implements, and manages a comprehensive, integrated, customer-focused program of mission support services for GRC. These services support the Center in accomplishing its research, technology, and program and project goals and objectives. The Directorate's broad categories of services include logistics and technical information; security management and safeguards; and procurement and acquisition, and minority university research programs. The Logistics and Technical Information Division (LTID) has logistics (including equipment storage) responsibilities for both GRC sites and custodial responsibilities at Lewis Field.

1.3.4 Safety & Mission Assurance Directorate

The GRC Safety and Mission Assurance Directorate (SMAD) is charged with providing support to Glenn Projects & Programs, and to NASA programs, activities, and operations in furtherance of the goals and objectives of the NASA Mission. Responsibilities include support of System Safety, Reliability, Quality, EEE Parts and Materials & Processing Engineering, as well as in Risk Management, Software Assurance, Institutional Safety, and Occupational Health.

1.3.5 Aeronautics Directorate

The Aeronautics Directorate serves as the focal point for aeronautics research at GRC and provides project management, leadership, and oversight in support of the Aeronautics Research Mission Directorate (ARMD). It has responsibility for integrating requirements, representing aeronautics research, advocating and negotiating for support, and communications across the Center and between the Center and customers. Also, serves as the formal Center Point of Contact (POC) between NASA Headquarters ARMD and GRC. The Aeronautics Directorate ensures successful execution of the aeronautics research projects by working closely with other Directorates and Offices at GRC, other NASA Centers, academia, other government agencies, and industry.

1.3.6 Space Flight Systems Directorate

The Space Flight Systems Directorate serves as the focal point for all space-related projects, tasks, and activities at GRC and provides project management, leadership, and oversight in support of the Human Exploration and Operations Mission Directorate (HEOMD), Science Mission Directorate (SMD), and Space Technology Mission Directorate (STMD). It has responsibility for integrating requirements, advocating and negotiating for support, and communications between GRC and its space-related customers. Also, serves as the formal Center point of contact between NASA Headquarters' space-related Mission Directorates and GRC. The Space Flight Systems Directorate ensures successful execution of all space-related projects, tasks, and activities by

working closely with other GRC Directorates and Offices, other NASA Centers, academia, other government agencies, and industry.

1.3.7 Research and Engineering Directorate

The Research and Engineering Directorate is responsible for research and technology development work in GRC's core competency areas as well as a full range of integrated engineering services including concept exploration and requirements development, preliminary design, detailed design, development, verification, certification, flight / mission sustainment, and disposal.

1.4 Testing activities at GRC

Testing activities at GRC are generally managed out of the Facilities, Test and Manufacturing Directorate (FTMD) and/or Plum Brook Station (PBS). The FTMD and PBS are responsible for management of all GRC test facilities, systems and operations for NASA that support internal and external customers. Services include: test engineering and design, test facility operations, systems operations, project management, technician support, test facility and systems maintenance, manufacturing, and institutional support. The staff assures safe, effective, responsive and reliable facilities, testing, and manufacturing at GRC to advance the nation's aeronautics, space, technology, and science interests.

Test facility and support system operations, maintenance, manufacturing and engineering services are accomplished by an integrated team approach that includes input from the customer as well as a mix of GRC employees and contract personnel. The goal of the GRC and Contractor partnership is to foster an environment conducive to mutual success. Working in conjunction with GRC, the contractor must provide a quality experience to the research and development community making GRC's test facilities "the first choice" of our customers. To this end, GRC is prepared to share corporate knowledge, participate in informal discussion, solicit feedback, and coordinate resources with the contractor. The partnership will also serve as a forum for open discussion in an effort to achieve the following objectives:

- Operating safely and in environmental compliance
- Maintain compliance with GRC Business Management System (BMS) policies and procedures
- Meeting the agreed upon expectations of the test customer (Quality, Cost, Schedule)
- Resolving issues expeditiously and fairly without confrontation or litigation
- Developing trust and open communication
- Evaluating and exploiting opportunities for marketing and utilization of GRC test facilities and manufacturing capabilities
- Support and contribute to GRC strategic planning and implementation activities and examine the GRC environment for developments and trends that are relevant to the Center vision, goals, and objectives
- Support the Center's plan to accomplish its mission through a blended workforce
- Maintain awareness of trends and technologies related to GRC's mission

2.0 Scope and Requirements

2.1 Contract Structure

This contract will consist of a Base and an Indefinite Delivery Indefinite Quantity (IDIQ) portion.

2.1.1 Base

The Base work effort is defined as on-going, repetitive, routine technical activities as described generally in this statement of work (SOW). Base work will be defined in more specific detail in a work breakdown structure (WBS) provided to the Contractor as described in Section 3.1 of this SOW. This WBS (and the resulting approved Contract Management System (CMS) Work Plan) will constitute technical direction for all technical work. Specific technical direction for some technician tasks will be defined in work orders as described in Section 3.2 of this SOW.

2.1.2 IDIQ

The IDIQ work effort is defined as non-recurring, distinct projects that support the work of this SOW but require unusual management, reporting or skills. The type of work activities included are at the contracting officer (CO) or contracting officer's representative (COR) discretion and may include projects with all or a combination of the following characteristics:

- Distinct, specific period of performance (well defined start and end dates)
- Purchase, modification, refurbishment, repair or upgrade of capital equipment
- Unique technical skills not presently in the Base
- Government's need for extra visibility into a requirement
- Separate funding and financial reporting
- Substantive dollar value

2.2 General Scope and Requirements

The activities described in this Statement of Work will be accomplished by the contractor or mixed contractor/FTMD/PBS test and project teams, at the NASA GRC's discretion. Successful completion of the FTMD/PBS mission requires the combined effort of, and extensive interaction between, FTMD/PBS and the contractor. The contractor shall work independently and as part of mixed teams as directed by GRC. Mixed teams can include multiple contractor and government organizations.

NASA anticipates that a wide variety of skills will be required to successfully perform the services described in this SOW. Further, NASA expects that contractor personnel will consist of engineers and technicians of various disciplines, test and project managers, crafts-persons, managers, supervisors, and administrative support persons. Specific certifications/training etc. may be required for some activities. Examples of these special certifications are located in Attachment C. The contractor

TFOME-II SOW
August 8, 2014

shall provide skilled personnel with specific technical training/certifications and proof of proficiency to meet the requirements of this SOW.

GRC's mission success relies heavily on the achievement of zero mishaps in the workplace. In addition, GRC is committed to the principles of proactive environmental management and the conservation of energy and natural resources. Therefore all Federal, state, and local regulations along with NASA standards, local policies and requirements captured in or derived from the Glenn Safety Manual, Occupational Health Programs Manual, Environmental Program Manual, NASA Energy Management Program, and the GRC Five Year Energy and Water Management Plan are integral parts of all tasks within this contract. These documents are available at:

Glenn Safety Manual (GSM)

<http://smad-ext.grc.nasa.gov/shed/pub/gsm/gsm-manual.pdf>

Glenn Occupational Health Programs Manual (OHPM)

<http://smad-ext.grc.nasa.gov/shed/pub/ohpm/ohpm-manual.pdf>

Glenn Environmental Programs Manual (EPM)

<http://www.grc.nasa.gov/WWW/FTD/EEMO/documents/epm-TOC.pdf>

NASA Procedural Requirements (NPR) 8570.1 NASA Energy Management Program

http://nodis3.gsfc.nasa.gov/npg_img/N_PR_8570_001A_/N_PR_8570_001A_.pdf

GRC Five Year Energy and Water Management Plan

See Attachment S.

The contractor shall comply with all Federal, state, and local regulations along with NASA standards, local policies and requirements captured in or derived from the latest versions of the Glenn Safety Manual, Occupational Health Programs Manual, Environmental Program Manual, NASA Energy Management Program, and the GRC Five Year Energy and Water Management Plan. The contractor shall continuously assess and evaluate the safety, health, energy conservation, and environmental compliance programs as they relate to the work in this SOW to identify areas of possible improvement, to recommend corrective actions, and to implement corrective actions as approved by GRC. GRC will provide advice, guidance and direction on safety, health, energy conservation, and environmental compliance as needed.

GRC routinely hosts and conducts a wide variety of internal and external audits, assessments and inspections. These audits, assessments and inspections typically focus on health & safety, environmental compliance, and quality assurance. The Contractor shall provide qualified and competent personnel to support all audits, inspections, and assessments for work and tasks identified in this SOW. Any specific findings or violations generated from audits, assessments, or inspections that are identified during work performed or in the management of this SOW shall be addressed and documented utilizing GRC's closed-loop corrective action processes and systems.

When the contractor completes work on a system or piece of equipment; that system or equipment shall be free of missing components or defects which would prevent it from functioning as originally intended and designed. Corrective, repair, and

TFOME-II SOW
August 8, 2014

replacement work shall be carried to completion including operational checks and cleanup of the job site. Except where otherwise noted, replacements shall match existing in function, dimensions, finish, color, and design. The contractor shall verify the hardwire shutdowns and calibrations, when applicable, on any system or piece of equipment which has been taken out of service for major repair or rehabilitation or has been replaced due to component failure or wear.

At all times, debris shall not be allowed to spread unnecessarily into adjacent areas or accumulate in the work area itself. All such debris, excess material, and parts shall be cleaned up and removed at the completion of the job and/or at the end of each day. The Contractor shall comply with GRC housekeeping policies and ensure the cleanliness of all equipment areas and machinery covered under this SOW.

GRC includes two distinct campuses, separated by about 60 miles. GRC Lewis Field (LF) and GRC Plum Brook Station (PBS) have a large inventory of ground test and laboratory facilities that support research and development activities related to GRC's core competencies. The contractor shall support assigned activities at the Lewis Field and Plum Brook Station campuses.

GRC LF, located just west of Cleveland Ohio, adjacent to the Cleveland Hopkins International Airport, is comprised of 298 acres and includes 79 active buildings and 92 active other structures and facilities (electrical substations, cooling towers, underground utilities, etc.). The buildings on the Center enclose a total of approximately 2,250,000 square feet of floor area. The space is devoted to Propulsion R&D and Test space (43%), Aeronautics/Materials R&D and Test space (20%), Administrative Office space (27%), Warehouse, Storage & Shop space (4%), and Miscellaneous Building space (6%). Currently, 70% of these facilities are 60 years old or greater.

GRC PBS, located just south of Sandusky Ohio, is comprised of 6,377 acres (5,427 acres inside fence line, 950 acres leased outside fence line) and includes 130 active buildings and 39 active other structures and facilities. The buildings on the station enclose a total of approximately 584,000 square feet of floor area. The space is devoted to Propulsion R&D and Test space (40%), Materials R&D and Test space (2%), Administrated Office space (14%), and Warehouse and Storage space (44%). PBS is home to very large-scale, world class space environment and propulsion test facilities including the Space Power Facility (SPF) and Space Propulsion research Facility (B-2) that support national and international aerospace test programs.

The contractor shall provide for day-to-day testing, development, certification, operations, manufacturing, maintenance, and repair activities as described in this SOW.

Research and development testing is subject to frequent change due to problems such as; hardware and/or software delays, instrumentation issues, researcher availability, funding issues, changing program and Agency priorities, etc. Facility test requirements and schedules are rarely consistent from one quarter to the next. In order to minimize test costs and schedule impacts to our customers, the combined civil service/contractor team must be flexible to react quickly and efficiently to changes in workload in this dynamic environment.

The services available under this contract can be provided to any customer as approved by the Contracting Officer (CO) and Contracting Officer Representatives (COR). These services are required at GRC, and may occasionally be required at other NASA Centers, or at other government or contractor installations for limited durations. In general, however, the services provided under this contract pertain to GRC LF and PBS activities. The contractor is not required to have a local facility of their own.

The work associated with this contract is organized into four performance areas: Test Facilities and Laboratories, Manufacturing, Lifting Devices and Equipment, and PBS Institutional Support.

2.3 Test Facilities and Laboratories

The test facilities and laboratories covered in this SOW include wind tunnels, engine altitude chambers, engine component facilities, space simulation chambers, zero gravity facilities, instrumentation R&D laboratories, materials and structures R&D laboratories, clean rooms, and rocket test facilities. Several different test rigs may be housed within a single test facility or building. The use of these facilities changes with the needs of the research community and industry, making it highly improbable that all facilities will be active simultaneously. It is imperative that the contractor be able to flex resources quickly and easily between test facilities to accommodate fluctuations in demand. A representative list of GRC test facilities is contained in **Table 1**. Examples of Lewis Field and Plum Brook Station test facilities are shown in Figures 2-4. Additional facility descriptions are available at <http://facilities.grc.nasa.gov/>.

Table 1: Test Facilities and Laboratories

- 10x10 Supersonic Wind Tunnel and Drive System
- 8x6 Supersonic Wind Tunnel and Drive System
- 9x15 Low Speed Wind Tunnel and Drive System
- Aero-Acoustic Propulsion Laboratory
- Icing Research Tunnel, Drive System and Refrigeration Plant
- Propulsion Systems Laboratory
- Research Aircraft
- Engine Research Building
- 2.2 Second Drop Tower
- Zero Gravity Research Facility
- Space Experiments Laboratory
- Electric Propulsion Laboratory
- Electric Propulsion Research Building
- Power Systems Facility
- Research Combustion Laboratories
- Altitude Combustion Stand
- Cryogenic Component Laboratories (PBS and LF)
- Spacecraft Propulsion Research Facility (PBS)
- Space Power Facility (PBS)

- Hypersonic Test Facility (PBS)
- Combined Effects Chamber (PBS)
- Instrument and Controls Technology Laboratories
- Materials & Structures Laboratories
- Communications Laboratories
- Fuel Cell Laboratories
- Clean rooms

Figure 2: Lewis Field Aero Test Facilities

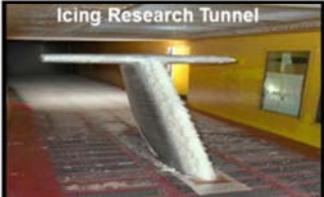
 <p>9'x15' Wind Tunnel</p>	 <p>8'x6' Wind Tunnel</p>	 <p>Aero-Acoustic Propulsion Lab</p>
<p>Subsonic Propulsion Wind Tunnels</p> <ul style="list-style-type: none">•Noise suppression•Inlet/Airframe integration•STOVL hot gas ingestion	<p>Transonic and Supersonic Propulsion Wind Tunnels</p> <ul style="list-style-type: none">•Advanced propulsion concepts•Inlet/Airframe Integration•Internal/external aerodynamics	<p>Engine Acoustic Research Facility</p> <ul style="list-style-type: none">•Fan/nozzle acoustics research•Simulate hot engine nozzles in flight•Aerodynamic and Aeroacoustic measurements capabilities
 <p>Icing Research Tunnel</p>	 <p>Propulsion Systems Laboratory</p>	 <p>Engine Component Facilities</p>
<p>Largest Icing Tunnel in US</p> <ul style="list-style-type: none">•Aircraft icing certification•Ice protection systems development•Icing prediction/code validation	<p>NASA's only altitude full-scale engine facility</p> <ul style="list-style-type: none">•Engine operability/performance•High altitude, inlet distortion simulation•Nozzle-engine integration/development	<p>Over 50 Versatile Engine Component Facilities</p> <ul style="list-style-type: none">•Combustor and Heat Transfer•Compressor and Turbine•Inlets and Nozzles

Figure 3: Lewis Field Space Test Facilities

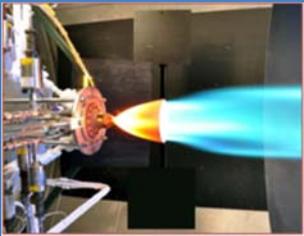
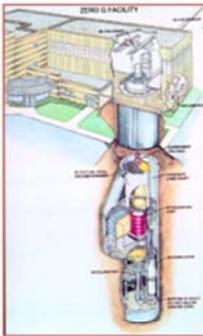
	<p>Combustion Research</p> <p>Advanced Rocket Propulsion Materials Research Ignition Technology Diagnostics</p>	<p>Reduced Gravity</p> <p>Combustion Science Fluid Physics Materials Research</p>	
	<p>Space Simulation</p> <p>Advanced Electric Propulsion Space Power Energy Storage Integrated Power/Propulsion Systems</p>	<p>Cryogenic Fluid Management</p> <p>Cryogenic Insulation Cryogenic Propellant Systems Low-Gravity Cryogenic Gauging</p>	

Figure 4: Plum Brook Station Test Facilities

<p>Propulsion Test</p> <p>Liquid Engine/Stage Testing Thermal-Vacuum Cold-soak Start / Restart Altitude Hot-fire</p>			
			<p>Space Simulation</p> <p>Thermal-Vacuum (world's largest) Reverberant Acoustic Mechanical Vibration Reverberant EMI/EMC</p>
	<p>Cryogenic Testing</p> <p>Cryogenic Component/Subsystem/System Propellant Densification Pressure Systems</p>		

A goal of this contract with respect to test facilities is to optimize the utilization of scarce resources (workforce, equipment, material, and funds) to maintain the FTMD/PBS facilities and equipment needed to support the Center's mission in a safe, efficient and effective manner.

2.3.1 Testing

2.3.1.1 Scope

A primary goal of this contract is to meet research and development customers' requirements safely, on time, and at the lowest possible cost consistent with applicable standards. Testing services are comprised of the four phases of a test in GRC's facilities: Test Pursuit and Planning, Test Preparation, Test Operations, and Post-test Activities. In all of these phases, the schedule, cost, and test requirements need to be continually reviewed and balanced. Therefore, constant communication is required at all times among FTMD/PBS, the customer, and the contractor. The following describes each testing phase in more detail.

a) Test Pursuit and Planning

The goal of test pursuit and planning is for FTMD/PBS, the contractor and the customer to agree on test requirements, test cost estimates, schedule, and roles and responsibilities for tests and deliverables. Test pursuit begins upon receipt of an initial customer test inquiry and continues through initial test planning. Test planning begins upon receipt of appropriate funds and customer test requirements and includes subsequent test preparation and test operations.

Initially, the test planning team may consist of only the test project manager, facility manager and customer representatives. As needed, input from contractor engineers and/or technicians may be required to support the effort to develop a work plan.

b) Test Preparation

The goal of test preparation is to ensure that all required facility systems and test hardware are ready to begin test operations.

Test preparation includes development, fabrication, acquisition, installation and end-to-end functionality checks for all new, reconfigured or modified model and facility systems, including but not limited to:

- Instrumentation
- Data-acquisition and specialized model system software including test-dependent or user-supplied software
- Data systems including user-supplied hardware
- Model controls including user-supplied model controls
- Model and associated mounting hardware
- Special test equipment
- Facility modifications

Test preparation documentation includes, but is not limited to:

- Safety Permit documentation
- Test and operating procedures
- Facility configuration control documents
- Design documents (test article, equipment and facility modifications)

The final steps of the test preparation phase typically include verification activities such as: test readiness reviews, operational readiness reviews, and/or final safety walkthroughs and permitting. The type and timing of verification activity depends on the facility or activity and will be specified by the FTMD/PBS.

c) Test Operations

The goal of test operations is to safely and productively satisfy the customer's research and development test objectives.

This contract provides support to conduct testing in facilities and laboratories at GRC in accordance with specific GRC policies for each individual facility. The safe and efficient operation of the test facilities requires qualified facility personnel with specific technical training and proof of proficiency. These personnel qualifications are a prerequisite to operate the individual facilities. Specific certifications/training etc., are identified in the Safety Permit package and the GRC Safety Manual (<http://smad-ext.grc.nasa.gov/shed/pub/gsm/gsm-manual.pdf>). Examples of these special certifications are located in Attachment C. Test operations typically include:

- Test article, facility equipment and system pre-run setup and checkout
- Coordination with central services (such as air & electrical power) dispatchers
- Facility operation and test execution according to test and facility procedures
- Modification of test and operating procedures as necessary
- Data acquisition, reduction and display
- Trouble-shooting and resolution of problems encountered during test
- Re-running any test points

d) Post-test Activities

The goal of Post-Test Activities is to deliver the test hardware and final data to the customer and restore the facility systems to their baseline configuration.

Post-test activities typically include, but are not limited to:

TFOME-II SOW
August 8, 2014

- Transmittal of final data to the customer
- Completion of final test documentation, including documents describing facility modifications made to support the test
- Documentation of lessons learned and proposed changes to test and operating procedures
- Test specific hardware is removed from the facility as required
- Facility is left in an agreed-upon post-test configuration
- Post-test instrumentation calibration is performed according to GRC policy
- Customer-owned hardware is removed and returned if required
- Test debriefing is conducted
- Post-test customer survey conducted

2.3.1.2 Requirements

The contractor shall provide skilled personnel required to meet contract requirements including, but not limited to, engineers and technicians of various disciplines, test and project managers, crafts-persons, managers, supervisors, and administrative support persons.

The contractor shall ensure close communication with GRC and the test customer, consistent with GRC direction for a given test.

The contractor shall aggressively control and, where possible, significantly reduce the cost of GRC research facility operations, maintenance, and engineering services while maintaining technical excellence within acceptable levels of risk. However, GRC retains the right to approve cost reduction strategies.

The work described in this SOW will be accomplished by the contractor, or shared by means of mixed Contractor/GRC test and project teams, at GRC's discretion.

The Contractor shall provide technical assistance to the GRC lead. At a minimum, the Contractor shall assist the GRC lead to:

- Manage available resources, budget, and approved changes
- Facilitate and coordinate completion of work performed by others
- Facilitate coordination between disciplines
- Manage resolution of problems
- Report status to customer, Contractor and FTMD/PBS Management
- Assure compliance with Safety and Mission Assurance processes as they relate to the test activity
- Provide a single point of contact for test issues

TFOME-II SOW
August 8, 2014

- Facilitate/perform system integration and testing activities

The contractor shall participate in and provide input to technical reviews and meetings as directed by GRC.

a) Test Pursuit and Planning

The contractor shall provide input to or independently develop test plans and proposals as described in Section 2.3.1.1(a) and directed by GRC.

Contractor inputs shall include, but not be limited to:

- Estimates for cost, labor, equipment and material
- Work breakdown structure and test specific schedule
- Engineering approach
- Plans for calibration and checkout of instrumentation and data acquisition systems, programming and checkout of software, design, procurement, fabrication, assembly, and checkout of subsystems
- Approaches to resolving special matters pertaining to Safety, Environmental Protection, and Mission Assurance, configuration management, and maintenance
- Known technical and cost risks associated with the test

The contractor shall support FTMD/PBS in the development and maintenance of facility documentation including but not limited to:

- Facility user guides
- Facility capability descriptions (i.e. pamphlets, web sites, handbooks)
- Facility drawings and schematics

b) Test Preparation

The contractor shall perform all activities as described in Section 2.3.1.1(b) independently or as part of a combined team as directed by GRC.

The contractor shall verify that any training on model and facility hardware or systems, software, and operations is completed and documented.

The contractor shall assemble and submit required documentation for safety approvals and/or permits. The contractor shall support the Glenn Safety Permit Process as it relates to the tasks of this SOW. The contractor shall use the safety permit request, permit renewal, or modification process using the safety permit website (<https://safetypermit.grc.nasa.gov>). Necessary documentation includes drawings, diagrams, schematics, process and

instrumentation diagrams, detailed hazard analysis, photographs, check sheets, list of alarms and shutdowns, operational and emergency procedures, and certification of qualified operators or field operators. All attachments shall be in Word, Excel or PDF format. The GRC Safety Permit Process is further detailed in the Glenn Safety Manual located at <http://smad-ext.grc.nasa.gov/shed/pub/gsm/gsm-manual.pdf>. The contractor shall work with the appropriate GRC Safety Committee(s) to address and resolve actions and findings as necessary.

c) Test Operations

The contractor shall perform all activities as described in Section 2.3.1.1(c) independently or as part of a combined team as directed by GRC.

d) Post Test Activities

The contractor shall perform all activities as described in Section 2.3.1.1(d) independently or as part of a combined team as directed by GRC.

2.3.2 Maintenance

2.3.2.1 Scope

FTMD/PBS shares responsibility with other GRC organizations for the maintenance and repair of the GRC facilities listed in **Table 1**. Teams responsible for maintenance and repair projects will be assembled from Government and/or Contractor personnel representing the relevant disciplines required to complete the project. In addition, these teams may include other NASA contractors depending on the nature of the project.

Maintenance and repair services include:

- Preventative Maintenance (PM)
- Program Maintenance (PGM)
- Predictive Testing & Inspection (PT&I)
- Trouble Calls (TC)
- Repairs
- Replacement of Obsolete Items (ROI)
- Service Requests (SR)
- Calibration services
- Configuration control

See [Section 6.0, Abbreviations, Definitions and Acronyms](#), for further definition of these maintenance and repair services.

TFOME-II SOW
August 8, 2014

Services under this section apply to facility systems, sub-systems, equipment and components. This includes structural, electrical, mechanical, and controls aspects of the facilities as well as data acquisition and reduction systems and computers. Examples of facility maintenance tasks are contained in Attachment D.

Related to safe operations and the expectation of zero mishaps are performing the critical and recurring maintenance actions in a proactive manner to allow FTMD/PBS to meet their customers' expectations.

GRC's Maintenance and Repair Program conforms to the latest version of the NASA Policy Requirement (NPR) 8831.2, Facilities Maintenance and Operations Management. This NPR establishes NASA's facilities operations and maintenance philosophy, which is to support NASA's mission by aggressively and proactively pursuing and adopting the safest and most cost-effective maintenance techniques. In addition, this NPR fixes commonality of facilities maintenance definitions and procedures Agency-wide, and permits the application of uniform, quantitative metrics that can be used to add credibility to the NASA facilities maintenance budgeting process.

This contract supports the implementation of GRC's Maintenance and Repair Program which:

- Complies with current NASA Facilities Maintenance and Operations Management policies
- Implements and expands upon GRC's Conditioned Based Maintenance (CBM) philosophy
- Ensures that testing schedules are executed on time and for the duration required
- Ensures that GRC's maintenance reporting requirements are met (including responses to frequent NASA Headquarters data calls)
- Ensures that all appropriate personnel are trained in procedures, policies, and practices in accordance with current GRC, OSHA, EPA, and other applicable federal, state, local and regulatory agency standards
- Ensures that all operators of equipment are required to be qualified and certified and have current licenses/certifications and listed as such on the safety permit documentation

GRC requires specialty trade related groups to perform repairs, modifications and replacement of unique research support systems, equipment and components. These groups would include structural ironworkers, boilermakers and pipefitter trade services to perform specific welding of all types of piping and structural components associated with the GRC facilities. Millwright type trade services are likewise required to perform requested rigging and specific precision alignments of research support and facility equipment and their associated components. Electricians are required to perform services on high voltage and variable frequency equipment. In addition to routine activities, all of these trade

services may also be needed on an emergency basis if equipment failures occur during critical tests.

GRC utilizes a computerized maintenance management system (CMMS) for maintenance and repair management functions. GRC's current CMMS is Maximo Asset Management 7.1.1.12, a product of IBM, Incorporated. Wherever the term CMMS is used in this SOW, it refers to GRC's Maximo software, or its successor as designated by GRC.

2.3.2.2 Requirements

The contractor shall perform maintenance and repair services in the facilities listed in **Table 1** and as described in Section 2.3.2.1, in accordance with GRC facilities maintenance and repair policies. The Contractor shall request services from, and schedule coordination with other organizations as required. The Contractor shall coordinate maintenance and repair work with other organizations in order to maximize facility availability. Maintenance and repair services shall be detailed in CMMS work orders.

The Contractor shall provide specialty trade personnel to perform repairs, modifications and replacement of unique research support systems, equipment and components, including but not limited to, structural ironworkers, boilermakers and pipefitter trade services to perform specific welding of all types of piping and structural components, millwright type trade services as required to perform requested rigging and specific precision alignments of research support and facility equipment and their associated components, and electricians as required to perform services on high voltage and variable frequency equipment associated with the GRC facilities. The Contractor shall provide these specialty trade services for both routine activities and on an emergency basis if equipment failures occur during critical tests.

The Contractor shall utilize GRC's CMMS for all maintenance and repair management functions associated with this contract. This shall include asset inventory management, asset history management and work control (scheduling, tracking, field observation logging, etc.). GRC will provide controlled access to the CMMS, and reserves the right to upgrade CMMS software at any time during the life of this contract. The Contractor is prohibited from using an electronic interface between the GRC CMMS and any other CMMS (including an external Maximo system) that duplicates the functionality of the GRC CMMS to provide for the functions described in this Section.

The Contractor shall perform maintenance and repair services on equipment according to the Original Equipment Manufacturer (OEM) specifications, manufacturer's recommendations, and relevant GRC manuals unless the COR approves an alternate approach.

The Contractor shall utilize the GRC Area Clearance process when maintenance and repair work requires the interruption of a utility or service. This process ensures that the work can be accomplished in a safe manner and that there is adequate notification of the timing, duration and nature of the impact to building occupants and/or facilities and to maximize facility availability

As part of the continuing improvement of the maintenance and repair programs, the Contractor shall propose changes to existing procedures. The Contractor shall communicate repair needs to FTMD/PBS with justifications.

2.4 Manufacturing

2.4.1 Scope

The FTMD is responsible for all centralized manufacturing activities at GRC. The work includes machining; fabrication including joining, welding, and sheet metal; instrumentation; machine repair; and bonded storage. The organization provides manufactured hardware to support all internal and external GRC customers.

The FTMD maintains a blended workforce, with contractor employees and Civil Servants working closely together on small teams. The contractor is expected to augment the services provided in three distinct ways:

1. Providing full time staff augmentation on the GRC shop floor.
2. Providing shop surge staff for periods of weeks or months depending on project need.
3. Supplying manufactured hardware through its own external manufacturing facility or via subcontracts and procurements.

Figure 5: GRC Manufacturing Competencies/Capabilities

<p><u>Precision Machining</u></p> <ul style="list-style-type: none">• CNC Turning and Milling• Precision Machining• Wire, Die Sink, and Micro EDM  <p>Lean Direct Injection (LDI) 7 Port Fuel Injector</p>	<p><u>Fabrication</u></p> <ul style="list-style-type: none">• Abrasive Water Jet Cutting• Welding and Plasma Cutting• Sheet Metal Fabrication• Rolling to 10 ft. Wide <p><u>Instrumentation</u></p> <ul style="list-style-type: none">• Intricate Custom Installations• Electron Beam Welding• Laser Welding & Cutting• Micro Brazing <p><u>Avionics</u></p> <ul style="list-style-type: none">• Flight qualified technicians• Custom Card Populating• Cable and Harness Fabrication	 <p>Ares Super Segment</p>  <p>Round to Rectangular (Nozzle)</p>  <p>Instrumented Aero Hardware</p>
<p><u>Services</u></p> <ul style="list-style-type: none">• Manufacturing Engineering• Assembly & Inspection• Developmental and Flight Hardware• Art-To-Part <p><u>Glenn Research Center is ISO9001/AS9100 Rev C Certified</u></p>	 <p>SCaN Testbed Flight Hardware</p>	

2.4.2 Requirements

Development, Manufacturing and Fabrication of new test rigs, test hardware, modification or development of new flight hardware or ground support equipment can be done in house or contracted out. This can include structures, parts, assemblies, mechanisms, instrumentation, electronics, inspection, and cable harnesses.

2.4.2.1 Staff Augmentation on GRC Shop Floor

The contractor shall provide full-time staff to augment the Civil Service technician workforce. The contractor staff shall be journeymen in trades applicable to assigned projects, including but not limited to machining, fabrication, and instrumentation. Requirements for certifications in welding, flight soldering, or other specialty disciplines will be specified when required. The contractor shall provide qualified machine repair technicians to move, set up, align, maintain, upgrade, and repair manufacturing equipment.

2.4.2.2 Surge Support Staff

The contractor shall provide full-time support for periods of not less than one week and generally not more than three months per engagement to handle surges-of-work in the manufacturing facility. The surge staff shall be journeymen in trades applicable to assigned projects, including but not limited to machining, fabrication, and instrumentation.

2.4.2.3 Supply Manufactured Hardware

The contractor shall provide manufactured hardware through in-house manufacturing at its own facility, or through subcontract or purchase mechanisms. Requests for manufactured hardware will be issued with drawings, specifications, etc., to enable a contractor response of cost and delivery time.

2.5 Lifting Devices and Equipment (LDE)

2.5.1 Scope

This contract provides the technical support services that are necessary to meet GRC requirements for lifting devices and equipment. Table 2 shows the types of equipment covered by this statement of work. This contract provides for certification, inspection and maintenance of GRC lifting devices and equipment in compliance with NASA Standards and the GRC Safety Manual. This work includes nondestructive testing (NDT), Replacement of Obsolete Items (ROI), trouble calls, service requests (including critical lifts) and repair of equipment and system components. See Attachment Q for a current list of all GRC LDE.

Table 2: Lifting devices and equipment

- Cranes (Overhead and mobile)
- Hoists and winches
- Derricks
- Hooks
- Hydra-sets and Load Measuring Devices
- Man Lifts
- Rigging equipment (i.e. shackles, D-rings, swivel D-rings)
- Slings
- Rescue Lines
- Engine Hoists
- Aerial Platform Lifts
- Forklifts
- Jacks

2.5.2 Requirements

The contractor shall provide for certification, inspection and maintenance of GRC lifting devices and equipment in accordance with NASA Standards and the GRC Safety Manual. The contractor shall perform preventive and programmed maintenance, perform lifting devices and equipment nondestructive testing (NDT), and routine inspection. The contractor shall maintain the inspection and maintenance documentation in a GRC provided LDE database(s). The data entered in the LDE database(s) becomes the property of GRC and shall be readily accessible to GRC.

The contractor shall generate and schedule the PM and PGM work orders based on direction from the FTMD/PBS, using GRC's CMMS (see Section 2.3.2.2). GRC's PM and PGM task activities shall be itemized on the related Frequencies and Maintenance Checklists/Job Plans contained in CMMS.

2.6 PBS Institutional Support

2.6.1 Scope

GRC PBS, located just south of Sandusky Ohio, is comprised of 6,377 acres (5,427 acres inside fence line, 950 acres leased outside fence line) and includes 130 active buildings and 39 active other structures and facilities. The buildings on the station enclose a total of approximately 584,000 square feet of floor area. The space is devoted to Propulsion R&D and Test space (40%), Materials R&D and Test space (2%), Administrated Office space (14%), and Warehouse and Storage space (44%). PBS is home to very large-scale, world class space environment and propulsion test facilities including the Space Power Facility (SPF) and Space Propulsion research Facility (B-2) that support national and international aerospace test programs.

FTMD/PBS shares responsibility with other GRC organizations for the maintenance and repair of the GRC facilities listed in **Table 1**. Teams responsible for maintenance and repair projects will be assembled from Government and/or Contractor personnel representing the relevant disciplines required to complete the project. In addition, these teams may include other NASA contractors depending on the nature of the project.

Preventive and corrective maintenance services include:

- Scheduled maintenance
- Emergency repairs
- Machinery repair
- Calibration services
- Configuration control

Services under this section apply to facility systems, sub-systems, equipment and components. This includes structural, electrical, mechanical, and controls aspects of the facilities as well as data acquisition and reduction systems and computers.

Examples of facility maintenance tasks are contained in Attachment D.

Related to safe operations and the expectation of zero mishaps are performing the critical and recurring maintenance actions in a proactive manner to allow FTMD/PBS to meet their customer's expectations.

This contract supports the implementation of an Operations and Maintenance Program which:

- Complies with current NASA Facilities Maintenance and Operations Management policies
- Implements GRC's Conditioned Based Maintenance philosophy and incorporates those elements of Reliability Centered Maintenance that apply

TFOME-II SOW
August 8, 2014

- Ensures that testing schedules are executed on time and for the duration required
- Ensures that GRC's maintenance reporting requirements are met
- Ensures that all appropriate personnel are trained in procedures, policies, and practices in accordance with current GRC, OSHA, EPA, and other applicable federal, state, local and regulatory agency standards
- Ensures that all operators of equipment are required to be qualified and certified and have current licenses/certifications and listed as such on the safety permit documentation

This contract provides personnel, materials, tools, and equipment necessary to effectively and efficiently operate and maintain infrastructure and institutional systems and deliver institutional services at Plum Brook Station as described in this statement of work. This work includes, but is not limited to, operations, maintenance and repair of buildings, structures, systems, equipment, grounds and paved surfaces at Plum Brook Station. While it is expected that the majority of this work will be done at Plum Brook Station, the GRC reserves the right to extend the same services to Lewis Field. For more detailed description of typical institutional support, see Attachment E.

2.6.1.1 PBS Infrastructure and Institutional Systems Operations and Maintenance

PBS infrastructure and institutional systems are operated and maintained in accordance with FTMD/PBS direction, manufacturer's recommendations, industry best-practices, local, state and federal laws, and relevant GRC policies unless the COR/DCOR approves an alternate approach. Figure 6 shows examples of PBS infrastructure and institutional systems. PBS infrastructure and institutional systems include, but are not limited to:

- Approximately 50 miles of roads (~ 25% of the roads are considered main arteries), parking lots, guard rails, fencing, gates, traffic control signs, and all their associated hardware and supports
- Approximately 15 miles of security fence and 13 gates
- Plum Brook Station life safety systems, including the fire alarm system, fire extinguishers, fire hydrants and sprinkler systems
- Specialized communications systems including support of fire, security and operations monitoring and alarm systems; custom systems required by test programs; and other communications services
- High-voltage electric power distribution system including substations
- Natural gas distribution system
- Domestic water distribution system
- Raw water distribution system
- Storm and sanitary sewer systems
- Drainage ditches and culverts
- Station grounds consisting of approximately 6400 acres with varied terrain

TFOME-II SOW
August 8, 2014

- Grounds maintenance including brush and field mowing, mowing around occupied buildings, roadways, buried utilities, and overhead power lines, removal of vegetation and growth, and removal of fallen trees along the perimeter fence line, roadways and in operational areas.
- Snow and ice removal on the main traffic arteries, walkways and parking lots surrounding occupied buildings and locations where personnel are performing operations.
- Pest control (animal and insect)
- Operation of PBS records libraries. Receive, organize, store, ship, issue, and retrieve various records, including operation manuals, standards, codes, and specifications, reports, references, test records and miscellaneous historical documents.
- Routine, emergency and special custodial services in the office buildings and research areas at PBS.
- Specialized custodial services at the operating test facilities (for example: cleaning the vacuum chambers at SPF and B-2, prior to a critical pump down, or after an oil back-streaming incident).
- Computer support services to include off the shelf and custom software and hardware in support of fire, security and operations monitoring and alarm systems; custom systems required by PBS operations; custom systems required by test programs
- Implementation of Environmental Compliance, Water Compliance, Recycling, and Pollution Prevention programs at PBS.
- General safety inspections of PBS facilities.
- Drafting support
- CMMS administration for PBS.
- Maintenance of training and certification records of PBS personnel.
- Implementation of GRC equipment and records storage program at PBS
- Mail services
- Shipping and receiving services
- Fuels acquisition, storage and distribution
- Implementation of environmental restoration and management activities at PBS including controlled burns, native plant restoration, and invasive plant removal.
- Unique support to test customers outside of major test facilities (for example provision of temporary power and shelter for an outdoor test).
- Support for special events (meetings, tours, conferences, open houses, outreach activities, etc.,)
- Coordination with local police, fire and emergency response agencies.

2.6.2 Requirements

The contractor shall provide all personnel, materials, and equipment necessary to effectively and efficiently operate and maintain infrastructure and institutional systems and deliver institutional services at Plum Brook Station as described in Section 2.6.1.

The contractor shall provide constant coordination of PBS institutional support with designated NASA personnel to ensure that requirements are clearly understood, conflicts and issues are quickly addressed and resolved, and work is in compliance with current NASA and GRC policies.

2.6.2.1 PBS Infrastructure and Institutional System Operations and Maintenance

The Contractor shall provide all personnel, materials and equipment necessary to operate, maintain, refurbish and modify PBS infrastructure and institutional systems to meet station requirements in accordance with FTMD/PBS direction, manufacturer's recommendations, industry best-practices, local, state and federal laws, and relevant GRC policies unless the COR/DCOR approves an alternate approach.

The contractor shall obtain NASA approval prior to implementing significant repairs or modification to PBS infrastructure or institutional systems except in cases of emergency (significant immediate risk of injury, death, or damage to high-value assets). In emergency situations, the contractor shall take steps necessary to mitigate the immediate risk of injury, death or damage to high-value assets and then coordinate further action with NASA. The contractor shall maintain a list of deferred maintenance and repair projects for PBS infrastructure and institutional systems to be reviewed with FTMD and PBS at least once per year. The contractor shall continuously review processes and procedures for PBS infrastructure and institutional system operation and maintenance to identify opportunities for increased efficiency or effectiveness and communicate those opportunities to PBS and FTMD.

2.6.2.2 PBS Institutional Services

The Contractor shall provide all personnel, materials and equipment necessary to deliver institutional services to meet station requirements in accordance with PBS/FTMD direction, industry best-practices, local, state and federal laws, and relevant GRC policies unless the COR approves an alternate approach.

The contractor shall continuously review processes and procedures for PBS institutional services to identify opportunities for increased efficiency or effectiveness and communicate those opportunities to PBS and FTMD.

3.0 Management and Administration

Management and administration is considered to be a critical part of this contract. Research and development testing is subject to frequent changes due to problems such as; hardware and/or software delays, instrumentation issues, researcher availability, funding issues, changing program and Agency priorities, etc. Facility test requirements and schedules are rarely consistent from one quarter to the next. In order to minimize test costs and schedule

impacts to our customers, the contractor shall effectively manage available resources and be flexible to react quickly and efficiently to changes in workload.

The contractor's management structure shall provide efficient, effective and responsive coordination and direction of all activities under this contract.

The Contractor shall provide all management and administrative functions necessary for the Contractor to successfully execute the facility/systems/equipment testing and maintenance, manufacturing, lifting device and equipment support functions, and PBS institutional support functions as described in this SOW. The contractor's management team shall focus on accomplishing all work using sound business practices. This team shall efficiently utilize personnel across and within the locations and, to the maximum extent practical, streamline and consolidate business and technical processes. Management and administrative functions include, but are not limited to:

- Work identification and planning
- Work Control, including surge management
- Personnel management
- Personnel training and certifications
- Labor oversight
- Labor reporting
- Technical reporting
- Budget formulation and management
- Resource analysis and reporting
- Lifting device certification tracking and reporting
- Property management and reporting
- Asset management and maintenance (including the Annual Data calls to HQ, RCM, PMS, etc)
- Procurements and subcontracting
- IT Management
- Quality Management
- Apprentice program administration

3.1 Work Identification and Planning

GRC will provide a top-level WBS describing the work to be done under this SOW. Each WBS element describes specific work performed in a facility/laboratory work area, the support systems, manufacturing, and institutional work areas. The WBS elements are organized into functional work groups. The COR will issue new WBS elements, or modify existing WBS elements, as needed to clarify work to be performed. These WBS elements will be updated for each six month period and will serve as the basis for determining any contract cost and fee adjustments to be made in accordance with Clause H.17, Contract Value Adjustments. Attachment E contains sample work breakdown structure (WBS) elements. These are provided to give prospective offerors insight into how work requirements will be communicated to the contractor. The contractor shall provide a Work Plan as described below for each WBS element and update whenever WBS elements are modified. The contractor shall work with GRC to address and resolve any resource issues (load-leveling, availability, skill-mix, etc). At no

time shall the estimated funds on any Work Plan be exceeded without approval from the NASA CO or COR.

(1) Original Work Plan

The Contractor shall submit a detailed work plan to the COR for approval. The work plan is submitted using a GRC furnished electronic contract management system (CMS). Access to, and training on the GRC CMS will be provided during contract phase-in. See Attachment R for additional information about the GRC CMS. The initial submittal shall be during the contract transition period but not later than ten (10) calendar days before the full performance start date of the contract. The Work Plan shall take into consideration the requirements identified for the first six months of the contract and consist of the following:

- a. A narrative statement reflecting the management and technical approach to accomplish the requirements
- b. Proposed workforce quantities and skill-mix
- c. A schedule identifying milestones, tasks, activities, events.
- d. Detailed cost and labor estimates to accomplish the identified requirements.
- e. A list of identified contract deliverables.
- f. Associated risks to accomplish the identified requirements.

(2) Revisions to Work Plan

The Contractor shall submit revisions to the Work Plan as indicated below. Each revision to the Work Plan shall be approved by the COR prior to implementation by the Contractor.

- a. every 6 months,
- b. when directed by the COR, and / or
- c. whenever requirements have changed to the extent the Contractor believes such revision is deemed desirable for optimum achievement of contract objectives.

3.2 Work Control

GRC work policies and procedures are defined in in the GRC Business management system (BMS). Access to the GRC BMS Library will be provided to Contractor employees during phase-in. See Attachment S for work policies and procedures that apply directly to this SOW. Unless otherwise authorized by the CO/COR, the Contractor shall adhere to and comply with all GRC BMS documents as they apply to the activities described in this SOW.

GRC will provide work scope and priority guidance to the contractor. The activities described in this guidance shall be accomplished by the contractor or mixed contractor/FTMD/PBS test and project teams, at GRC's discretion.

The Contractor shall utilize a GRC provided work management system for the conduct of day-to-day technician activities. In this work management system, specific,

individual work orders are generated that will further define the technical requirements. GRC's current work management system is Maximo Asset Management 7.1.1.12, a product of IBM, Incorporated. Since the Maximo software used by GRC has been customized from the vendor's standard version, local training will be provided to the Contractor's personnel as required. GRC will also provide controlled access to Maximo, and reserves the right to upgrade the version of Maximo at any time during the life of this contract and/or move to another GRC work management system.

The COR, customer or authorized designee, will identify work in a work management system work order, which shall be performed by the Contractor. The Contractor shall develop and implement work requests as necessary to execute agreed-upon CMS Work Plans as described in Section 3.1. Acceptable performance of a work order is defined as on-time, in-budget delivery of a work product that conforms to the form, fit, or function of the work order description or specification. Each work order will have an expected due date, and a designated priority level. The Contractor shall assume that any work order without a specified priority will be designated as "routine". The Contractor shall treat each work order as a discrete item (that is, the Contractor shall keep an individual record in the work management system of each work order, its completion schedule/status, costs/materials/labor-hours associated with that specific work order, etc.). The Contractor shall review all work orders, and shall inform the COR, customer or authorized designee, if any impediments to completion are anticipated (i.e. repairs or modifications to the equipment or facility/laboratory, supplies not currently in stock, other work of perceived higher priority, etc.). The COR, customer or authorized designee, will determine how GRC will address any potential impediments to work order completion. Once work has begun (a work order has been issued), the contractor shall monitor actual progress against plan, identify problems, and take appropriate corrective action. These responsibilities are in addition to the actual execution of the technical requirements.

The Contractor shall input data for all completed work orders in the work control systems including; hours worked, trades required, materials required, problems or discrepancies, etc. The data entered in the work control system becomes the property of GRC. The Contractor shall notify the COR of any work orders which fall outside the scope of the current SOW or WBS.

3.3 Workforce

3.3.1 Contractor Licensing, Certification, and Specific Experience Requirements

The contractor shall maintain a technical, security, safety and environmental training database for all employees. The database shall include, as a minimum, name of employee, position or title, required or unique training, certifications, licenses and status (i.e. completion and expiration dates). Data in this database becomes the property of GRC.

The contractor shall provide and maintain all special certifications and/or security clearances consistent with GRC direction. The Contractor shall provide personnel that have the appropriate skills for their assignments. The degree of skills shall be commensurate with that required for the work. Those personnel working in trades, whose performance requires license or certification or both,

shall be so licensed/certified and said documentation shall be made available to the COR upon request. The Contractor shall ensure all necessary certification and licensing requirements for performing work under this contract remain current for the work being performed. When specified, the Contractor shall obtain various levels of security clearances for designated personnel. When entry authorization to Restricted Areas is required for performance of Contractor duties, the Contractor shall assure timely access by notifying the COR or designee at least three (3) working days prior to need. When specified, the Contractor shall implement non-disclosure agreements (corporate and individual) to protect test customer interests.

All workmanship shall be accomplished in conformance with approved and accepted industry standards; equipment manufacturer's standards; all applicable, local, state, and federal standards; applicable NASA standards, and building and safety codes. Where standards conflict or are unclear, the Contractor shall request clarification from GRC.

3.3.2 Safety POC

The Contractor shall provide at least one full-time on-site safety and health professional as part of their Safety & Health function. A qualified safety and health professional is defined as an individual having at least one of the following industry-recognized safety certifications:

- Certified Safety Professional (CSP)
- Certified Industrial Hygienist (CIH)
- Bachelor's or Associate's degree in safety, industrial hygiene, engineering, or in a related field with at least ten (10) years of full-time safety and health experience.

The contractor's safety and health professional(s) shall ensure proactive and innovative safety practices on a continual basis throughout the contract period including, but not limited to:

- Implementation of an effective job hazard analysis program to document, control, and communicate hazards identified during the execution of tasks performed under this SOW.
- Periodic safety and health inspections of all job sites, tasks, and activities related to this SOW. All findings from these inspections shall be documented and addressed utilizing a closed loop corrective action process and be available to GRC for review.
- Flow down all GRC safety and health requirements to subcontractors.
- Site-specific Health and Safety Plans (HASPs) shall be provided for specified non-recurring activities where unique hazards are identified and require mitigation and/or control not covered under the Corporate HASP.

3.3.3 Critical Personnel Listing

The Contractor shall provide to the COR a list of the Contractor's critical personnel and a means of contacting these individuals in the event of an

emergency or during off-hours. The Contractor shall notify the COR of changes in the list of the Contractor's key personnel within three (3) working days.

3.4 Resource Management

The Contractor shall be responsible for effective and efficient use of resources. Resources include money, people, time, information, equipment and facilities. Funding for test-related activities associated with this contract is unpredictable and comes from a variety of sources, including NASA, other government agencies, and the private sector. Typically, at the beginning of the fiscal year, only a portion of the operating budget is identified for that year. As the year progresses, new projects and funding are identified and some ongoing projects are completed. This dynamic funding situation requires the contractor to be flexible, and to make adjustments to implementation plans as necessary to minimize the impact of the fluctuating workload on operations and staffing levels. Information must be generated, gathered, and distributed in a timely manner so that problems can be identified early and corrected with minimal impact.

3.4.1 Hours of Operation

Extended hours and/or multiple shifts are sometimes required to support testing and maintenance activities. The contractor shall manage assets effectively to ensure that skilled personnel are available when required to support the requirements of this contact while controlling cost. Recognized Holidays are in accordance with clause 1852.242-72, Observance of Legal Holidays, in Section H of this contract.

3.4.2 Funding

The Contractor shall maintain status information on each funding action, which shall be made available to the COR upon request.

3.4.3 Financial Reporting

Financial reports shall be in accordance with the Deliverables section of this SOW and approved CMS work plans (see Section 3.1 of this SOW). The contractor shall support meetings with GRC to analyze and explain the contents of these reports as required.

Funding for many of the activities associated with this contract is unpredictable and comes from a variety of sources, including NASA, other government agencies, and the private sector. Often, a fund source will levy specific financial reporting requirements on FTMD and PBS. The Contractor shall support FTMD and PBS efforts to comply with GRC, Agency, Program and Customer financial tracking and reporting requirements by providing timely access to, analysis of, and updates to financial data.

Specific financial reporting is required for work associated with capital assets. Capital asset reporting shall be in accordance with clause GRC 52.245-99 Capital Asset Acquisition, in Section G of this contract.

3.4.4 Technical Reporting

Technical progress reporting shall be in accordance with approved CMS Work Plans (see Section 3.1 of this SOW) and Section 4.0 of this SOW.

From time to time the CO and/or COR may require special reports. The Contractor shall provide special reports to the CO, COR or their designee upon request.

3.4.5 Progress Review Meetings

The Contractor shall attend and actively participate in progress meetings conducted by GRC. These meetings (established by the COR) will review overall contract status, work completed versus work scheduled, problems, issues and concerns.

3.5 Lifting Device and Equipment (LDE) Tracking and Reporting

The contractor shall maintain LDE certification and maintenance data in GRC provided databases for all LDE at GRC. The database shall include, at a minimum:

- Equipment Number
- Equipment Type
- Description
- Location
- Additional Location
- Purchase Date
- Size X Reach
- Capacity
- Serial Number
- Model
- MFG
- Notes
- In Service checkbox
- Load Test expiration date
- Date inspected
- Who conducted the inspection

Data in this database becomes the property of GRC.

3.6 Property Management

3.6.1 Government Furnished Property

GRC will provide Government owned property, including but not limited to, facilities, tools, vehicles, equipment, and materials to the Contractor for use only in connection with this contract. Government provided equipment shall be used

in the performance of this SOW, when available and appropriate. All such facilities, equipment, and materials will be provided in "as is" condition. An initial listing of Government furnished property is provided in Attachment P, and will be updated as part of contract phase-in.

The Contractor shall obtain written approval from the COR prior to making any modifications or alterations to the facilities. At the completion of the contract, all facilities shall be returned to the Government in the same condition as received, except for reasonable wear and tear and per approved modifications and alterations.

3.6.2 Property Management

The contractor shall be responsible for managing all Government furnished property and all contractor acquired material (CAM) under this contract. The Contractor shall implement a property control system for those items for which the Contractor has assumed responsibility. The Contractor shall adhere to current NASA property policies and procedures. For more information, see 52.245-1, Government Property and other applicable property clauses in Section G.

The Contractor shall furnish a quarterly inventory report to the COR.

The total or partial breakdown or failure of the Government furnished items shall not relieve the Contractor of responsibility to fully perform the work of the contract. On completion of the contract, all Government furnished tools and equipment, including specialized predictive testing and inspection equipment and tools, shall be returned to the Government in the same condition as received, except for normal wear and tear. Tools and equipment that are direct expensed to the contract shall remain the property of the Government. The Contractor shall be responsible for the cost of any repairs or replacement caused by negligence or abuse by the Contractor personnel.

3.7 Procurements

3.7.1 Contractor Purchases

Other than that provided as Government furnished property and services, the Contractor shall be responsible for acquiring all material, parts, tools, equipment (including safety and health equipment), supplies and services for the performance of all work under this contract. Attachment G contains information on the types and quantities of purchases that can be expected annually. All such purchases shall be considered cost reimbursable items under this contract and shall remain the property of the Government.

The Contractor shall coordinate with the COR and the COR shall approve all CAM purchase requests in excess of \$10,000.00 prior to purchase. GRC will not be obligated to reimburse the contractor for items exceeding \$10,000.00 when prior coordination has not occurred. The Contractor shall provide a real-time program that reports to the COR detailing all purchases made under this contract

regardless of cost. The Contractor shall obtain competitive quotes for material purchased in accordance with the Contract clause entitled "Competition in Subcontracting". GRC will periodically review the purchases and may, at its discretion, lower the Contractor's purchasing authority if abuses are discovered.

3.7.1.1 Approved Sources

GRC may, at its discretion, direct the Contractor to purchase the required material and equipment from Government approved sources.

3.7.1.2 Refunds

Any refunds, rebates, credits, or other amounts (including any interest) accruing to or received by the Contractor or any assignee shall be paid or passed to GRC by the Contractor, to the extent they are properly allocable to costs for which the Contractor has been reimbursed by GRC under the contract.

3.7.1.3 End of Contract

At thirty (30) days before the Contract End Date, the Contractor shall provide a report to the COR, detailing all CAM currently in possession of the Contractor and shall turn over all CAM to GRC. All CAM purchased under this contract remains the property of GRC.

3.8 Information Technology (IT) Management

3.8.1 Information Technology Systems

GRC will provide computers with preloaded (standard) software and access to GRC networks to the Contractor's personnel for use in providing the Contractor interface capability to Government networked systems.

The contractor shall identify non-standard software needs to GRC. GRC will determine the validity of the requirement and provide necessary software tools to perform the work under this SOW. GRC reserves the right to direct the contractor to procure non-standard software products.

The contractor shall supply mobile devices to their employees as required to perform the work under this SOW. Mobile devices shall comply with GRC mobile device policies.

3.8.2 IT Security

The Contractor shall comply with the GRC IT Security (ITS) Program. The GRC IT Security Program is comprised of a set of policies, procedures, and guidelines for ensuring the security of GRC's IT resources. This program encompasses IT Security management, planning, implementation, and performance evaluation. The IT Security Program covers all IT resources

including, but not limited to, computers, networks, telecommunications systems, applications, data and information. For more information see RFP Section I.

3.9 Quality Management and Control

To ensure that GRC customers receive products and services of high quality and to facilitate continual improvement, GRC has established a Business Management System (BMS) that is compliant with the American National Standard Quality Management Systems Requirements/International Organization for Standardization, (ANSI/ISO/ASQ Q) 9001:2008 standard, and the Society of Automotive Engineers (SAE) Aerospace (AS) 9100 Rev C standard. All GRC processes are included under the scope of the ISO 9001:2008 standard, whereas, only select areas that are a part of the development of critical and complex products pertain to the AS9100 Rev C standard. GLPR 8730.5H, GRC Business Management System (BMS) Quality System Manual, and related documents, applies to all GRC employees, including contractors. GRC test customers may impose additional quality assurance requirements on test facilities and/or operations. GRC space flight programs/ projects may also impose the additional quality assurance requirements within GLPR 7120.5.30, Space Assurance Requirements. GRC will provide advice, guidance and direction on process and quality assurance requirements as needed. The contractor shall comply with GRC and test customer quality requirements, policies, processes, and procedures, including, but not limited to, GLPR 8730.5H, GRC Quality System Manual. GLPR 8730.5H is available in Attachment S.

3.10 Risk Management

The Contractor shall perform ongoing risk management to identify, document, analyze, track, and control risks associated with the work being performed under this SOW. From their identified risks, they shall communicate the significant open risks and associated mitigation plans, per the Technical Progress Reports (d) Section III requirements. The contractor shall also support GRC in the implementation of GRC risk management policies, processes and procedures as contained in Glenn Interim Directive (GLID 8000.2), Risk Management or its successor(s). GLID 8000.2 is provided for reference in Attachment S.

3.11 Apprentice Program

The Contractor shall participate in a State of Ohio certified apprenticeship program that meets the demands of the FTMD/PBS need for qualified testing and lab mechanics, electricians and electronics technicians, machinists, fabricators and instrument makers to augment or replace technicians leaving the various trades.

4.0 Deliverables

All reports shall be delivered FOB Destination to the recipients of reports. The Contractor is solely responsible for assuring that delivery is made to every specific

recipient named (that is, the Contractor shall not ship multiple copies to one recipient with the expectation that those reports will then be distributed to other named recipients).

A. WORK PLAN (see Section 3.1)

(1) Original Work Plan

The Contractor shall submit a detailed work plan to the COR for approval. The work plan is submitted using a GRC furnished electronic contract management system (CMS). The initial submittal shall be during the contract transition period but not later than ten (10) calendar days before the full performance start date of the contract. The Work Plan shall take into consideration the requirements identified for the first six months of the contract and consist of the following:

- g. A narrative statement reflecting the management and technical approach to accomplish the requirements
- h. Proposed workforce quantities and skill-mix
- i. A schedule identifying milestones, tasks, activities, events.
- j. Detailed cost and labor estimates to accomplish the identified requirements.
- k. A list of identified contract deliverables.
- l. Associated risks to accomplish the identified requirements.

(2) Revisions to Work Plan

The Contractor shall submit revisions to the Work Plan as indicated below. Each revision to the Work Plan shall be approved by the COR prior to implementation by the Contractor.

- d. every 6 months,
- e. when directed by the COR, and / or
- f. whenever requirements have changed to the extent the Contractor believes such revision is deemed desirable for optimum achievement of contract objectives.

B. NEW TECHNOLOGY REPORTS (IF EITHER CLAUSE FAR 52.227-11, PATENT RIGHTS -- RETENTION BY THE CONTRACTOR (SHORT FORM), OR CLAUSE NFS 1852.227-70, NEW TECHNOLOGY, IS APPLICABLE TO THIS CONTRACT)

If applicable, the Contractor shall disclose new technology discovered under this contract as it occurs using NASA Form 1679. The Final New Technology Report shall be submitted on Form C-3041. Final payment may be withheld pending receipt/approval of the Final New Technology Report.

C. COSTING RUN-OUT REPORT

No later than June 30th of each year of this contract, the Contractor shall provide an informal statement that indicates how the funds currently allocated to the contract will be consumed by September 30th of the subject year. In this Costing Run-Out Report, the Contractor shall notify the Contracting Officer if there are any claims that could arise

from the deobligation of all or part of the funds that will not be consumed by that date. Funds that will not be consumed by September 30th may be unilaterally deobligated by the Government.

D. TECHNICAL PROGRESS REPORTS

(1) WRITTEN REPORTS shall be brief, factual and informal. They shall be prepared as set forth below:

(a) A cover page containing:

- (1) Contract number and title.
- (2) The type of report ("Monthly Technical Progress Report", etc.), sequence number of the report (when applicable), and the period/unit being reported.
- (3) Contractor's name, address, and organizational segment generating the report.
- (4) Signature of Contractor's cognizant Project Manager (or, if submitted electronically, an unambiguous indicator that the Project Manager has generated/reviewed the report)
- (5) Date of issuance.
- (6) Inclusion of the following statement: "Prepared for NASA Glenn Research Center, Cleveland, OH 44135."

(b) Section I -- Technical Progress Summary: A description of the work, identified by WBS, performed during the report period and the overall technical progress achieved. The current schedule status shall also be addressed in this summary.

(c) Section II -- Current Problem(s): A description of any current problem(s) which may impede technical, schedule and/or cost performance, along with proposed corrective action(s). Include an explanation of how the problems could affect the cost and schedule of the reporting categories in the financial and schedule reports if applicable, as well as the effects at the total contract level.

(d) Section III -- Risk Management: Include a list of Significant Open Risks and associated Mitigation Plans. Significant Open Risks are those that have the potential to affect major development milestones & goals, such as a delivery delay, a design-freeze date, a cost ceiling, a safety or health concern, environmental impacts, a technical trade-off decision, etc. Further guidance is available from the GRC Risk Management reference documents listed below:

- GLID 8000.2 Risk Management, which expires December 3, 2014 or until the approval and release of GLPR 8000.1 (latest revision)
- NPR 8000.4 Agency Risk Management Procedural Requirements (latest revision)

E. FINANCIAL MANAGEMENT REPORTS

- (1) The Contractor shall submit financial reports pursuant to:
 - (a) NFS 1852.242-73, "NASA Contractor Financial Management Reporting"
 - (b) NPR 9501.2, "NASA Contractor Financial Management Reporting"
 - (c) GRC 52.242-96, "NASA Contractor Financial Reporting – Supplemental Requirements"
- (2) If NFS 1852.242-74 (Notice of Earned Value Management System) is applicable to this contract, then the Contractor shall submit the Modified Cost Performance Report (NFS 1852.242-76) as required therein.

F. ELECTRONIC SUBMISSIONS.

The government requires electronic submittal of all reports, except that at least one copy of each financial report must be a signed hardcopy. The signed hardcopy may be received no later than 20 working days after the close of the report period, so long as the electronic copy was provided within 10 working days after the close of the report period. (If the Contractor submits its financial report with an electronic signature, a signed hardcopy is not required.) All other reports, unless elsewhere noted, may be submitted by e-mail, or via the internet, or by some other electronic method, in lieu of a hardcopy. Dedicated Web-Sites, accessible via password and updated by the Contractor, are acceptable reporting tools for Technical Progress Narratives (See Section B, above) and the Draft Final Report, if compatible with the current NASA Glenn Research Center hardware/software and authorized by the COR. CD/disc submittals are acceptable reporting tools for Technical Progress Narratives (See Section B, above) and the Draft Final Report, if compatible with the current NASA Glenn Research Center hardware/software and authorized by the COR.

G. FINAL TECHNICAL REPORT

If required by GRC.

The following requirements are supplemental to those stated in NFS clause 1852.235-73.

- (1) In addition to the requirements of NPG 2200.2, the format and content of the Final Report shall also follow NASA-SP--1999-7602 "NASA Publications Guide for Authors", incorporated herein by reference and made a part hereof. This document is available at <http://www.sti.nasa.gov> [Click on "Publish STI" and scroll down to "NASA-SP--1999-7602", where you can choose the format for viewing the publication].
- (2) The Final Report shall include a section entitled "New Technology". This section shall identify all non-patentable discoveries such as improvements, innovations, and computer codes; and all patentable inventions, whether developed or discovered during the performance of the contract. Possible secondary applications of reported new technology shall also be included in this section.

TFOME-II SOW
August 8, 2014

(3) The Contractor shall submit an electronic copy of a DRAFT-FINAL REPORT to the NASA COTR within 30 days after completion of the technical effort. The COTR's review will address technical accuracy, conformance with applicable law, policy and publication standards, and a determination of the availability and distribution of NASA-funded documents containing scientific and technical information (STI), (NASA Form 1676, NASA Scientific and Technical document Availability Authorization (DAA)). Approval or disapproval (in part or in total) of the draft-final report will be accomplished by NASA within thirty (30) days after receipt. Disapproved draft-final reports shall be resubmitted within 10 working days for review following correction of the cited deficiency, unless otherwise directed by the NASA Contracting Officer or NASA Project Manager/COTR.

(4) Within thirty (30) calendar days after notification of approval of the Contractor's draft-final report, the Contractor shall distribute the approved Final Report electronically and in hardcopy. Each hardcopy Final Report shall consist of one reproducible copy of the Final Report itself, plus one set of glossy continuous tone prints of all photographic materials included in the Final Report.

(5) Printing, duplicating, binding and other reproduction required under this contract is subject to the provisions of the Government Printing and Binding Regulations published by the Joint Committee on Printing, Congress of the United States and the clause at NFS 1852.208-81 entitled "Restrictions on Printing and Duplicating".

(6) The Contractor is solely responsible for managing the technical effort, the schedule, and the contract funds to ensure delivery of the Draft-Final Report and the Final Report on time. Failure to deliver the Final Report as scheduled, or a request that additional funding be provided by the government to ensure delivery of the Final Report, may result in a Performance Evaluation of "Unsatisfactory", or a reduction in profit/fee equal to the additional cost associated with delivery of the Final Report, or both.

H. OTHER REPORTS

The contractor shall also provide the following reports as directed by the COR:

REPORT	FREQUENCY
Contractor Monthly Accident Report (CMAR)	Monthly
Incident Report	One per incident/investigation
Mishap report (NF 1627),	One per reportable incident
2nd, 3rd shift Roster	As required
Centrally Reportable Equipment	Annually
Quarterly Property Management Report	Quarterly
Misc. Reports Required by Audit or Regulatory Agencies	As Required
Skills Maintenance Plan	Annually
Employee Certification Records	Annually
Preventive Maintenance Plan (test facility)	Annual with updates as required
Preventive Maintenance Plan (Institutional)	Annual with updates as required
PBS Natural Gas Usage Report	Monthly
PBS Cathodic Protection System Test Data and Repair Report	Annually

TFOME-II SOW
August 8, 2014

Pesticide Application Report	Annually
Utility Usage Report	Monthly
Energy Report	Quarterly
Life Safety System Inspection and Maintenance Plan	Annually
Vehicle Maintenance System Data Entry	Monthly
NPDES Report	Monthly
Drinking Water Report	Annually
Halogenated Degreaser Inspection Log	Weekly
Paint Booth Log	As it is Used
Boiler Fuel Report	Annually
90-day Storage Site Inspection Log	Weekly
Satellite Site Inspection Logs	Weekly
Recyclable Count	Each Occurrence
Solid Waste Report	Monthly
Chemical Inventory	Annually
Underground Storage Tank Logs	Monthly
Spill Reports	Each Occurrence

In the event that a deliverable report, document, etc. is required elsewhere in this contract but is not described in this clause, the Contractor shall notify the Contracting Officer immediately. The government will treat the insertion of a description of an existing contract-required deliverable report/document/etc. as a no-cost administrative change.

5.0 Phase-In/Phase-Out

Reference 52.237-3, Continuity of Services within this contract for a description of requirements to be fulfilled by the Contractor in order to transition into day-to-day operations after contract award and requirements for turning over operations to future contractors at the completion of the contract.

5.1 Joint Inventory

The Contractor and the COR shall conduct a joint inventory during the phase-in period but not later than five (5) days after commencing work under this contract to determine the exact number and serviceability of GFF, GFE & GFM (tools, equipment and materials, etc.) offered to the Contractor. Within thirty (30) days of this inventory, the Contractor shall provide the COR with a written listing of all facilities, equipment, tools and materials that the Contractor shall use and for which the Contractor shall assume accounting responsibility. Government furnished items shall not be removed from GRC, unless approved in advance by the COR.

6.0 Abbreviations, Definitions and Acronyms

ACES	.....Agency Consolidated End-user Services
ANSI	.....American National Standards Institute
ARMD	.....Aeronautics Research Mission Directorate
BMS	.....Business Management System
CAM	.....Contractor Acquired Material
CBM	.....Condition-Based Maintenance Facility and equipment maintenance scheduled only when the condition of the facility or equipment requires it. CBM replaces maintenance scheduled at arbitrary time or usage intervals. It usually involves the application of advanced technology to detect and assess the actual condition
CMMS	.....Computerized Maintenance Management System (i.e. MAXIMO System) A CMMS is a set of computer software modules and equipment databases containing facility data with the capability to process the data for facilities maintenance management functions. These functions typically include: facility/equipment inventory and history, work input control, job estimating, work scheduling and tracking, preventive and predictive maintenance, and facility inspection and assessment.
CMS	.....Contract Management System
CO	.....Contracting Officer
COR	.....Contracting Officer's Representative
CPS	.....Central Process System
DCOR	.....Deputy Contracting Officer's Representative
EPA	.....Environmental Protection Agency
FAR	.....Federal Acquisition Regulation
FOB	.....Freight On Board Responsibility for freight costs is determined by the suffix "Origin" or "Destination" after "FOB." "FOB Origin" indicates that the individual or organization originating the purchase (receiving the goods) is responsible for freight costs/liability. "FOB Destination" indicates that the person or organization receiving the order (sending the goods) is responsible for freight costs/liability.
FTMD	.....Facilities, Test and Manufacturing Directorate
GFE	.....Government Furnished Equipment
GFF	.....Government Furnished Facilities
GFM	.....Government Furnished Material
GRC	.....Glenn Research Center
HQ	.....Headquarters
HVAC	.....Heating, Ventilation and Air Conditioning
IMFP	.....Integrated Financial Management Program
IT	.....Information Technology
ITS	.....Information Technology Security
LDE	.....Lifting Devices and Equipment
LF	.....Lewis Field
LTID	.....Logistics and Technical Information Division

TFOME-II SOW
August 8, 2014

NASANational Aeronautics and Space Administration
NDTNon-Destructive Testing
NEMS.....NASA Equipment Management System

OEMOriginal Equipment Manufacturer
OSHAOccupational Safety and Health Administration

PBSPlum Brook Station

PGMProgrammed Maintenance

A preventative maintenance task whose cycle is greater than one year

PMPreventative Maintenance, Program Manager

Preventive Maintenance is also known as periodic maintenance, time-based maintenance, meter-based maintenance, run-time based maintenance, or interval-based maintenance. PM is the planned, scheduled periodic inspection, adjustment, cleaning, lubrication, material replacement, and minor repair of equipment and systems. A PM instruction typically consists of many check-point activities that are stored in the CMMS Job Plan Module

POCPoint of Contact

PT&IPredictive Testing and Inspection

PT&I is the use of advanced technologies to assess the condition of assets. Examples of PT&I activities include methods to locate thinning of pipe walls, detect roof weaknesses and/or wet insulation, identify equipment wear problems, and locate heat buildup in electrical equipment. Data collected from PT&I actions can be used to schedule PM or repairs, validate other maintenance and repair efforts, verify new installations, determine the overall material condition of assets, or establish equipment operational baselines

R&DResearch and Development

RCMReliability Centered Maintenance

RFPRequest For Proposal

ROIReplacement of Obsolete Items

ROIs are components of a facility that should be programmed for replacement because they are becoming obsolete (no longer parts-supportable at the end of service life), do not meet electrical or building codes, or are unsafe but are still operational and would not be construed as broken and needing repair

SFSSpace Flight Systems

SMADSafety and Mission Assurance Directorate

SOWStatement of Work

SPFSpace Power Facility

SRService Request

SRs are for facilities related work that is new in nature. Service requests are not maintenance or repair items, but are often performed under facilities maintenance contracts

TCTrouble Call

Trouble Calls are reactive maintenance work generally of a one-time nature to repair, adjust, calibrate, or replace broken or malfunctioning existing equipment or systems. The scope of a TC is limited to a total cost of \$2,000.

TFOMETest Facilities Operations, Maintenance & Engineering

WBSWork Breakdown Structure

7.0 Attachments

- 7.1 Attachment B – FTMD/PBS Organizational Details and Functions
- 7.2 Attachment C – Representative Special Certifications and Training
- 7.3 Attachment D – Sample Test Facility Maintenance Tasks
- 7.4 Attachment E – Sample CMS Work Breakdown Structure
- 7.5 Attachment F – Plum Brook Station Master Building List
- 7.6 Attachment G – Purchases
- 7.7 Attachment P – Initial Government Furnished Equipment List
- 7.8 Attachment Q – Lifting Devices and Equipment
- 7.9 Attachment R – CMS Overview
- 7.10 Attachment S – Documents from the GRC BMS Library