

ATTACHMENT E
WORK BREAKDOWN STRUCTURE (WBS)
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WBS: 1.00.1 RESEARCH TEST APPRENTICES

Period of Performance:

Title: RESEARCH TEST APPRENTICES

Background

Why the project is being pursued

The FT Division is responsible for providing technical support services to the Aeronautics and Space programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, vacuum facilities, turbo machinery, combustion facilities, engine component facilities, and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions and to record the research data. The effort of this WBS is to provide apprentice technicians to augment and provide a feeder system to the technical support services that are necessary to meet the test schedules and requirements as determined by the test programs and the FT Division's vision.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor shall provide an Apprenticeship program that meets the demands of the FT Division's need for qualified Research Lab Mechanics, Electricians and Electronics Technicians to augment or replace technicians leaving the various trades. Applicants need to meet an acceptable two year associate degree prerequisite level of competency. Deviations from prerequisite competency must be discussed with the Performance Monitor (PM)

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"The Apprenticeship program shall include a four year and 4 month State of Ohio Certification of a completed Apprentice Program in the Mechanical, Electrical and Electronics trades. The program shall consist of four one year evaluations of expected milestones and deliverables established at the beginning of each year of the program for each trade with a sequence of progression through each year and a required approval from supervision for advancement. Apprentices not meeting established milestones, metrics and deliverables shall be evaluated immediately to determine suitability for retention in the program. The Contractor is expected to replace individuals not meeting evaluation criteria immediately. Independent of supervision and technical guidance at the completion of the Apprenticeship Program, Apprentices shall be able to provide: facility and test rig maintenance and preventative maintenance (PM's), research and test hardware build-up and installation and a full range of project management skills inclusive of system coordination and integration with Facility Engineering, Test Engineering, Research Engineering, Technician Management and the Electrical, Electronic and Mechanical Trade Technicians and upon program completion Apprentices shall possess the skills ability and knowledge to be rapidly trained as model and facility operators in all research test facilities and test rigs that are supported by the FT Division. These facilities are normally operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, build-up, testing, and delivery of hardware and research operations schedules.

a. Description of Work – Apprentices will rotate through each FT Division Branch in 6 month cycles. Apprentices shall move to a different area assignment in 3 month intervals within the 6 month

Branch cycle. Apprentices will perform tasks that are assigned. Journeyperson will determine apprentice task and guide apprentices to task completion. Apprentice's will use hand, power tools and diagnostic equipment to complete task.

b. Quality Standards – “Quality” shall be defined and measured for each apprentice period performed to assure apprentices stay on pace to complete the Program within the required four years.

c. Schedule Standards – Each apprentice shall complete all scheduled requirements for the period evaluated.

d. Documentation Standards – Validated level of proficiency documentation showing each apprentice completing the assigned portion of the program.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"1. Contractor will provide documentation that demonstrates the Program meets the Ohio State Apprentice Program requirements.

2. Contractor will provide documentation showing a four year and 4 month plan that describes the efforts to train apprentices on the various tools, equipment and systems required to provide qualified personnel on NASA Glenn's research systems.

3. Contractor will conduct eight six (6) month evaluations that validate acceptable apprentice progress with management signed oversight.

4. Contractor will meet quarterly with the Performance Monitor (PM) to ensure the Apprentice Program is meeting milestones and deliverables.

5. Apprentice work efforts will be tracked using the Maximo system.

6. Contractor will identify a process for selection/replacement of new apprentices. Contractor will replace unsuccessful or terminated apprentices immediately (Approximately in 90 days). During the replacement process the on-going efforts shall be communicated to the PM

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	60
Schedule	30
Communication	10
NONE	0

Personnel Profile

Apprentices will have the ability and aptitude to become Mechanical, Electronic, Electrical technicians or engineering associates. The work requires some physical exertion, such as regular

and recurring running, walking, or bending, walking or climbing ladders or scaffolds to observe, collect, or record data. In many situations the duration of the activity (such as most of a workday) contributes to the arduous nature of the job. In other situations there may be special requirements for agility or dexterity such as exceptional hand/eye coordination.”

Government Furnished Property

N/A

WBS: 1.00.2 MANUFACTURING DIVISION APPRENTICES

Period of Performance:

Title: MANUFACTURING DIVISION APPRENTICES

Background

Why the project is being pursued

The Facilities Testing Division (Code FT) is responsible for providing engineering and technical services support to the Manufacturing Division, Aeronautics and Space programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, research aircraft, combustion, vacuum, engine component, microgravity and cryogenic facilities. The requirements of this WBS are to provide an Apprenticeship Program for the Engineering Directorate's (Code D) Manufacturing Division (Code DM).

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor shall provide an Apprenticeship program that meets the demands of the Manufacturing Division's need for qualified Machinists, Fabricators and Instrument makers to augment or replace technicians leaving the various trades. The contractor shall be compliant with all required personnel protective equipment for their employees. Applicants need to meet an acceptable two year associate degree prerequisite level of competency. Deviations from prerequisite competency must be discussed with the Quality Assurance Evaluator (QAE)

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

The Apprenticeship program shall include a four year State of Ohio Certification of a completed Apprentice Program in the Machinists, Fabrication and Instrumentation trades. The program shall consist of four one year evaluations of expected milestones and deliverables established at the beginning of each year of the program for each trade with a sequence of progression through each year and a required approval from supervision for advancement. Apprentices not meeting established milestones, metrics and deliverables shall be evaluated immediately to determine suitability for retention in the program. The Contractor is expected to replace individuals not meeting evaluation criteria immediately. Independent of supervision and technical guidance at the completion of the Apprenticeship Program, Apprentices shall be able to provide: Level of effort in machining, fabrication and Instrumentation and upon program completion Apprentices shall possess the skills ability and knowledge to be rapidly trained as model. These facilities are normally operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical delivery of hardware and research operations schedules.

a. Description of Work – Apprentices will rotate through each DM Division Branch in 6 month cycles where appropriate. Apprentices will perform tasks that are assigned. Journey person will determine apprentice task and guide apprentices to task completion. Apprentices will use hand, power tools, machining equipment and diagnostic equipment to complete task.

b. Quality Standards – "Quality" shall be defined and measured for each apprentice period performed to assure apprentices stay on pace to complete the Program within the required four years.

c. Schedule Standards – Each apprentice shall complete all scheduled requirements for the period evaluated.

d. Documentation Standards – Validated level of proficiency documentation showing each apprentice completing the assigned portion of the program.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

1. Contractor will provide documentation that demonstrates the Program meets the Ohio State Apprentice Program requirements.
2. Contractor will provide documentation showing a four year plan that describes the efforts to train apprentices in the various skill sets.
3. Contractor will conduct eight six (6) month evaluations that validate acceptable apprentice progress with management signed oversight.
4. Contractor will meet quarterly with Performance Monitor (PM) to ensure the Apprentice Program is meeting milestones and deliverables.
5. Apprentice work efforts will be tracked using the Maximo system.
6. Contractor will identify a process for selection/replacement of new apprentices. Contractor will replace unsuccessful or terminated apprentices immediately. This effort will be communicated to the PM.
7. Contractor will provide training and certification related to PPE requirements related to work assignments in a timely fashion.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	50
Schedule	30
Communication	20
NONE	0

Personnel Profile

Apprentices will have the ability and aptitude to become Machinists, Fabricators or Instrument makers.

Government Furnished Property

N/A

WBS: 1.07.1 MACHINERY REPAIR/TECHNICAL SERVICES

Period of Performance:

Title: MACHINERY REPAIR/TECHNICAL SERVICES

Background

Why the project is being pursued

The Research Testing Division is responsible for providing services to the Manufacturing Technology Division (MTD) at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, research aircraft, combustion, vacuum, engine component, microgravity and cryogenic facilities. The requirements of this task are to provide machinery repair and fabrication services that are necessary to meet the program requirements as determined by test programs and MTD management.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor shall provide technical and operations support for the following function: Machinery Repair Department Precision Machining Development Department

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

The Contractor shall be responsible for the repair, maintenance and weld requirements of machine tools, metal fabrication equipment, accessories, and hand tools in the Manufacturing Technology Division (MTD). The Contractor shall also be responsible for augmenting the fabrication services in the Precision Machining Development Branch. The Contractor shall staff, operate and maintain the Machinery Repair Department 8 hours per day, Monday through Friday, between the core hours of 6AM and 6PM. Fabrication services are required during core hours and may have periods of time when shift work is required. Contract machinery repair personnel who operate and / or perform work on Government equipment shall have completed a state certified apprenticeship program in an associated machining trade or have, as a minimum, five (5) years of verifiable technical experience in the machinery repair trade. Contract fabricators shall have a high school diploma, Associate Degree preferred, for all positions. Specialized training maybe required for some equipment and assembly jobs and will be provided. Personnel must be able to complete all specialized training. Fabricators shall have a minimum of 3 years of journeyman work experience. Work will be directed through the use of Work Orders, using Maximo following established processes and procedures.

A. Description of Work – The Contractor shall inventory, diagnose, troubleshoot, repair, and rebuild machine tools, metal fabrication equipment, furnaces, accessories, hand tools, and perform preventive maintenance (PM's). The work shall include, but is not limited to, the repair or modification of electronic, electrical, mechanical, pneumatic, hydraulic systems, and the alignment, leveling, or movement of equipment or machinery. The Contractor shall analyze and repair Computer Numerical Control (CNC) machines and their associated computers to the component level. The Contractor shall ensure that it has access to all relevant maintenance and operator's manuals, and technical information relating to the equipment serviced by the Machine Repair Department. The Contractor shall inform the NASA COTR (or authorized designee) of the extent of the repairs, available repair alternatives, expected costs, and parts / supplies that may be needed. The COTR (or authorized designee) will evaluate the alternatives, needs and determine which option would best suit the interest of the Government. The COTR's (or authorized designee's) decision will be communicated to the Contractor through an approved Work Order within the Maximo Work Order System.

B. Description of Fabrication Work: All work will be measured to the highest standards for space flight work.

1. Strong Fabrication and Fitting Experience able to read detailed schematics or blue prints to fabricate sheet metal components from various type of material, and assist in assemblies and subassembly research and space flight hardware to ensure a quality product, from the simple to the complex including fixturing as required.

2. Experience in the sheet metal layout set-up and operations of spot welding, riveting, press brakes, shears, drill presses punch presses, hand tools, fastener insertion, basic machining and other tooling\equipment common to the trade.

3. Team assemblers: perform all of the assembly tasks assigned and rotating through the different tasks, rather than specializing in a single task as required using stainless steel, aluminum, galvanized, cold rolled or hot rolled material from 2" thick to 24 gauges.

Must be able to work in a team environment as more than half of all assemblers work in teams at one time or another.

Work areas may be noisy, and many assemblers may have to sit or stand for long periods. Cleanup is required at the end of each shift or as needed.

C. Quality Standards – "Quality" shall be defined as each Work Order performed and completed in a manner which assures the equipment / system operates as it was designed to function, assures the safety of all equipment and personnel; and displays the efficient use of time and materials. The Contractor shall complete all Work Orders in accordance with the Work Order specifications. There shall be less than 5% of the total hours of a work activity spent on rework. The Contractor shall provide repair services that meet Original Equipment Manufacturer (OEM) specifications. The OEM specifications shall be recognized as the standard tolerances. The Government may require non-routine modifications to OEM specifications at its discretion, in which case such modifications will be communicated at the onset of the job, in the issued Work Order. The Contractor shall assure 95% of required repairs conform to the Work Order specifications (before rework), or equipment failures attributed to preventable technical failures, in a one-year period. Fabrication services will be held to the highest standards for space flight work.

D. Schedule - The Contractor shall complete 95% of the total number of routine Work Orders by the required Work Order due date. Urgent Work Orders shall be completed by the required Work Order due date, with no more than three jobs exceeding five days late per quarter. "Late" is defined as not meeting the Work Order due date. "On Time" is defined as in accordance with the established or planned schedule.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Documentation – Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones

Metrics

Quality of Performance	40
Schedule	30
Service Within Estimate	30
None	0

Personnel Profile

Experienced mechanical, millwright, fabricators, electrical and electronic personnel as required.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.08.1 MACHINE SHOP: BONDED STORAGE, MACHINING, FABRICATION SERVICES

Period of Performance:

Title: MACHINE SHOP: Bonded Storage, Machining, Fabrication Services

Background

Why the project is being pursued

The Facilities Testing Division (Code FT) is responsible for providing engineering and technical services support to the Manufacturing Division, Aeronautics and Space programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, research aircraft, combustion, vacuum, engine component, microgravity and cryogenic facilities. The requirements of this WBS are to provide support services for the Engineering Directorate's (Code D) Manufacturing Division (Code DM)) that are necessary to meet test schedules and requirements as determined by test programs and Code DM management.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor shall provide bonded storage, machining, instrumentation, fabrication and welding support for the Manufacturing Division (Code DM):

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

The Contractor shall provide bonded storage, machining, instrumentation, fabrication and welding support, Monday through Friday, between the core hours of 7AM to 6PM. Contract personnel who operate and / or perform work on Government equipment shall have completed a state certified apprenticeship in their associated trade or have a minimum of seven (7) years of verifiable experience in their field. The Manufacturing Division process is located in Building 50.

A. Description of Machinist Work – Provide precision machining and assembly using a wide variety of CNC and manual machining equipment. Independently determine full scope of work and logically plan the steps required to complete work efficiently and accurately. Work in a professional, team oriented environment in providing input to engineers and peers on design and machinability options and ideas. Design and modify fixtures and tooling for effectiveness and accuracy of machining assignments. Provide technical guidance to customers and peers to assist them in improving precision, accuracy and reliability of process equipment. Provide direct and indirect support to Prototyping and Assembly for machining, fixture building and assembly activities as requested. The work routinely involves the operation of Computer Numerical Control (CNC), conventional equipment and hand tools to perform a variety of assigned tasks. Task assignments routinely consist of manufacturing new hardware, re-working or modifying existing hardware. Task assignments will vary in length and difficulty and will usually be limited to one or two "pieces", but assignments may occasionally exceed twenty pieces. Materials commonly used in the performance of Work Order assignments may vary from plastics, graphite, stainless steels, brass, aluminum, carbon steel, high temperature alloys and may include experimental materials. Tolerances will normally be within .005", however some Work Orders may specify tolerances within .0002".

B. Description of Fabrication Work: All work will be measured to the highest standards for space flight work.

1. Strong Fabrication and Fitting Experience able to read detailed schematics or blue prints to fabricate sheet metal components from various type of material, and assist in assemblies and subassembly research and space flight hardware to ensure a quality product, from the simple to the

complex including fixturing as required.

2. Experience in the sheet metal layout set-up and operations of spot welding, riveting, press brakes, shears, drill presses punch presses, hand tools, fastener insertion, basic machining and other tooling\equipment common to the trade.

3. Team assemblers: perform all of the assembly tasks assigned and rotating through the different tasks, rather than specializing in a single task as required using stainless steel, aluminum, galvanized, cold rolled or hot rolled material from 2" thick to 24 gauges.

Description of Welding Work: Provide precision welding and assembly using a wide variety of welding equipment and welding processes. Independently determine full scope of work and logically plan the steps required to complete work efficiently and accurately. Work in a professional, team oriented environment in providing input to engineers and peers on joint design and welding options.

Design and modify fixtures and tooling for effectiveness complete welding assignments. Provide technical guidance to customers and peers to assist them in improving product quality and service.

Demonstrated ability to read and interpret blueprints, diagrams, sketches and job specifications and a strong mechanical background. Perform electric arc, gas, inert gas, resistance and other type of welding on experimental models, facility, instrument probes, etc. Using special welding equipment such as automatic heliarc, automatic short arc, and spray arc, when required. Performs such related trade tasks as brazing, soldering, flame cutting, flame treating, etc. Welds a variety of metals and alloys plus those in the refractory group. Joins dissimilar metals and those of different mass and the ability to use hand tools related to the welding trade.

C. Description of Bonded Storage:

- Update the BS Procedure document, as needed (including receiving chemicals, property passes, transportation from offsite contractors)
- Assist new project managers on facility requirements (safety hazards, cleanroom procedures, etc.)
- Control of hardware for various projects (items that require tracking, i.e. NASA tag equipment, flight hardware, etc.)
- Manage age sensitive chemicals in flammable and corrosive cabinets (label with date of receipt and date of expiration and MSDS information)
- Prepare purchase requests for commercial and stock requisitions (APRS, stock requisitions)
- Initiate facility and project work orders and work requests
- Daily activities including assisting: Transportation personnel with pickup and deliveries, Shipping & Receiving to send and receive FedEx or UPS and tracking, Inventory Control Specialist to scan and tag equipment, Project Managers and Engineers to discuss program requirements, Building Managers to coordinate work schedules, Calibration Lab for pickup of equipment, Mechanical and Electronic Engineers to issue parts and assembly kits for buildup, Stock Room to pick up orders, etc.
- Research vendors for best purchase data (price, part no., ship time, CofC, point of contact, etc)
- Arrange pickup excess hardware
- Coordinate badge requests for contractors and vendors performing various tasks
- Operate towmotor to physically move hardware to various areas
- Computer support (file attachments, e-mail, online forms, MP5, APRS, etc).
- Documentation Control including: (information provided to project with information on when items was received, where purchased, who signed out, shipping no (DD-250), copies of shipping document (C-727) or where shipped out
- Assist in preparing for tours in 100E
- Other duties as required

Personnel Requirements Refer to AB&C: Require that all personnel must be able to work in a team environment as more than half of all assemblers work in teams at one time or another.

Work areas may be noisy, and many assemblers may have to sit or stand for long periods. Cleanup is required at the end of each shift or as needed.

D. Quality Standards – “Quality” shall be defined as each task performed and completed in a manner which assures the “part” is machined to specifications of the design, assures the safety of equipment and personnel; and displays the efficient use of time and materials. The Contractor shall provide “parts” in accordance with task specifications. The acceptable standard shall be 98% conformance to specifications of approved tasks. An acceptable “part” is one that conforms to the form, fit or function of the task description or specification. The Contractor shall complete all tasks in accordance with the task specifications. There shall be less than 5% of the total hours of a work activity spent on rework. The Contractor shall assure 95% of required repairs conform to the task specifications (before rework), or equipment failures attributed to preventable technical failures, in a one-year period. Fabrication services will be held to the highest standards for space flight work.

E. Schedule Standards – The Contractor shall complete 95% of the total number of routine Work Order assignments by the task due date. The Contractor shall complete 97% of the total number of urgent task assignments by the Work Order due date and shall not impact the research schedule, unless otherwise specified and agreed.

F. Documentation Standards – Work will be performed and documented by using the Maximo system. Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Refer to C: General Scope of Work; Schedule Standards

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	40
Schedule	30
Service Within Estimate	30
None	0

Personnel Profile

Experienced machinists, mechanical, tool and die, fabricators, associate engineers and bonded storage personnel as required

Government Furnished Property

The Contractor, if necessary, will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.01.1 AERO POWER AND PROPULSION / TECHNICAL SERVICES

Period of Performance:

Title: AERO POWER AND PROPULSION / TECHNICAL SERVICES

Background

Why the project is being pursued

The Facilities Testing (FT) Division is responsible for providing technical and operations support services to the Aerospace programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, drive operations for the wind tunnels, vacuum, combustion, engine component, and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The effort of this WBS is to provide technical support services that are necessary to meet the test schedules and requirements of the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall provide technical and operations support to the following GRC facilities:

- „« 10 x 10 Supersonic Wind Tunnel (SWT) complex
- „« 8 x 6 / 9 x 15 Supersonic / Transonic Wind Tunnel complex
- „« Propulsion Systems Laboratory (PSL) complex
- „« Engine Components Research Laboratory (ECRL) CURRENTLY INACTIVE STATUS

GRC Center wide technical support through the Tactical Group

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance, research and test hardware build-up and installation; as well as model and facility operations. These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules. Personnel who operate and / or perform work on Government facilities, research test articles and/or equipment shall have completed a state certified apprenticeship program in an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered ""qualified"" shall also possess a working knowledge of common computer software applications, basic aerodynamic physics and principles; and possess the ability and enthusiasm to work within a highly productive team environment. Security clearances will be required for designated personnel.

a. Description of Work -- The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and model) operations. The Contractor shall ensure the daily usability of the Wind Tunnel complexes by performing routine and non-routine maintenance in accordance with PM schedules and Task Orders; and identify needed repairs to accommodate planned operations and run schedules. Support efforts shall include the build-up, assembly, installation, modification, calibration, troubleshooting, repair, removal, storage and inventory all mechanical, electrical and electronic components and data systems associated with the Wind Tunnel complexes. Additional support efforts shall include pre-run and post-run set-up's, inspections, check-outs, daily calibrations and complete squawk sheet procedures associated with the operation of the facility and test hardware (including model). During

the normal course of duties, the Contractor shall perform work involving hydraulics, vacuum systems, pneumatics, various fuels and gaseous systems; and facility and model instrumentation and controls verification tasks. The Contractor may also be required to perform work involving various welding and weld inspection processes.

The Contractor shall incorporate Maximo Work Order system for scheduling work for the Wind Tunnel complexes.

The Contractor shall incorporate the researcher's operation schedule (also referred to as the "run schedule") as established by facility management and engineering, into the "planned schedule".

The Contractor shall perform all facility and model test operations for the Wind Tunnel complexes. Operations and run schedules vary widely and will include multiple shift research testing. The Contractor shall maintain the test operators' run log for the facility and follow all established facility procedures, as well as ISO 9001 standards, for all required documentation.

The Contractor shall perform work associated with Division Blanket Purchase Agreements (BPA's). Such work typically includes but is not limited to specialty services for welding, rigging, pipe fitting and electrical support.

The work requires physical exertion, such as walking, bending, stooping, kneeling, climbing ladders or scaffolds and recurring lifting of moderately heavy items. In many situations the duration of the activity, such as most of a workday, contributes to the arduous physical nature of the job. In other situations there may be special requirements for agility or dexterity such as exceptional hand/eye coordination.

b. Quality Standards -- "Quality" shall be defined as - each Maximo Task Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall have 97% of Task Orders completed IAW specifications listed on the Task Order. The Contractor shall have the pre-run and post-run check / squawk sheet tasks completed 100% accurately, with no check / squawk sheet anomalies. A check / squawk sheet anomaly is an item that is inaccurately documented i.e. valve is checked "closed", but is subsequently found to have been open.

c. Schedule Standards -- The Contractor shall complete 95% of the routine jobs (Task Orders, check sheets, squawks) and 98% of the urgent jobs (Task Orders, squawks) by the Task Order due dates. The Contractor shall complete pre-run check sheets 1 hour prior to the run and deliver the check sheets 30 minutes after completion, following established facility procedures. The Contractor shall complete post-run check sheets within 1 hour after the run and shall deliver the check sheets within 1 hour after completion, also following established facility procedures. Squawk sheets shall be completed 4 hours prior to the scheduled test run.

10 x 10 Supersonic Wind Tunnel Drive Complex (10 x 10 SWTDC), 8 x 6 Supersonic Wind Tunnel Drive Complex (8 x 6 SWTDC)

a. Description of Work -- The Contractor shall perform operations and maintenance of the systems and equipment that support the research and development functions of the Center. The systems and equipment to be maintained under this WBS are housed in the following facilities:

10 x 10 SWTDC The Contractor shall operate, maintain, inspect, repair and troubleshoot equipment

associated with the 10 x 10 SWTDF in accordance with the appropriate operations and maintenance manuals. The equipment includes the auxiliary support equipment such as the lube oil system, hydraulic system, pneumatic system, diesel generator, high-pressure compressor, gear boxes, fans as well as the components of the interior tunnel circuit in the direction of flow from and including the first stage cooler through the exit end of the secondary compressor. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The Contractor shall perform these functions in accordance with the NASA Glenn safety manual, the Electrical Application Safety Committee (EASC), and the Process System Safety Committee requirements for operating permits.

8 x 6 SWTDC- The Contractor shall operate, maintain, inspect, repair and troubleshoot equipment associated with the 8 x 6 SWTDC in accordance with the appropriate operations and maintenance manuals. The equipment includes the auxiliary support equipment such as the lube oil system, hydraulic system pneumatic system, diesel generator, high-pressure compressor, gear boxes, fans as well as the components of the interior tunnel circuit in the direction of flow from and including the return leg cooler through the exit end of the compressor. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The Contractor shall perform these functions in accordance with the NASA Glenn Safety manual and Electrical Application Safety Committee (EASC), and the Process System Safety Committee requirements for operating permits.

The Contractor shall provide personnel, equipment, tools, materials, vehicles, supervision and other items necessary to perform the management, operations, maintenance, repair and modification of the research support systems as defined in this WBS.

Operations shall include equipment operations' functions, watch-standing, tending, (these terms describe a monitoring function, particularly when a piece of equipment has been inspected, repaired, and being brought back into service, or when a new piece of equipment is coming on line), or attendance type work requiring the presence of qualified persons to perform specific duties during a specific or scheduled time period. Operations shall include equipment and system pre-run checkout and setup, start, control, monitoring, troubleshooting, shutdown, post-run checkout, and securing of the equipment following shutdown. Operations shall also include Operation Corrective Maintenance and Repair (OCMR) of the auxiliary, ancillary and distribution systems. Repair of equipment problems, malfunctions, breakdowns, and related repair deficiencies that occur, which may affect scheduled research operations, shall be considered part of Operations. The Contractor shall perform work in accordance with operations and maintenance manuals and manufacturer's literature.

The Contractor shall provide qualified personnel to accomplish field operations activities associated with the Wind Tunnel Drive systems and equipment in the performance of this WBS. The Contractor shall be responsible for all the preparatory activities to ready equipment for operations, monitoring of the equipment during operations, and securing the equipment.

Equipment and systems operations performed ""in total"" (without the assistance of government personnel or other support personnel) by the Contractor. This includes pre-run checkout and set up, start, control, monitoring, shutdown, and post-run securing of equipment and systems by the Contractor for the following:

SYSTEM OPERATION PROCEDURE

10 x 10 Air Dryer System OP-A06-001.01-025

10 x 10 Diesel generator set and systems OP-A10-001.08A

3000 lbs High Pressure compressor OP-A14-001.01-00

10 x 10 Turning Gear OP-A07-001.11-013

10 x 10 buffer Air System N/A

10 x 10 Primary and Secondary Coolers OP-A07-001.01-000

8 x 6 / 9 x 15 Air Dryer System OP-B06-001.01-015

8 x 6 Diesel Generator Set and Systems OP-B04-001.12-003

8 x 6 / 9 x 15 Turning Gear OP-B04-001.11-001

Periodic Altitude Exhauster Spray Cooler Operations OP-E04-001.03-013

Equipment and systems' operations that are set up and started by the Contractor, with operational control responsibility turned over to "others" (i.e. drive motors are initially started by the drive motor operators and then, once running, control is passed along to the tunnel operators to set final research test conditions). This includes pre-run checkout and set up, monitoring, and tending of operating equipment and systems, shutdown, and post-run securing of equipment and systems by the Contractor for the following:

SYSTEM OPERATION PROCEDURE

10 x 10 Main and Secondary Drive Motors OP-A04-001.01-011

10 x 10 Primary and Secondary Coolers OP-A07-001.01-000

8 x 6 / 9 x 15 Drive Motors OP-B04-001.01-013

b. Quality Standards -- 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 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.

c. Schedule Standards -- The Contractor shall schedule and complete work in a manner that minimizes disruption of the NASA mission and daily activities. The Contractor shall be fully cognizant of the NASA Research Facility Test/Central Process Systems Requirement Schedule in planning work activities. The test/requirement schedule may be updated periodically throughout the week to reflect schedule changes. The Contractor's first priority shall be to ensure the equipment is ready for operation to meet these research requirements.

"

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"Documentation Standards -- When required, the Contractor will obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation will be stored in the Technical Research Library (TRL).

The Contractor will follow configuration control guidelines. When required, the Contractor will be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the COR (or authorized designee). The Contractor will utilize NASA specified software packages, as appropriate, to update documentation.

Documentation Standards -- Refer to documentation requirements that are stated in 4.2 Work

Control Systems of the SOW.
"

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical, Electronic and / or Electrical Technician personnel as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be posted to the TERMS (or it's successor) database to be available for review by the COR (or authorized designee) on a quarterly basis.

WBS: 1.02.1 SPACE POWER AND PROPULSION / TECHNICAL SERVICES

Period of Performance:

Title: SPACE POWER AND PROPULSION / TECHNICAL SERVICES

Background

Why the project is being pursued

The Testing Division (Code FT) is responsible for providing technical support services to the AeroSpace programs at the Glenn Research Center. Some of the key facilities used by the programs are the vacuum, microgravity and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions and to record the research data. The effort of this task is to provide technical support services that are necessary to meet the test schedules and requirements of the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements; The Contractor shall provide technical and operations support to the following GRC facilities:

- „« Electric Propulsion Research Building (EPRB)
- „« Electric Power Laboratory (EPL)
- „« Energy Conversion Laboratory (ECL)
- „« Plasma Interaction Facility (PIF)
- „« Power Systems Facility (PSF)
- „« Space Power Research Laboratory (SPRL)
- „« Photovoltaic / System Test Facility (STF) Control Center
- Instrumentation Research Lab (IRL)

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance, preventative maintenance (PM's), research (test hardware and model) build-up and installation; as well as, research and facility operations. These facilities shall normally be operational eight (8) hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations' schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have completed a state certified apprenticeship program in an associated mechanical, electrical or electronic trade or have a minimum of five (5) years of verifiable technical experience in the above listed disciplines. Work will be directed through the use of work orders, following established processes and procedures. Contract personnel shall also have demonstrated proficiency in fabrication and assembly work along with a solid understanding of vacuum system interactions due to the unique operational requirements of this area.

Security clearances may be required for designated personnel.

a. Description of Work; The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and model) operations. The Contractor shall ensure the daily usability of facilities in this area through the use of proper maintenance, repair practices and operational procedures. The Contractor shall fabricate, assemble, install, set up, modify, calibrate, troubleshoot, repair, remove, store and inventory all mechanical, electrical and electronic research and / or facility hardware to meet test or experiment

requirements and specifications as directed by Work Orders. The work environment will have exposure to high-pressure gas systems, High Vacuum systems, laser light, solar simulators, high voltage (AC and DC), as well as high temperature surfaces and cryogenic materials. The contractor shall maintain Bonded Storage areas and on occasion support and/or provide demonstrations, and tours to GRC visitors and personnel both onsite and offsite as required. The Contractor shall perform modifications to test facilities, their parasitic ports and ancillary support equipment and shall maintain required documentation and records of all modifications. If Work Orders indicate, the Contractor shall also be required to perform test hardware or experiment assembly inside a Clean Room environment. The Contractor shall maintain the appropriate Class Clean Room environment by complying with established Clean Room standards and practices, as applicable. Other unique technical and maintenance certifications may be required, i.e. GRC Flight System Assembly Training (FSAT) manual and critical lift certifications for flight hardware buildup, assembly and handling. The work may require some physical exertion, such as regular and recurring walking, or bending, walking or climbing ladders or scaffolds. In many situations the duration of the activity (such as most of a workday) contributes to the arduous nature of the job. In other situations there may be special requirements for agility or dexterity such as exceptional hand/eye coordination.

b. Quality Standards; "Quality" shall be defined as - each Work Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall complete all Work Orders in accordance with the Work Order specifications. There shall be less than 5% of the total hours of a work activity spent on rework.

c. Schedule Standards - The Contractor shall complete all of the scheduled activities/tasks by the Work Order due date unless the requestor named on the Work Order gives approval of a proposed change. The Contractor shall deliver or otherwise provide services requested in accordance with that change. The Contractor shall complete 95% of assignments by the Work Order due dates."

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"1. Documentation Standards; Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

2. Meet the test schedules and requirements as determined by the test programs and the FT Contract Performance Monitor (CPM). Specific milestones are subject to change as priorities or funding levels change."

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	60
Schedule	40
None	0
None	0

Personnel Profile

Experienced Mechanical, Electronics, and Electrical as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.03.1 SPACE POWER & PROPULSION, COMMUNICATIONS & INSTRUMENTATION BRANCH SERVICES

Period of Performance:

Title: Space Power & Propulsion, Communications & Instrumentation Branch Services

Background

Why the project is being pursued

The FT/Testing Division is responsible for providing technical support services to the Sensors, Electronics and Optical Instrumentation Technology and Advance Communications Technology programs at the Glenn Research Center. Some of the key facilities used by the programs are the Thin Film Sensor Technology, High Temperature Electronics, and Laser Laboratories and Satellite Earth Station Facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions and to record the research data. The effort of this task is to provide technical support services that are necessary to meet the test schedules and requirements of the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor may provide technical and operations support to the following technology areas depending on program needs:

- 1.3.1A Surface Science Technology
- 1.3.1B Thin Film Sensor Technology
- 1.3.1C Semi-Conductor Technology
- 1.3.1D Fiber Optic Technology
- 1.3.1E Laser Technology
- 1.3.1F Instrumentation Technology
- 1.3.1G Laser / Optics Diagnostics
- 1.3.1H Advanced Communication Technology

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

The Contractor shall staff, maintain, and conduct experiments in the research and development of thin film sensor technology, high temperature electronics and laboratories equipped with electron microscopes, surface analysis spectrometers, optical lithography, vacuum equipment, and shall perform operations in a manner consistent with standard clean room practice.

The Contractor shall provide support and maintain laser laboratories equipped with pulsed and continuous-wave lasers, fiber-optic sensors, and an electronics laboratory for fabrication of instrumentation prototypes.

The Contractor shall provide daily operation and maintenance services for several satellite earth station facilities, and provide technical support to researchers using these facilities.

These facilities will normally be operational eight (8) hours per day, Monday through Friday, but actual operations' schedules may vary (increase / decrease) to accommodate critical maintenance, build-up, testing, delivery and research operations' schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have a minimum of three (3) years experience in the required skills. Work will be directed through the use of

Work Orders, following established processes and procedures. The work may require some physical exertion, such as regular and recurring walking or bending, walking or climbing ladders or scaffolds. In many situations the duration of the activity (such as most of a workday) contributes to the arduous nature of the job. In other situations there may be special requirements for agility or dexterity such as exceptional hand/eye coordination.

Description of Work – The Contractor will provide technical support services to fabricate test devices, prepare specimens for testing, assemble special specimen fixtures, modify testing parameters, troubleshoot and repair associated research hardware; and provide data gathering services.

The Contractor will provide technical support services to build, assemble, calibrate, modify, troubleshoot and repair lasers, optical systems, and associated electronic hardware.

The Contractor will provide technical support services to build, calibrate, modify, troubleshoot and repair various satellite communications systems, and associated electronic hardware.

1.3.1A Surface Science Technology

The Contractor will support research in thin film sensor devices, which are chemically and structurally analyzed in the microscopy facilities. The results of the analyses are used to determine failure mechanisms in the devices and also to provide chemical information in order to design thin film structures that will operate at the high temperatures incurred during jet engine operation. The Contractor shall provide technical support in the development of thin film research programs and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Operate SEM (Scanning Electron Microscope) equipped with EDS (Energy Dispersive Spectrometer), SAM (Scanning Auger Microscope), ESCA (Electron Spectroscopy for Chemical Analysis) system and an XPS (X-ray Photoelectron Spectroscopy). Additionally, operate the Atomic Force Measurement (AFM) and Optical Microscope.
2. Establish instrumental parameters for optimum performance.
3. Make simple elemental identification of spectral results.
4. Perform computer manipulation of spectral data.
5. Keep laboratory records for the microscopy systems, including data reduction and analytical reports.
6. Maintain vacuum systems and related microscopy equipment by performing routine maintenance.
7. Prepare specimens for microscopy.
8. Provide dicing saw operations.

1.3.1B Thin Film Sensor Technology

The Contractor shall support the development of thin film sensor technology by complete fabrication and process development for a variety of prototype Silicon Carbide (SiC) devices which include p-n junction and Schottky diodes, Junction Field Effect Transistor (JFET's), MESFET's, Metal Oxide Semiconductor (MOS) based devices and sensor microstructures. This research is tested within a

clean room environment located in the Instrument Research Laboratory (IRL), Building 77 and involves experimentation with thin film sensor processes. The Contractor shall provide technical support in the research and development of thin film sensor devices and shall, as required by task order or in accordance with preventive maintenance (PM) schedules:

1. Set up and operate thin film deposition, optical lithography, and other thin film process equipment.
2. Fabricate thin film devices using standard thin film techniques.
3. Perform hardware and electrical modifications to process equipment.
4. Maintain supplies as needed for regular class 1000 Clean Room operations.
5. Maintain vacuum systems and other process equipment by performing regular maintenance.
6. Provide dicing saw operations.

1.3.1C Semi-Conductor Technology

The Contractor shall provide support for all aspects of semiconductor crystal growth processing with mechanical and electronic support for semiconductor-purity and high vacuum Chemical Vapor Deposition (CVD) systems. The Contractor shall maintain the operation of all High Temperature Integrated Electronics and Sensors (HTIES) crystal growth facilities. These systems are specifically designed for Silicon Carbide (SiC) epitaxial growth, and will allow NASA to directly compare the merits of the different growth system configurations. The Contractor shall be capable of carrying out pre-growth treatments of small crystalline substrates using various chemical techniques including the use of various organic solvents, acids, bases, and related cleaning procedures. The Contractor shall provide technical support for all aspects of semiconductor crystal growth processing with mechanical and electronic support for semiconductor-purity and high vacuum CVD systems and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Perform mechanical installations and calibration of high purity components.
2. Design and construct simple hardware needed for support of crystal growth efforts.
3. Prepare informal reports describing work performed under this task.
4. Operate computer controlled chemical vapor deposition (CVD) systems.
5. Operate computer-controlled interfacing techniques.
6. Work with and change gas cylinders.
7. Perform chemical cleaning of reaction vessels.
8. Utilize techniques for electrical evaluation of small crystalline substrates.
9. Ensure safety standards with sophisticated and potentially hazardous equipment/systems.
10. Provide dicing saw operations.

1.3.1D Fiber Optic Systems

The Contractor shall support research in optical systems including a family of sensors that will monitor aircraft engine parameters such as internal temperature, pressure, fuel rates, ambient air temperature, and density. The Contractor shall provide technical support in the development of fiber-optic sensor research programs and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Provide electro-optical support for fiber-optics sensors lab.
2. Design, fabricate and test electronic circuitry.
3. Fabricate fiber-optic sensors and related optical assemblies.
4. Characterize fiber-optic components and test sensor prototypes.
5. Set-up and perform experiments, working from a test plan and using standard electronic instruments and optical hardware.
6. Write BASIC programs to interface data acquisition computers with sensor prototypes and laboratory instruments.
7. Write program to statistically analyze results.
8. Use commercial graphics programs to plot results.
9. Maintain a stock of necessary electronic and fiber-optic parts.

1.3.1E Laser Systems

The Contractor shall conduct research in optical instrumentation, including laser anemometry, laser spectroscopy, holographic interferometry, fiber optics, and particle sizing. This research is located in five laboratories in the Instrumentation Research Laboratory (IRL) Building 77 and in facilities in ERB Building 5 and CRL sites and involves experimentation with lasers and complex optical path configurations on optical tables. The Contractor shall support the set-ups that must be changed and optimized during the course of research. The Contractor shall provide technical support in the research and development of laser systems and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Set up and maintain lasers, optics, fiber optics, and electronics equipment for the performance of laboratory experiments.
2. Conduct experiments and store data on electronic media for analysis.
3. Devise and construct special optics holders and mountings.
4. Verify proper operation of lasers, including argon-ion, copper-vapor, helium-neon, pulsed Nd:YAG, dye, and diode lasers and provide routine maintenance of these lasers.
5. Set up optical experiments on optical tables, using lenses, mirrors, detectors, electro-optics, fibers, and associated hardware.
6. Set up electronic instrumentation for acquisition of data.
7. Perform data-taking procedures, including the making of holograms and the operation of PC-

controlled data acquisition systems.

8. Perform optical component evaluation tests.

1.3.1F Instrumentation Technology

The Contractor shall provide electronic support for fiber-optic sensor research for in-house fiber-optic sensor research programs in the development of a number of novel instrumentation methods. The Contractor shall provide technical support in the research and development of new optical instrumentation systems and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Assemble, document, and test analog and digital electronics that interface with fiber optic sensor assemblies and aircraft computer systems.
2. Program, document and debug 8X51 assembly language firmware to be used in conjunction with sensors, sensor electronics and aircraft computer systems.
3. Prepare data acquisition hardware for use in testing and calibration of sensors and their electronics.
4. Setup and interface to experiments for the testing and calibration of sensor systems.
5. Organize, plan and perform aerospace environmental stress screening experiments.
6. Construct printed circuit boards from schematic drawings.
7. Identify specifications for and interface with off lab board fabricators.
8. Document data, results, and findings of experiments.
9. Maintain replacement parts of related hardware and materials with manufacturer's specification data.

1.1.3G Laser / Optics Diagnostics

The Contractor shall provide support for the laser/optical diagnostics work of High Speed Research, Advanced Subsonics Technology, and Smart Green Engine programs located in Building 5 CE-5, Building 5 SE-5, Building 38 ASCR, and Building 77 Room 119. The Contractor shall provide technical support in the research and development of new laser/optical systems and shall, as required by Work Order or in accordance with preventive maintenance (PM) schedules:

1. Operate and maintain lasers, optics, fiber optics, and electronic equipment necessary for the performance of experiments.
2. Perform preventive maintenance (PM) on laser systems, which include, but are not limited to Nd: YAG, Dye, and Argon-ion lasers.
3. Install optical equipment necessary for the performance of experiments.
4. Operate electronic equipment, including oscilloscopes, digital cameras, data acquisition and control systems.

5. Perform normal maintenance tasks on laser systems, such as: replacing depleted dye solutions and de-ionized water, cleaning/changing optics, and optimizing dye laser output.
6. Perform mode and power optimization of fiber-optically-coupled lasers, as well as alignment of various transmitting and receiving optical elements around test stands.
7. Install and align optical elements of beam delivery systems.
8. Reconfigure optical elements for varying experimental requirements.
9. Install, perform checkouts of, and operate electronic instrumentation used to acquire and process laser diagnostic data.
10. Evaluate diagnostic equipment performance and procedures.
11. Recommend and/or execute modifications to equipment or procedures to improve data acquisition and processing performance.

1.3.1H Advanced Communications Technology

Glenn Earth Station Facilities

The Contractor shall maintain earth station equipment and antennas. The Contractor shall provide support in the developmental design, buildup, checkout and testing of electronic circuits and subsystems used to support communication technology research testing, and shall perform modifications to these systems as directed. The Contractor shall provide technical support to researchers using the facilities and participate in the development of advanced satellite communications systems. The Contractor shall, as required by Work Orders or in accordance with the preventive maintenance (PM) schedules:

1. Maintain satellite earth station equipment. This includes routine servicing of outdoor and indoor equipment and the maintenance of records (user manuals and equipment logs).
2. Support researchers during communication experiments by operating the earth station(s), monitoring the performance of equipment, and the recording of test data.
3. Develop, construct, modify, test, install, maintain, and calibrate 'Specialized Electronic Hardware' as needed to interface equipment, automate operations, and monitor performance. This includes the construction of printed circuit boards from schematic drawings.
4. Responsible for efficient operation of earth station systems. This includes preparing hardware/instrumentation for use in testing and calibration of satellite links and their electronics, and performing antenna re-pointing and alignment.
5. Coordinate with individuals outside of NASA to efficiently manage satellite time and NASA earth station assets. Examples include working with the satellite providers Network Operations Center to coordinate transmission events, confirm proper alignment of earth station pointing and power levels, and prompt reporting of interference or other anomalies that may impact the experiment.
6. Install, perform checkouts of, and operate electronic test instrumentation used to calibrate communications systems. This includes the periodic evaluation of diagnostic equipment performance and diagnostic procedures.

7. Troubleshoot malfunctions and measure system performance using specialized test and measuring instruments such as spectrum analyzers, power meters, frequency counters, network analyzers, oscilloscopes, voltmeters, ammeters, ohmmeters, capacitance meters, etc.

8. Assist in the construction and certification of new earth station antenna systems as required.

9. Maintain replacement parts of related hardware and materials in accordance with manufacturer's specification data.

10. Document data, results, and findings of experiments and deliver information to the requestor.

a. Quality Standards – "Quality" shall be defined as - each Work Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall complete all Work Orders in accordance with the Work Order specifications. There shall be less than 5% of the total hours of a work activity spent on rework. The Contractor shall have 100% compliance to class 1000 specifications.

b. Schedule Standards -- The Contractor shall deliver or otherwise provide all requested services/supplies/items in accordance with the planned schedule. The Contractor shall complete 90% of routine assignments and 95% of urgent assignments by the Work Order due dates.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Documentation Standard -- Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical, Electrical, Electronics, and Laboratory technicians as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee on a quarterly basis.

WBS: 1.04.1 MATERIALS AND STRUCTURAL DEVELOPMENT & TESTING/TECHNICAL SERVICES

Period of Performance:

Title: MATERIALS AND STRUCTURAL DEVELOPMENT & TESTING/TECHNICAL SERVICES

Background

Why the project is being pursued

The Facilities Test Division (FT) is responsible for providing technical support services to the Materials & Structures programs at the Glenn Research Center. Some of the key facilities used by the programs are the mechanical testing, fatigue and fracture laboratories and specimen manufacturing shop. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions and to record the research data. Specimen and test articles are manufactured to finite specifications for some of the research facilities. The effort of this task is to provide technical support services that are necessary to meet the test schedules and requirements as required by the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements – The Contractor shall provide technical, operations and machining support to the following GRC facilities:

1.4.1A

Special Projects Laboratory (SPL)
Materials Research Laboratory (MRL)
Materials and Structures laboratory (M & S)
High Temperature Composites Laboratory (HTC)
Material Processing Laboratory
Basic Materials Laboratory (BML)

1.4.1B Specimen Machine Shop

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

The Contractor shall staff, maintain and conduct experiments in the advanced metallics, ceramics, tribology and surface science, and environmental durability testing laboratories which develop high temperature materials such as metals, ceramics, coatings and lubricants primarily used in aerospace power and propulsion systems.

The Contractor shall staff, maintain, and conduct experiments in the mechanical testing, fatigue and fracture laboratories and specimen manufacturing shop. These laboratories are equipped with fatigue machines, universal tensile machines and sophisticated controlled mechanical test equipment used in the testing of aerospace propulsion and power system components made of high-temperature metallics, ceramics, and fiber reinforced composite materials.

The Contractor shall staff, maintain and operate equipment and hand tools in order to provide various metallurgical specimens. Personnel who operate or maintain Government equipment in this shop, shall have completed a state certified apprenticeship in the machining trade or have a minimum of seven years in the skilled machine trade.

A. Description of Work

1.4.1A

The Contractor shall provide technical support services to fabricate test devices, prepare specimens for testing, assemble special specimen fixtures, modify testing parameters, troubleshoot and repair associated research hardware. Technical services will provide support to research endeavors in advanced metallic and ceramic systems utilizing the mechanical testing laboratories and the fatigue and fracture laboratories. When requested, the Contractor shall also support research in electron optics.

The Contractor shall ensure the daily usability of the specialized laboratories by performing technical maintenance and repairs on machines and laboratory equipment.

Mechanical testing shall be accomplished by obtaining, collecting, and recording data and conducting experiments on computer-controlled furnaces and test systems. The Contractor shall change furnaces and test systems, perform calibrations of laboratory hardware and test equipment which shall be traceable to national standards. When directed by Work Orders, the Contractor shall instrument specimens with thermocouple and strain gauges, tab, align and mount specimens in mechanical testing equipment – align grips, specimen, and load train. The Contractor shall set up and operate electrical systems and devices, electronic instruments, computer data acquisition and control equipment. The Contractor shall also install, operate and maintain laboratory equipment to ensure safe and productive operation within the fatigue and fracture laboratory. Technical services required shall also include the maintenance and operation of the central hydraulic and distilled water systems to ensure peak performance and keep all accumulators at their required pressure levels. When directed by Work Order, the Contractor shall fabricate and install special induction coils used for heating test specimens and also fabricate custom specimen fixtures. The Contractor shall:

Develop new testing procedures for experimental materials with the assistance of engineers and scientists.

Assist with the designing and purchasing of new equipment for more advanced testing needs.

Set up research equipment.

Perform routine maintenance on research equipment.

Repair research equipment.

Monitor tests using computer data acquisition systems.

Inventory and prepare stock requests for restocking expendable supplies and equipment.

1.4.1B Specimen Machine Shop

The Contractor shall operate and maintain the Specimen Machine shop located in Building 49. Work assignments shall involve the operation of equipment and hand tools to provide metallurgical specimens. The typical specifications will be in the form of completed drawings, sketches or other types of instruction communicated to the Contractor through the standard issuance of Work Orders. Specifications will vary in difficulty and length of time for completion. Materials are commonly experimental and may include high temperature alloys, ceramics, composites and single crystal materials. Tolerances will normally be within .005in. However, some features may be within .0002in.

The following list represents a sampling of equipment located in the Specimen Shop facility:

CNC MACHINERY

4 each Sodick Wire EDM machines

2 each A-320

1 each BF-275

1 each AQ550

1 each Sodick LN1 RAM EDM

- 1 each Fryer CNC Lathe
- 1 each Bridgeport CNC Mill
- 1 each Bridgeport CNC Surface Grinder
- 2 each K.O. Lee CNC Surface Grinders
- 1 each Mitsubishi CNC Ultrasonic Mill
- 1 each Omax 2626 Water Jet
- 1 each OGP Comparator

NON CNC MACHINERY

- 1 each Bridgeport Mill
- 1 each Monarch Lathe
- 2 each DoAll Surface Grinders
- 1 each 6 X 18
- 1 each 8 X 18
- 1 each B&S Micromaster Surface Grinder
- 1 each Royal Master Infeed Grinder
- 1 each Royal Master Thru-Feed Centerless Grinder
- 1 each 8" Bandsaw
- 1 each Comparator
- 1 each 12" Drill Press
- 1 each EASCO RAM EDM

b. Quality Standards — “Quality” shall be defined as - each Work Order performed and completed in a manner which assures the equipment / machining process operates as it was designed by specification, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall complete all Work Orders in accordance with the Work Order specifications. There shall be less than 5% of the total hours of a work activity spent on rework.

c. Schedule Standards - The Contractor shall deliver or otherwise provide all requested services/supplies/items in accordance with the planned schedule. The Contractor shall complete 90% of routine assignments and 95% of urgent assignments by the Work Order due dates.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Documentation Standards - Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical, Electronic, Electrical, Laboratory Technicians, Machinists, Tool & Die Makers and CNC Technicians as required.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be sent to the COTR (or authorized designee on a quarterly basis.

WBS: 1.05.1 CRANES, HOISTS AND LIFTING DEVICES

Period of Performance:

Title: Cranes, Hoists and Lifting Devices

Background

Why the project is being pursued

The NASA Glenn Safety Office has a requirement to ensure that all Cranes, Hoists and Lifting Devices are code compliant, maintained and inspected. This WBS element is to provide the technical support services necessary to meet the program requirements for Cranes, Hoists and Lifting Devices as specified in chapter 20 of the Glenn Safety Manual under the control of the GRC LDEM.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall furnish all labor, supervision, tools, materials, equipment, transportation and management necessary to perform inspection, testing, maintenance and repair to all cranes, hoists and lifting device equipment such as slings, shackles, turnbuckles, etc. Aerial lift platforms shall also be included in this scope of work. Fork lift load testing will also be included. These are one time verifications of new fork lifts or those having undergone major repair. Annual load tests will be required for fork lifts used in critical lifts or handling flight hardware.

The work under this WBS shall include Replacement of Obsolete Items (ROI), trouble calls and repair of equipment and system components. Definition of terms are according to NPR 8831.2E and includes preventive and programmed maintenance.

The Contractor shall provide inspection, testing services, maintenance and repairs as required in accordance with NASA-STS-8719.9 Standard for Lifting Devices and Equipment (applicable documents list paragraph 2) and OSHA to support routine and periodic certification requirements of:

1. Cranes
2. Hoists
3. Man Lifts
4. Lift hardware (such as; shackles, eyebolts, swivel eyebolts)
5. Slings
6. Rescue Lines
7. Engine Hoists
8. Aerial Lifts
9. Fork Lifts

The Contractor shall have 90 days to complete an inventory of all related items being transferred to this contract and report out on the differences between the information supplied by the outgoing contractor and what is verified in the field. The Contractor shall also compare their list with the reference provided to the LDEM's assessment contractor.

The outgoing contractor stored inspection forms on a separate database to allow auditors to view. The contractor shall find space on an FT shared server to store this information.

The Contractor shall maintain records of training provided and current certifications of personnel assigned to this WBS.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Recurring Maintenance

The contractor shall generate and schedule the PM and PGM work orders using the Government's CMMS. The Government's PM and PGM task activities itemized on the related Frequencies and Maintenance Checklists/Job Plans contained in the CMMS:

- a. Crane and Hoists Monthly PM
- b. Crane Annual PM
- c. Crane Load Tests 4 year PGM
- d. Small Cranes & Hoists Annual PM
- e. Small Cranes & Hoists Load Tests 4 year PGM
- f. Slings Inspection Annual PM
- g. Slings 4 year Load Tests PGM
- h. Personnel & Mat'l Conveying Rescue Lines Annual PM

Work Requested by Organizations outside of TFOME scope

Trouble Calls and Repairs

The contractor shall perform trouble call and repair work as necessary to determine the cause of system and equipment malfunctions, eliminate the cause(s), and restore the system or equipment to satisfactory working condition. Trouble calls and repairs are requests called into the Facilities Division Work Control Office and routed to TFOME. These calls can come in from occupants of a facility, building managers or maintenance technicians. Trouble calls and repairs are unscheduled service calls of a one-time nature typically for repair, adjustment or replacement as necessary to correct a malfunction of any existing equipment or facilities maintained or operated by others.

Service requests

Service request work can include Critical Load Tests, modification or alteration of a crane, or purchase of a new lift device. Other work performed under this heading can include replacing of obsolete controls or cranes.

The contractor shall prepare and furnish cost estimates including proposed craft hours, materials (parts), subcontractor work, equipment, and delivery dates of material and duration of work. The contractor shall proceed when the work order is approved and funded by the customer.

Documentation

The CMMS shall be update to document work performed in these areas.

Fields to be updated include:

Equipment No., Date Completed, Parts, Regular hours, Overtime hours, Delay/Cancel Notes, Scheduled Start Date/Time, Equipment Condition Code, Comments, and Reason for Outage.

Inspection forms and load test summaries shall be uploaded to CMMS for Cranes and "permanent" or fixed items. Consumables, i.e. slings, shackles, harnesses, shall be managed in a database developed by the Contractor. Inspection, tagging and certification information shall be uploaded and available for viewing by auditors as needed.

All items related to the Lifting Device and Equipment Managers program shall be viewable by the Government's LDEM. "

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"Completed inspection forms input to the database
Certification records
Report of lifting devices at each facility including:
Location, Certification/Inspection Dates, In Service, Tagged out
"

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical or Electrical Technicians,

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be sent to the COTR (or authorized designee on a quarterly basis.

WBS: 1.06.1 RESEARCH COMBUSTION LABORATORY/ZERO GRAVITY/ TECHNICAL SERVICES

Period of Performance:

Title: RESEARCH COMBUSTION LABORATORY/ZERO GRAVITY/ TECHNICAL SERVICES

Background

Why the project is being pursued

The Facilities Test Division (FT) is responsible for providing technical support services to the Aerospace programs at the Glenn Research Center. Some of the key facilities used by the programs are the vacuum, combustion, fuel cell and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions and to record the research data. The effort of this task is to provide technical support services that are necessary to meet the test schedules and requirements of the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements; The Contractor shall provide technical and operations support to a variety of programs in the Space Combustion technology development area. Examples of these areas are, but not limited to:

Altitude Combustion Stand (ACS)
Supplemental Multilayer Insulation Research Facility (SMIRF)
Hydrogen Air Flametube Test Facility (Cell 23)
Fuel Cell and Electrolizer Test Stand facility (Cell 24)
Closed Loop Regenerative Fuel Cell Facility
Fuel Cell Testing Laboratory
Zero Gravity Facility
2.2 Second Drop Tower
Space Experiments Laboratory (SEL)

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Technical support efforts shall include facility maintenance, preventative maintenance (PM's), research and test hardware build-up and installation; as well as model and facility operations. These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules may vary (increase / decrease) to accommodate critical maintenance, build-up, testing, delivery of hardware and research operations' schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have completed a state certified apprenticeship program in an associated mechanical, electrical or electronic trade or have a minimum of four (4) years of verifiable technical experience in the above listed disciplines. Work will be directed through the use of Work Orders, following established processes and procedures. Contract personnel shall also have demonstrated proficiency in fabrication, machining and assembly work. Security Clearances may be required for designated personnel.

a. Description of Work – The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and model) operations. The Contractor shall ensure the daily usability of these complexes by performing routine and non-routine maintenance in accordance with PM schedules and Work Orders. The Contractor

shall identify all needed repairs to accommodate planned operations' / run schedules. The Contractor shall fabricate, assemble, install, set up, calibrate, checkout, troubleshoot and modify research and / or facility systems (such as but not limited to: high pressure gas systems, laser light, electronic instrumentation, high temperature surfaces and cryogenic materials) and hardware to meet test or experimental requirements and specifications.

When required, the Contractor shall provide support in a Class 10000 Clean Room environment.

The Contractor shall meet NHB 5300.4 (3A-2) standards for solder connections and NHB 5300.4 (3G) standards for harnesses and cabling as required while working with flight hardware packages.

The Contractor shall provide flight hardware Bonded Storage and logistics support. The Contractor shall carefully follow all established Bonded Storage processes and procedures with regard to Flight Hardware.

The Contractor shall incorporate the Maximo Work Order system requirements with Original Equipment Manufacturers (OEM) requirements in its' PM and Work Order schedules for these facilities.

The Contractor shall incorporate the researcher's operation schedule (also referred to as the "run schedule") as established by facility management and engineering, into the "planned schedule".

The Contractor shall perform facility and model test operations for these facilities. Operations' (run) schedules vary widely and may include multiple shift research testing. The Contractor shall maintain the test operators' run log for facilities and follow all established facility procedures, as well as RTD Business Management Systems (BMS) and ISO 9001 standards for all required documentation.

b. Quality Standards – "Quality" shall be defined as each Work Order being performed and completed in a manner which assures that facility and experimental systems function as designed; assures the safety of personnel and equipment; and provides efficient use of time and materials. The Contractor shall have 97% of Work Orders completed to specifications listed on the Work Order. There shall be less than 5% of the total hours of work activity spent on rework.

c. Schedule Standards -- The Contractor shall complete all of the scheduled activities/tasks by the Work Order due date unless the requester named on the Work Order gives approval of a proposed change. The Contractor shall deliver or otherwise provide services requested in accordance with that change. The Contractor shall complete 95% of assignments by the Work Order due dates.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Documentation Standards: Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones

Metrics

Quality of Performance

75

Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical, Electronics or Electrical Technicians as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.09.1 AVIATION ENVIRONMENTS / TECHNICAL SERVICES

Period of Performance:

Title: AVIATION ENVIRONMENTS / TECHNICAL SERVICES

Background

Why the project is being pursued

The Research Testing Division is responsible for providing technical support services to the Aeronautics programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, vacuum, turbo machinery, combustion, cryogenic, engine component facilities, and Refrigeration Systems Operations (RFS) at the Glenn Research Center. The key facilities used by the RFS are the Icing Tunnel and Building 301. These facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The effort of this WBS is to provide technical support services that are necessary to meet test schedules and requirements as determined by the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements; The Contractor shall provide technical and operations support to the following test cells, located within the Engine Research Building (ERB). Listed examples include but are not limited to: „« 1.9.1 A Gear Fatigue Rig „« 1.9.1 B Gear Test Rig „« 1.9.1 C Helicopter Transmission and Torque Regenerative Test Stand „« 1.9.1 D Tribology and Surface Science „« 1.9.1 E Aero Propulsion Laboratory (AAPL) complex „« 1.9.1 F Icing Research Tunnel (IRT) complex „« 1.9.1 G Refrigeration Systems Other facilities include combustors, turbomachinery, seals technology and lunar rover test beds.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Technical support efforts shall include facility maintenance, research and test hardware build-up and installation; as well as model and facility operations on a variety of research facilities, wind tunnels and test rigs that are associated with turbo machinery and high speed rotating equipment. These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations, schedules will vary (increase / decrease) to accommodate critical maintenance, build-up, testing, delivery of hardware and research operations schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have completed a state certified apprenticeship program in a mechanical, electrical or electronic trade or have a minimum of four (4) years of verifiable technical experience in the listed trade disciplines. The Contractor shall perform technical services to construct, erect, install, modify, maintain, repair, setup, calibrate and operate test rigs and research facilities. The systems within these facilities may consist of, but are not limited to: mechanical structures, critical alignment equipment, electric motor drivers, dynamometers and associated controls for torque, speed and power absorption, DC/AC electrical power (both 60 and 400 cycle), programmable logic controller, electronic signal conditioning and instrumentation, signal transfer devices both contact and non contact, data acquisition systems (Analog and digital), patch boards, lasers, hydraulics, high and low pressure gas, air and steam systems, lubricants, cryogenics, inert and exotic gases, fuels and oils. The contractor shall operate, maintain, inspect, repair and troubleshoot the Carrier refrigeration system, and other related functions as described herein. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The contractor shall perform these functions in accordance with the NASA Glenn safety manual, and the Electrical Application Safety Committee (EASC) requirements for operating permits.

a. Description of Work

1.9.1 A Gear Fatigue Rig

The Contractor shall support on-going research to determine fatigue life of gears of differing geometries and composition. The Contractor shall provide technical support for this program by providing:

1. Maintenance and repair services for all test rig, test hardware and facility requirements.
2. Test article and facility preparation; construct, assemble, install and/or modify (i.e. mechanical security, assembly, gear mesh pattern, gear loading, rotational alignment, balance, instrumentation, data acquisition system, etc.) equipment and systems related to the fatigue test rigs and CE-1 facility.
3. Test preparation; perform the setup and calibration of the facility and test articles, instrumentation and data acquisition system to provide a state of readiness for test operations.
4. Pre-Test operations; perform pre-operations systems checks, correcting any anomalies, in preparation for fatigue rig operations.
5. A test operation; this phase begins after "pre-test operations" and ends on the last data run. Fatigue rig operations shall be conducted to ensure data quality and repeatability, establish run configuration changes as dictated by engineering, manage unforeseen problems and troubleshoot system anomalies to optimize the run schedule as the test evolves to maximize value from the available facility time and assure systems safety at all times.
6. Post test operations; deliver final data set to the customer and restore the facility systems to their safe baseline configuration.

1.9.1 B Gear Test Rig

The Contractor shall support on-going research to determine the effects of lubrication parameters (flow rate, temperature, and pressure) on high-speed helical gear train drive system performance. The Contractor shall provide technical support for this program by providing:

1. Maintenance and repair services for all test rig, test hardware and facility requirements.
2. Test article and facility preparation; construct, assemble, install and/or modify (i.e. mechanical security, assembly, gear mesh pattern, gear loading, rotational alignment, balance, instrumentation, data acquisition system, etc.) equipment and systems related to the high-speed helical gear train test rig and the SW-8 facility.
3. Test preparation; perform the setup and calibration of the facility and test articles, instrumentation and data acquisition system to provide a state of readiness for test operations.
4. Pre-Test operations; perform pre-operations systems checks, correcting any anomalies, in preparation for high-speed helical gear train test rig operations.
5. A test operation; this phase begins after "pre-test operations" and ends on the last data run. Conduct High-speed helical gear train test rig operations ensuring data quality and repeatability, establish run configuration changes as dictated by engineering, manage unforeseen problems and troubleshoot system anomalies to optimize the run schedule as the test evolves to maximize value from the available facility time and assure systems safety at all times.
6. Post test operations; deliver final data set to the customer and restore the facility systems to their safe baseline configuration.

1.9.1 C Helicopter Transmission and Torque Regenerative Test Stand

The Contractor shall support on-going research to determine the parametric conditions of operation and efficiency of 500 horsepower or less helicopter transmissions. The Contractor shall provide technical support for this program by providing:

1. Maintenance and repair services for all test rig, test hardware and facility requirements.
2. Test article and facility preparation; construct, assemble, install and/or modify (i.e. mechanical security, assembly, gear mesh pattern, gear loading, rotational alignment, balance, instrumentation, data acquisition system, etc.) equipment and systems related to the Helicopter Transmission Test Stand and SW-11 facility.
3. Test preparation; perform the setup and calibration of the facility and test articles, instrumentation and data acquisition system to provide a state of readiness for test operations.
4. Pre-Test operations; perform pre-operations systems checks, correcting any anomalies, in preparation for fatigue rig operations.
5. A test operation; this phase begins after "pre-test operations" and ends on the last data run. Conduct Helicopter Transmission Test Stand operations ensuring data quality and repeatability, establish run configuration changes as dictated by engineering, manage unforeseen problems and troubleshoot system anomalies to optimize the run schedule as the test evolves to maximize value from the available facility time and assure systems safety at all times.
6. Post test operations; deliver final data set to the customer and restore the facility systems to their safe baseline configuration.

1.9.1 D Tribology and Surface Science

The Contractor shall provide support for on-going basic research in surface science in the tribology fields in test cells such as, ultra-high vacuum chambers and High Temperature Bearing Research. The Contractor shall support the development and testing of high temperature solid lubricants through the preparation, testing and analyzing of friction and wear specimens.

The Contractor shall provide technical support for this program by providing:

1. Maintenance and repair services for all test rig, test hardware and facility requirements.
 2. Test article and facility preparation, to include:
 - Select materials, design, fabricate, assemble and install components and instrumentation.
 - Prepare test specimens from refractory metals, structural ceramics and composite materials with ceramic matrices.
 - Cut and polish specimens using diamond grit-vibration technology.
 - Perform optical microscopy of specimens.
 3. Test preparation -- perform the setup and calibration of specimens and test equipment, instrumentation and data acquisition system to provide a state of readiness for test operations.
 4. Pre-Test operations; perform pre-test system checks, correcting any anomalies, in preparation for specimen testing.
 5. A test operation; this phase begins after "pre-test operations" and ends on the last data run. Operate friction and wear test equipment as per test plan. Conduct specimen testing ensuring data quality and repeatability, establish configuration changes as dictated by engineering, manage unforeseen problems and troubleshoot system anomalies to optimize the test schedule to maximize value from the available test time and assure systems safety at all times.
- Post-test operations; deliver accurate records of specimen preparation, test data and restore laboratory test equipment to a safe baseline configuration.

Standards apply to 1.9.1 A-D

- a. Quality Standards; "Quality" shall be defined as each Work Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of equipment and personnel; and displays the efficient use of time and materials. The Contractor shall complete all Work Orders in accordance with the Work Order specifications.
- b. Schedule Standards; The Contractor shall complete 95% of the routine jobs and 98% of the

urgent jobs by the Work Order due date. There shall be less than 5% of the total hours of a work activity spent on rework.

1.1.91 E,AAPL and F,IRT

Technical support efforts shall include facility maintenance, preventative maintenance (PM's), research and test hardware build-up and installation; as well as model and facility operations. These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations and schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have completed a state certified apprenticeship programming an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered "qualified" shall also possess a working knowledge of common computer software applications, basic aerodynamic physics and principles; and possess the ability and enthusiasm to work within a highly productive team environment. Security clearances will be required for designated personnel.

1. Description of Work; The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and model) operations. The Contractor shall ensure the daily usability of the Wind Tunnel complexes by performing routine and non-routine maintenance in accordance with PM schedules and Work Orders; and identify needed repairs to accommodate planned operations and run schedules. Support efforts shall include the build-up, assembly, installation, modification, calibration, troubleshooting, repair, removal, storage and inventory all mechanical, electrical and electronic components and data systems associated with the Wind Tunnel complexes. Additional support efforts shall include pre-run and post-run set-up's, inspections, check-outs, daily calibrations and complete squawk sheet procedures associated with the operation of the facility and test hardware (model). During the normal course of duties, the Contractor shall perform work involving hydraulics, vacuum systems, pneumatics, various fuels and gaseous systems; and facility and model instrumentation and controls verification tasks. The Contractor may also be required to perform work involving various welding and weld inspection processes.

2. The Contractor shall incorporate the Maximo Work Order system when scheduling work for the Wind Tunnel complexes. The Contractor shall incorporate the researcher's operation schedule (also referred to as the "run schedule" as established by facility management and engineering, into the "planned schedule". The Contractor shall perform all facility and model test operations for the Wind Tunnel complexes. Operations and (run) schedules vary widely and will include multiple shift research testing. The Contractor shall maintain the test operator's run log for the facility and follow all established facility procedures, as well as ISO 9001 standards, for all required documentation.

b. Quality Standards; "Quality" shall be defined as - each Work Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall have 97% of Work Orders completed IAW specifications listed on the Work Order. The Contractor shall have the pre-run and post-run check / squawk sheet tasks completed 100% accurately, with no check / squawk sheet anomalies. A check / squawk sheet anomaly is an item that is inaccurately documented i.e. valve is checked "closed", but is subsequently found to have been open.

c. Schedule Standards -- The Contractor shall complete 95% of the routine jobs (PM's, Work Orders, check sheets, squawks) and 98% of the urgent jobs (Work Orders, squawks) by the Work Order due dates. The Contractor shall complete pre-run check sheets 1 hour prior to the run and deliver the

check sheets 30 minutes after completion, following established facility procedures. The Contractor shall complete post-run check sheets within 1 hour after the run and shall deliver the check sheets within 1 hour after completion, also following established facility procedures. Squawk sheets shall be completed 4 hours prior to the scheduled test run.

1.1.9.1 G Refrigeration Systems

The Contractor shall provide personnel, equipment, tools, materials, vehicles, supervision and other items necessary to perform the management, operations, maintenance, repair and modification of the research support systems as defined in this SOW.

Operations shall include equipment operations, functions, watch-standing, tending, (these terms describe a monitoring function, particularly when a piece of equipment has been inspected, repaired, and being brought back into service, or when a new piece of equipment is coming on line), or attendance type work requiring the presence of qualified persons to perform specific duties during a specific or scheduled time period. Operations shall include equipment and system pre-run checkout and setup, start, control, monitoring, troubleshooting, shutdown, post-run checkout, and securing of the equipment following shutdown. Operations shall also include Operation Corrective Maintenance and Repair (OCMR) of the auxiliary, ancillary and distribution systems. Repair of equipment problems, malfunctions, breakdowns, and related repair deficiencies that occur, which may affect scheduled research operations, shall be considered part of Operations. The Contractor shall perform work in accordance with operations and maintenance manuals and manufacturer's literature.

The Contractor shall provide qualified personnel to accomplish field Operations activities associated with the Central Research Support System (CRSS) and its support systems and equipment in the performance of this contract. The Contractor shall be responsible for all the preparatory activities to ready equipment for operations, monitoring of the equipment during operations, and securing the equipment.

Equipment and systems operations performed "in total"(without the assistance of government personnel or other support personnel) by the Contractor. This includes pre-run checkout and set up, start, control, monitoring, shutdown, and post-run securing of equipment and systems by the Contractor for the following:

SYSTEM OPERATION PROCEDURE

Refrigerant Cycle Start and Run. OP-C04-001.01-003

Refrigerant System Shut-down and Refrigerant Holding in Flash Cooler OP-C04-001.01-004

Daily Refrigerant System Cycle Re-start and Run after Shutdown OP-C04-001.01-005

Refrigerant System Shut-down and Refrigerant Transfer to Storage Tank OP-C04-001.01-006

Holding Refrigerant in Storage Tank OP-C04-001.01-007

03 Cooling Tower 301-2 CTW Pumps 1 & 2 Short list Start-up OP-F02-001.01-02A

a. Description of Work; The Contractor shall perform operations and maintenance of the systems and equipment that support the research and development functions of the Center. The systems and equipment to be maintained under this SOW are housed in the following facilities:

- Refrigeration Building 170 (Bldg 9)
- Vilter Refrigeration System at Building 301, Elect. Power Lab.(Vilter system will be removed in the near future)

b. Quality Standards; 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 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.

c. Schedule Standards; The Contractor shall schedule and complete work in a manner that minimizes disruption of the NASA mission and daily activities. The Contractor shall be fully cognizant of the NASA Research Facility Test/Central Process Systems Requirement Schedule in planning work activities. The test/requirement schedule may be updated periodically throughout the week to reflect schedule changes. The Contractor's first priority shall be to ensure the equipment is ready for operation to meet these research requirements.

d. Documentation; The Contractor shall obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation shall be stored in the Technical Research Library (TRL). The Contractor shall follow configuration control guidelines. The Contractor shall be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the COTR (or authorized designee). The Contractor shall utilize NASA specified software packages, as appropriate, to update documentation. Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Contractor will provide and present weekly work force planning schedules. Take appropriate actions to ensure that all task orders and Maximo Work Management System requirements are met. Provide communication to Perf Mon as to what actions will be taken to ensure requirements are being met.

Contractor will conduct monthly meetings with staff to ensure that all required tasks are completed within estimated hours, and that assigned technicians are meeting required dates. A monthly written report will be made available to the Perf Mon detailing adherence and non-adherences on each requirement.

Documentation Standards; Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	40
Schedule	20
Communication	40
None	0

Personnel Profile

Experienced Mechanical, Electronic or Electrical technicians as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee on a quarterly basis.)

WBS: 1.10.1 WIND TUNNEL DRIVE OPERATIONS/TECHNICAL SERVICES

Period of Performance:

Title: WIND TUNNEL DRIVE OPERATIONS/TECHNICAL SERVICES

Background

Why the project is being pursued

The Facilities Testing (FT) Division is responsible for providing Preventative Maintenance (PM) support services to the Aerospace programs at the Glenn Research Center. The key facilities using maintenance support are the drive operations for the wind tunnels, 8X6, 9X15 and the 10X10. The facilities are complex in nature and rely on mechanical, electrical and electronic support. The effort of this WBS is to provide maintenance support services that are necessary to meet the test schedules.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall provide maintenance support to the following GRC facilities: Tunnel Drive Complex (10 X 10 SWTDC), 8 X 6 / 9 X 15 Supersonic Wind Tunnel Drive Complex (8 X 6 / 9 X 15 SWTDC)

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Support efforts shall include preventative maintenance (PM's). The facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules.

Personnel who operate and / or perform work on Government facilities, or equipment shall have completed a state certified apprenticeship program in an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered "qualified" shall also possess a working knowledge of common computer software applications. Security clearances shall be required for designated personnel.

a. Description of Work -- The systems and equipment to be maintained under this WBS are housed in the following facilities:

10 x 10 SWTDC The contractor shall maintain, inspect, repair and troubleshoot equipment associated with the 10 x 10 SWTDF in accordance with the appropriate operations and maintenance manuals. The equipment includes the auxiliary support equipment such as the lube oil system, hydraulic system, pneumatic system, diesel generator, high-pressure compressor, gear boxes, fans as well as the components of the interior tunnel circuit in the direction of flow from and including the first stage cooler through the exit end of the secondary compressor. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The Contractor shall perform these functions in accordance with the NASA Glenn safety manual, the Electrical Application Safety Committee (EASC), and the Process System Safety Committee requirements for operating permits.

8 x 6 SWTDC- The Contractor shall maintain, inspect, repair and troubleshoot equipment associated with the 8 x 6 SWTDC in accordance with the appropriate operations and maintenance manuals. The equipment includes the auxiliary support equipment such as the lube oil system, hydraulic

system pneumatic system, diesel generator, high-pressure compressor, gear boxes, fans as well as the components of the interior tunnel circuit in the direction of flow from and including the return leg cooler through the exit end of the compressor. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The Contractor shall perform these functions in accordance with the NASA Glenn Safety manual and Electrical Application Safety Committee (EASC), and the Process System Safety Committee requirements for operating permits.

The Contractor shall provide personnel, equipment, tools, materials, vehicles, supervision and other items necessary to perform the management, maintenance, repair and modification of the research support systems as defined in this WBS.

The Contractor shall perform work in accordance with operations and maintenance manuals and manufacturer's literature.

b. Quality Standards -- 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 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.

c. Schedule Standards -- The Contractor shall schedule and complete work in a manner that minimizes disruption of the NASA mission and daily activities. The Contractor shall be fully cognizant of the NASA Research Facility Test/Central Process Systems Requirement Schedule in planning work activities. The test/requirement schedule may be updated periodically throughout the week to reflect schedule changes. The Contractor's first priority shall be to ensure the equipment is ready for operation to meet these research requirements.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

Documentation Standards -- The Contractor will obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation will be stored in the Technical Research Library (TRL).

The Contractor will follow configuration control guidelines. The Contractor will be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the COTR (or authorized designee). The Contractor will utilize NASA specified software packages, as appropriate, to update documentation.

Documentation Standards -- Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0

None

0

Personnel Profile

Experienced Mechanical, Electronic or Electrical Technicians, as required. Qualifications are listed in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.11.1 REFRIGERATION SYSTEMS OPERATIONS/TECHNICAL SERVICES

Period of Performance:

Title: REFRIGERATION SYSTEMS OPERATIONS/TECHNICAL SERVICES

Background

Why the project is being pursued

The Research Testing Division is responsible for providing technical support services to the Aeronautics programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, vacuum, turbo machinery, combustion, cryogenic, engine component facilities, and Refrigeration Systems Operations (RFS) at the Glenn Research Center. The key facilities used by the RFS are the Icing Research Tunnel and Building 301. These facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The effort of this WBS is to provide technical support services that are necessary to meet test schedules and requirements as determined by the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

General Requirements; The Contractor shall provide maintenance support to the 1.9.1 E; Aero Propulsion Laboratory (AAPL) complex (when requested), 1.9.1 F; Icing Research Tunnel (IRT) complex , 1.9.1 G; Refrigeration.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance, preventative maintenance (PM's). These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations, schedules will vary (increase / decrease) to accommodate critical maintenance, build-up, testing, delivery of hardware and research. Personnel who operate and / or perform work on Government facilities and equipment shall have completed a state certified apprenticeship program in a mechanical, electrical or electronic trade or have a minimum of four (4) years of verifiable technical experience in the listed trade disciplines. The Contractor shall perform maintenance services to maintain, modify, repair, setup, and calibrate equipment. The systems within these facilities may consist of, but are not limited to: mechanical structures, critical alignment equipment, electric motor drivers, dynamometers and associated controls for torque, speed and power absorption, DC/AC electrical power (both 60 and 400 cycle), programmable logic controller, electronic signal conditioning and instrumentation, signal transfer devices both contact and non contact, data acquisition systems (Analog and digital), patch boards, lasers, hydraulics, high and low pressure gas, air and steam systems, lubricants, cryogenics, inert and exotic gases, fuels and oils. The contractor shall operate, maintain, inspect, repair and troubleshoot the Carrier refrigeration system, and other related functions as described herein. These activities shall be performed with the primary purpose to support GRC's aeronautical and space research missions. The contractor shall perform these functions in accordance with the NASA Glenn safety manual, and the Electrical Application Safety Committee (EASC) requirements for operating permits.

1. Description of Work

The Contractor shall provide facility mechanical, electrical and electronic maintenance support efforts. The Contractor shall ensure the daily usability of the Wind Tunnel complexes by performing routine and non-routine maintenance in accordance with PM schedules and Work Orders; and

identify needed repairs to accommodate planned operations and run schedules. During the normal course of duties, the Contractor shall perform work involving hydraulics, vacuum systems, pneumatics, various fuels and gaseous systems. The Contractor shall perform maintenance of the systems and equipment that support the research and development functions of the Center. The systems and equipment to be maintained under this SOW are housed in the following facilities:

1.1.91 E, AAPL and F, IRT

Maintenance support efforts shall include facility maintenance and preventative maintenance (PM's). These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations and schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules. Personnel who operate and / or perform work on Government facilities, research test articles and / or equipment shall have completed a state certified apprenticeship programming an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered ""qualified"" shall also possess a working knowledge of common computer software applications, basic aerodynamic physics and principles; and possess the ability and enthusiasm to work within a highly productive team environment. Security clearances will be required for designated personnel.

1.1.9.1 G Refrigeration Systems

The Contractor shall provide personnel, equipment, tools, materials, vehicles, supervision and other items necessary to perform the management, maintenance, repair and modification of the research support systems as defined in this SOW.

Refrigeration Building 9/170

- Building 301, Elect. Power Lab. Support PloyCold refrigeration units that chill the Facility cold traps.

2. The Contractor shall incorporate the Maximo Work Order system requirements with OEM requirements in their PM and Work Order schedule for the Wind Tunnel complexes. The Contractor shall incorporate the researcher's operation schedule (also referred to as the ""run schedule"" as established by facility management and engineering, into the ""planned schedule"". Operations and (run) schedules vary widely and will include multiple shift research testing. The Contractor shall follow all established facility procedures, as well as ISO 9001 standards, for all required documentation.

The Contractor shall perform work associated with Division Blanket Purchase Agreements (BPA's). Such work typically includes but is not limited to specialty services for welding, rigging, pipe fitting and electrical support.

a. Quality Standards; ""Quality"" shall be defined as - each Work Order performed and completed in a manner which assures the system/experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall have 97% of Work Orders completed per specifications listed on the Work Order.

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 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.

b. Schedule Standards; The Contractor shall schedule and complete work in a manner that

minimizes disruption of the NASA mission and daily activities. The Contractor shall be fully cognizant of the NASA Research Facility Test/Central Process Systems Requirement Schedule in planning work activities. The test/requirement schedule may be updated periodically throughout the week to reflect schedule changes. The Contractor's first priority shall be to ensure the equipment is ready for operation to meet these research requirements. The Contractor shall complete 95% of the routine jobs (PM's, Work Orders) and 98% of the urgent jobs (Work Orders) by the Work Order due dates.

c. Documentation; The Contractor shall obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation shall be stored in the Technical Research Library (TRL). The Contractor shall follow configuration control guidelines. The Contractor shall be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the COTR (or authorized designee). The Contractor shall utilize NASA specified software packages, as appropriate, to update documentation. Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW"

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"Contractor will provide and present weekly work force planning schedules to QAE. Take appropriate actions to ensure that all Maximo task orders and requirements are met. Provide communication to Perf Mon that requirements are being met.

Contractor will conduct monthly work force planning meetings with staff to ensure that all required Maximo booked hours, estimated hours, assigned technicians and required dates are met. Provide a written report to the Performance Monitor detailing adherence and non-adherences on each requirement.

Documentation Standards; Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW."

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	40
Schedule	20
Communication	40
None	0

Personnel Profile

Experienced Mechanical, Electronic or Electrical technicians as required. Qualifications are stated in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be sent to the COTR (or authorized designee on a quarterly basis.

WBS: 1.12.1 MAINTENANCE AND REPAIR TECHNICAL SERVICES

Period of Performance:

Title: Maintenance and Repair Technical Services

Background

Why the project is being pursued

The Facilities Testing (FT) Division is responsible for the maintenance and repair of the test facilities and laboratories listed in Table 1 of the SOW. Some of the key facilities include the wind tunnels, drive operations for the wind tunnels, vacuum, combustion, engine component, and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The effort of this WBS is to provide technical support services that are necessary to perform recurring and preventive maintenance and repairs.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall perform Maintenance and Repair services for Lewis Field Facilities. Support efforts shall include preventative maintenance (PM's). GRC Center wide technical support through the Tactical Group

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance and repairs. These facilities shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules. Personnel who perform work on Government facilities, research test articles and/or equipment shall have completed a state certified apprenticeship program in an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade.

Description of Work -- The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts. and perform facility and research (test hardware and model) operations. The Contractor shall ensure the daily usability of the Wind Tunnel complexes by performing routine and non-routine maintenance in accordance with PM schedules and Task Orders; and identify needed repairs to accommodate planned operations and run schedules. Support efforts shall include the troubleshooting, repair, removal, storage and inventory all mechanical, electrical and electronic components and data systems associated with the Wind Tunnel complexes.

During the normal course of duties, the Contractor shall perform work involving hydraulics, vacuum systems, pneumatics, various fuels and gaseous systems; and facility and model instrumentation and controls verification tasks. The Contractor may also be required to perform work involving various welding and weld inspection processes.

The Contractor shall incorporate Maximo Work Order system for scheduling work. Contractor shall maintain the test operators' run log for the facility and follow all established facility procedures, as well as ISO 9001 standards, for all required documentation.

The Contractor shall perform work associated with Division Blanket Purchase Agreements (BPA's). Such work typically includes but is not limited to specialty services for welding, rigging, pipe fitting.

The work requires physical exertion, such as walking, bending, stooping, kneeling, climbing ladders or scaffolds and recurring lifting of moderately heavy items. In many situations the duration of the activity, such as most of a workday, contributes to the arduous physical nature of the job. In other situations there may be special requirements for agility or dexterity such as exceptional hand/eye coordination.

The Contractor shall provide personnel, equipment, tools, materials, vehicles, supervision and other items necessary to perform the maintenance, repair and modification of the research support systems as defined in this WBS.

Repair of equipment problems, malfunctions, breakdowns, and related repair deficiencies that occur, which may affect scheduled research operations, shall be considered part of this effort. The Contractor shall perform work in accordance with operations and maintenance manuals and manufacturer's literature.

Quality Standards -- 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 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.

Schedule Standards -- The Contractor shall schedule and complete work in a manner that minimizes disruption of the NASA mission and daily activities. The Contractor shall be fully cognizant of the NASA Research Facility Test/Central Process Systems Requirement Schedule in planning work activities. The test/requirement schedule may be updated periodically throughout the week to reflect schedule changes. The Contractor's first priority shall be to ensure the equipment is ready for operation to meet these research requirements.

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"Documentation Standards -- When required, the Contractor will obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation will be stored in the Technical Research Library (TRL).

The Contractor will follow configuration control guidelines. When required, the Contractor will be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the COR (or authorized designee). The Contractor will utilize NASA specified software packages, as appropriate, to update documentation.

Documentation Standards -- Refer to documentation requirements that are stated in 4.2 Work Control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones

Metrics

Quality of Performance

75

Schedule	25
None	0
None	0

Personnel Profile

Experienced Mechanical, Electronic or Electrical Technicians, as required. Qualifications are listed in the above SOW.

Government Furnished Property

The Contractor will keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report will be made available to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.01.2 AERO POWER AND PROPULSION / ENGINEERING SERVICES

Period of Performance: 04/01/14 - 09/30/14

Title: AERO POWER AND PROPULSION / ENGINEERING SERVICES

Background

Why the project is being pursued

The Facility Testing Division (FTD) is responsible for providing test engineering services to the AeroSpace programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, research aircraft, combustion facilities, engine component test facilities, vacuum and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical, and electronic devices to produce the test conditions and to record the research data. The purpose of this Work Breakdown Structure (WBS) is to provide the test and facility engineering services necessary to meet the requirements of the test programs and research customers.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall provide mechanical, aeronautical, electrical, electronic, and/or chemical engineering personnel to perform assigned AeroSpace testing activities and related activities.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Perform mechanical, aeronautical, electrical, electronic and/or chemical engineering activities to meet predetermined milestones as they relate to required AeroSpace test activities. Timely communication with the NASA Performance Monitor (PM), Facility Manager, customers, and team members; highlighting problems and issues is highly important. Cooperation with the PM, Facility Manager, customers, and team members is essential to insure that technical, cost, and schedule objectives are met and that team performance is maximized.

Specific Work elements:

The Contractor shall perform work required to meet milestones identified by the FTD QAE. The WBS will include the following work elements:

1. Provide project management for all appropriate test or facility related functions. This includes defining, planning, organizing, directing, tracking, documenting and reporting of the respective projects. This also includes development of project work plans, schedules, milestones, and resource planning and tracking.
2. Test engineering functions including working with customers to develop test requirements and completing a test assessment to define high level test objectives and an appropriate facility for the test.
3. Engineering skills necessary to translate research requirements into a logical approach (plan), test article designs, required facility modifications, specifications for procurement and/or fabrication of the test article and/or needed test support equipment (instrumentation, test article mounts, control and data systems, other mechanical systems).

4. Develop the appropriate Safety and Environmental Plan to comply with all Federal, State, Local, and GRC Safety and Environmental requirements (including completing appropriate functions such as a hazards analysis and obtaining a Safety Permit).
5. Provide engineering technical expertise and direction to accomplish the necessary test related activities with responsibility for the successful accomplishment of activities including research hardware design oversight, instrumentation selection, test article installation and checkout, development of operating procedures, all test preparation functions, directing the testing, and completion of all post-test tasks including appropriate reporting.
6. Provide the project management and engineering guidance and direction for the upgrade, repair, and maintenance of all facility systems (mechanical, electrical/ electronic) in selected facilities and on selected projects.
7. Provide engineering to maintain facility capability and facility reliability. Provide engineering to maintain facility and support equipment calibration in compliance with the GRC Business Management Systems (BMS) procedures, this includes equipment, instrumentation, and airflow.
8. Provide engineering for the certification and re-certification efforts of assigned FTD managed test facilities.
9. Define, develop, and track facility metrics in selected facilities. Summarize and report results to the Branch and Division level.
10. Prepare specification and purchase documentation for commercially available equipment and direct/monitor the installation of specified equipment.
11. Participate in technical societies and working groups. Prepare and present GRC facility capabilities and accomplishments at conferences and working group meetings.
12. Assist the Facility Management and Planning Office (FTA) in the production of facility marketing materials including, brochures, pamphlets, and digital media.
13. Assist FTA in developing, coordinating, and tracking facility usage agreements with outside NASA customers. Gather feedback on the customers experience at GRC facilities and report on metrics relative to this feedback.
14. Assist FTA in coordinating special events, facility tours and visitor receptions relative to the showcasing of GRC Ground Test facility capabilities.
15. Adjust and maintain staffing levels and assignments commensurate with testing needs and schedules as communicated from FTD QAE.
16. Purchase goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools and parts, such that they are available when required and meet stated specifications.
17. Maintain an awareness of the state-of-the-art relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.
18. Direct, coordinate and oversee technical services personnel in the build up, installation and checkout of facility support systems and test hardware.

19. Travel and training as necessary. If travel and/or training are required, the cost should be budgeted in the accompanying cost plan, or an amendment to the WBS will be issued to cover the additional requirements.

20. Provide project management to make the new steady state data system (COBRA) operational through the development of viewer software and calculation software.

21. Provide engineering support to develop the software code for the COBRA viewer system and the COBRA calculator system.

For all the activities stated above:

The Contractor shall comply with GRC standard policy and procedures such as:

- a. FTD BMS Procedures
- b. GRC Safety and Environmental Policies

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

The milestones and deliverables for this period shall include but not be limited to:

1. A monthly technical project report describing work progress via milestones and deliverables on contract performed tasks shall be forwarded to the FTD Perf Mon on or before the predetermined due dates. The monthly report shall include information on the project technical progress, schedule status, and labor usage relative to the project plan.

2. A monthly detailed performance-based cost report will be provided to the FTD Perf Mon for this task. The cost figures will represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year's remaining performance based tasks. Cost variances and funding status will be presented in this report.

3. All labor hours associated with the performance-based WBS shall be tracked with ability for individual project tracking, if requested, for each GRC program or external customer project supported by FTD. The breakdown of WBS technical hours by NASA program or external project shall be forwarded to the FTD Perf Mon for this WBS if requested. Coordination with the appropriate Branch Chief and the FTD Perf Mon will be necessary to assure that the appropriate engineering effort is applied to each NASA Program or external project.

4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.

5. Meet the test schedules and requirements as determined by the test programs and FTD Perf Mon.

6. The Contractor shall procure subcontract service, consumables, equipment, tools, and parts, such that they are available when required and meet specifications.

7. Complete COBRA Viewer and Calculator Systems to make the COBRA data system operational within 18 months of the project start date.

As part of the reporting requirements of the WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced mechanical, aeronautical, electrical, electronics and chemical engineers as required. The Contractor may subcontract engineering support with concurrence from the FTD Perf Mon and COTR.

Government Furnished Property

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the COTR (or authorized designate) on a quarterly basis.

WBS: 1.02.2 SPACE POWER AND PROPULSION /ENGINEERING SERVICES

Period of Performance: 04/01/14 - 09/30/14

Title: SPACE POWER AND PROPULSION /ENGINEERING SERVICES

Background

Why the project is being pursued

The Testing Division (FT) is responsible for providing test engineering services to the AeroSpace programs at the Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, vacuum facilities, research aircraft, combustion facilities, engine component facilities, microgravity and cryogenic facilities. These facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The purpose of this Work Breakdown Structure (WBS) is to provide test engineering services that are necessary to meet the test schedules and requirements as determined by the test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall provide mechanical, aeronautical, electrical engineering, engineering associate and administrative personnel to perform the assigned AeroSpace testing and related activities.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Perform mechanical, electronic, computer, electrical engineering and administrative activities to meet predetermined milestones as they relate to required Space Power, Space Propulsion, and space environment testing requirements. Timely communication with the NASA FT Contract Performance Monitor(CPM), customers and team members; highlighting problems and issues is critical. Cooperation with the FT CPM, Facility Manager, customers and team members to insure that team performance is maximized is essential.

Specific Work Elements:

The Contractor shall perform activities required to meet milestones identified by the CPM. The WBS will include the following work elements:

1. Experimental engineering functions including working with customers to develop test requirements, development of test plans and test matrices, formulation of data computing requirements and instrumentation locations, test performance, data validation and analysis, and reporting results. Provide support for the operation of tests, support may be required during non-core hours.
2. Engineering necessary to translate research experimental requirements into designs and specifications for the fabrication, modification, documentation, and installation of instrumentation, electronic control and data systems and mechanical systems used in the research facilities and experiments.
3. Prepare and present facility and test hardware Safety and environmental permit data packages to GRC Safety Committees as required, including certifications, recertifications, analysis of potential hazards and determination of techniques required to insure the safe operation of tests.
4. Prepare specifications and purchase documentation for commercially available equipment and

monitor the installation of specified equipment.

5. Project test engineering with responsibility for coordination of activities including research hardware design oversight, instrumentation selection, hardware installation and checkout, development of operating procedures, scheduling, daily test operations, and associated maintenance.
6. Perform engineering maintenance on mechanical, electrical/electronic systems required for facility test operations.
7. Track facility metrics. Summarize and report results at the Branch and Division level.
8. Aid in the production of facility marketing materials including brochures, pamphlets and digital media (CD-ROM's etc.).
9. Track facility usage agreements with outside NASA customers. Gather feedback on customer experience at GRC facilities and report on metrics relative to this feedback.
10. Assist the Facility Management Branch (FMB) to coordinate special events, facility tours and visitor receptions relative to the showcasing of GRC Ground Test Facility capabilities.
11. Adjust and maintain staffing levels commensurate with testing needs and schedules as communicated from the customer.
12. Purchase goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools and parts, such that they are available when required and meet stated specifications.
13. Maintain an awareness of the state-of –the-art of relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.
14. Direct, coordinate, and oversee technical services personnel in the buildup and installation of facility and test hardware.
15. Travel and training as necessary. If travel and/or training are required, the cost should be budgeted in the accompanying cost plan, or an amendment to the WBS will be issued to cover the additional requirements.

For all the activities stated above:

The Contractor shall comply with the GRC standard policy and procedures such as:

- a. FT Business Management Systems (BMS) Procedures
- b. GRC Safety and Environmental Policies

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

The milestones and deliverables for this period shall include:

1. A monthly technical project report describing work progress via milestones and deliverables on contract performed tasks shall be forwarded to the FT CPM at the end of the month.

2. A monthly detailed performance-based cost report will be provided to the FT CPM for this WBS. The cost figures represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year's remaining performance based tasks. Cost variances and funding status will be presented in this report.

3. All labor hours associated with the performance-based tasks shall be tracked with ability for individual project tracking, if requested, for each GRC program supported in FT. The breakdown of task technical hours by program shall be forwarded to the FT CPM for this WBS, if requested.

4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.

5. Meet the test schedules and requirements as determined by the test programs and the FT CPM. Specific milestones are subject to change as priorities or funding levels change.

6. The Contractor shall procure subcontract services, consumables, equipment, tools, parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	70
Schedule	30
None	0
None	0

Personnel Profile

Experienced mechanical, electrical, electronic, test engineers, engineering associates, or administrative personnel as required. The Contractor may subcontract engineering support with concurrence from the FT QAE and COTR.

Government Furnished Property

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.06.2 RESEARCH COMBUSTION LABORATORY / ZERO GRAVITY/ENGINEERING SERVICES

Period of Performance:

Title: RESEARCH COMBUSTION LABORATORY / ZERO GRAVITY/ENGINEERING SERVICES

Background

Why the project is being pursued

The Facilities Testing Division (FT) is responsible for providing test engineering services to the AeroSpace programs at the Glenn Research Center. Some of the key facilities used by the programs include; vacuum, combustion, engine component, cryogenic and microgravity. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce test conditions and to record research data. The purpose of this Work Breakdown Structure (WBS) is to provide test engineering services that are necessary to meet test schedules and requirements as determined by test programs.

WBS Description

Description of Services to be procured and specific tasks to be performed

The Contractor shall provide mechanical, aeronautical, electrical engineering services to perform assigned AeroSpace testing activities.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Perform mechanical, aeronautical, electrical engineering and administrative tasks to meet predetermined milestones as they relate to required AeroSpace test activities. Timely communication with the NASA FT Contract Performance Monitor (CPM), customers and team members, highlighting problems and issues is critical. Cooperation with the FT CPM, Facility Manager, customers and team members to insure that team performance is maximized is essential.

Specific Work Elements:

The Contractor shall perform activities required to meet milestones identified by the FT CPM. The WBS will include the following work elements:

1. Experimental engineering functions including working with customers to develop test requirements, development of test plans and test matrices, formulation of data computing requirements and instrumentation locations, test performance, data validation and analysis, and reporting results.
2. Engineering necessary to translate research experimental requirements into designs and specifications for the fabrication, modification, and installation of instrumentation, electronic, control and data systems and mechanical systems used in the research facilities and experiments.
3. Prepare and present facility and model Safety and Environmental permit data packages to GRC Safety Committees as required including certifications, recertifications, analysis of potential hazards and determination of techniques required to insure the safe operation of tests.
4. Prepare specifications and purchase documentation for commercially available equipment and monitor the installation of specified equipment.

5. Project test engineering with responsibility for coordination of activities including research hardware design oversight, instrumentation selection, hardware installation and checkout, development of operating procedures, daily test operations, and associated maintenance.
6. Perform engineering maintenance on mechanical, electrical/electronic systems required for facility test operations.
7. Track facility metrics. Summarize and report results at the Branch and Division level.
8. Aid in the production of facility marketing materials including brochures, pamphlets and digital media (CD-ROM's etc.).
9. Track facility usage agreements with outside NASA customers. Gather feedback on customer experience at GRC facilities and report on metrics relative to this feedback.
10. Coordinate special events, facility tours and visitor receptions relative to the showcasing of GRC Ground Test facility capabilities.
11. Adjust and maintain staffing levels commensurate with testing needs and schedules as communicated from the FT CPM.
12. Purchase lots of goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools, and parts, such that they are available when required and meet stated specifications.
13. Maintain an awareness of the state-of-the-art relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.
14. Direct, coordinate, and oversee technical services personnel in the buildup and installation of facility and test hardware.
15. Travel and training as necessary. If travel and/or training are required under this WBS, the cost has should be budgeted into the accompanying cost plan, or an amendment will be issued to cover the additional requirements.

For all the activities stated above:

The contractor shall comply with GRC standard policy and procedures such as:

- a. RTD Business Management Systems (BMS) Procedures
- b. GRC Safety and Environmental Policies

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

The milestones and deliverables for this period shall include:

1. A technical project report describing work progress via milestones and deliverables on contract performed tasks shall be forwarded to the FT CPM at the end of each month.
2. A detailed performance-based cost report will be provided to the FT CPM for this task. The cost

figures represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year's remaining performance based activities. Cost variances and funding status will be presented in this report.

3. All labor hours associated with the performance-based activities shall be tracked with ability for individual project tracking, if requested, for each GRC program supported in FT. The breakdown of task technical hours by program shall be forwarded to the FT CPM for this WBS, if requested.
4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.
5. Meet the test schedules and requirements as determined by the test programs and the FT CPM.
6. The Contractor shall procure subcontract services, consumables, equipment, tools, and parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with this WBS (cost, schedule, technical requirements) including any mitigation activities. No significant risks have been identified at this time.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
None	0
None	0

Personnel Profile

Experienced mechanical, electrical, electronic, test engineers, engineering associates as required. The Contractor may subcontract engineering support with concurrence from the FT CPM and COTR.

Government Furnished Property

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the COTR (or authorized designee) on a quarterly basis.

WBS: 1.09.2 AVIATION ENVIRONMENTS /ENGINEERING SERVICES

Period of Performance:

Title: AVIATION ENVIRONMENTS /ENGINEERING SERVICES

Background

Why the project is being pursued

The Testing Division (Code FT) is responsible for providing test engineering services to the AeroSpace programs at the NASA John Glenn Research Center. Some of the key facilities used by the programs are the wind tunnels, combustion facilities, engine component, vacuum and cryogenic facilities. The facilities are complex in nature and rely on mechanical, electrical and electronic devices to produce the test conditions, and to record the research data. The effort of this Work Breakdown Structure (WBS) is to provide the necessary test engineering services for the Aviation Environments Test Engineering Branch, Code FTB, to safely and effectively ready the test articles for testing, meeting the test schedules and requirements as determined by the test programs. The objective is threefold: to provide research customers with the greatest amount of useful information, expending the least amount of resources, in a timely manner.

WBS Description

Description of Services to be procured and specific tasks to be performed

The contractor shall provide the necessary engineering skills or disciplines, namely: mechanical, aeronautical, electrical and/or chemical engineering, to perform the assigned AeroSpace Testing and related activities.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Perform mechanical, aeronautical, electrical engineering and administrative requirements to meet programmatic milestones as they relate to planned AeroSpace Test activities. Timely communication with the cognizant NASA FTB Performance Monitor (PM), Facility Manager, customers and team members, highlighting problems and issues is highly important. Cooperation with the FTB QAE, Facility Manager, customers and team members is essential to ensure that team performance is maximized.

Specific Work Elements:

The Contractor shall perform work required to meet milestones identified by the FTB Perf Mon. The WBS will include the following work elements:

1. Provide project management for all appropriate test or facility related functions. This includes defining, planning, organizing, directing, tracking, documenting, and reporting on the respective projects.
2. Test engineering functions including working with (internal and external) customers to develop test requirements and completing a test assessment to define high level test objectives and an appropriate facility for the test.
3. Provide engineering functions necessary to translate research requirements into a logical approach (plan), which may include test article designs and facility modifications, consistent with assigned budgets.

4. Also, provide engineering functions to define specifications for procurement or fabrication efforts of the test article and/or needed test support equipment (instrumentation, test article mounts, control and data systems, other mechanical systems).
5. Develop the appropriate Safety and Environmental Plan to comply with all Federal, State, Local and GRC Safety and Environmental requirements including: completing re-certifications efforts, hazards analyses, obtaining a Safety Permit, and acquiring or maintaining required certifications.
6. Provide engineering direction to accomplish the necessary test related activities with responsibility for coordination of activities including research hardware design and fabrication oversight, instrumentation selection, and hardware installation and integration into the test facility.
7. Provide the Project Management and Engineering guidance and direction for the upgrade, repair, and maintenance of all facility systems (mechanical, electrical/electronic) in selected facilities.
8. Provide the engineering to assure the facility capabilities are maintained, the facilities are reliable, and the facilities and support equipment are calibrated and in compliance with the Business Management Systems (BMS) procedures including Equipment, Instrumentation, and Airflow.
9. Define, develop, and track facility metrics in selected facilities. Summarize and report results to the appropriate Branches and at the Division level.
10. Assist the Facility Management and Planning Office (Code FTA) to market the GRC facilities, including developing and producing materials for this purpose, and preparing and delivering presentations at technical society meetings on GRC capabilities and accomplishments.
11. Assist the Code FTA to develop, coordinate, obtain approval of, and track usage agreements with outside NASA customers. Gather feedback on customer experience at GRC facilities and report on metrics relative to this feedback.
12. Assist the Code FTA to coordinate special events, facility tours and visitor receptions relative to the showcasing of GRC Ground Test facility capabilities.
13. Adjust and maintain staffing levels commensurate with testing needs and schedules as communicated from the FTB Perf Mon.
14. Purchase goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools and parts, such that they are available when required and meet stated specifications.
15. Maintain an awareness of the state-of-the-art relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.
16. Direct, coordinate, and oversee technical services personnel in the buildup and installation and checkout of facility support systems and test hardware.
17. Ensure staff is highly skilled to perform the assigned duties. Travel may be required to coordinate activities with outside customers to ensure successful integration of the test article into the test facility. If travel and/or training are required, the cost should be budgeted in the accompanying cost plan, or an amendment to the WBS will be issued to cover the additional requirements.

For all the activities stated above:

The contractor shall comply with GRC standard policy and procedures such as:

- a. FT BMS Procedures
- b. GRC Safety and Environmental Policies

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

"The milestones and deliverables for this period shall include:

1. A technical project report describing work progress via milestones and deliverables on contract performed work shall be forwarded to the FTB Perf Mon about the last Friday of the month.
2. A detailed performance-based cost report will be provided to the FTB Perf Mon for this work. The cost figures represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year's remaining performance based work. Cost variances and funding status will be presented in this report.
3. All labor hours associated with the performance-based work shall be tracked with ability for individual project tracking, if requested, for each GRC program supported in FTB. The breakdown of WBS technical hours by program shall be forwarded to the FTB Perf Mon for this work, if requested.
4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.
5. Meet the test schedules and requirements as determined by the test programs and the FTB Perf Mon.
6. The Contractor shall procure subcontract services, consumables, equipment, tools, and parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the contractor shall include any open risks associated with this work (cost, schedule, technical requirements) including any mitigation activities. No significant risks have been identified at this time."

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	50
Project Schedule	20
Monthly Report	10
Cost	20

Personnel Profile

Experienced Mechanical and Electrical Test Engineers, and other specialized engineering disciplines to support areas for gas analysis, data systems and instrumentation, etc as required. The contractor may subcontract engineering support with approvals from the Perf Mon and COTR.

Government Furnished Property

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the COTR (or authorized designee) on a quarterly basis.

WBS: 2.01 SPACE POWER FACILITY (SPF) MAINTENANCE, ENGINEERING AND OPERATIONS

Period of Performance:

Title: SPACE POWER FACILITY (SPF) MAINTENANCE, ENGINEERING AND OPERATIONS

Background

Why the project is being pursued

The Plum Brook Management Office is responsible for providing engineering, technical and operations support services to a wide range of NASA and non-NASA Programs at NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio. The 6,400 acre Plum Brook Station is home to five world-class space environment and propulsion test facilities. One of these facilities, the Space Power Facility, is the world's largest space simulation chamber, measuring 100 ft in diameter and 122ft tall. The facility was designed to test nuclear and non-nuclear space hardware in a simulated space environment. The facility is currently being upgraded, and will soon have three additional test capabilities; reverberant acoustic test capability, mechanical vibration test capability, and electromagnetic interference and compatibility test capability. This facility is complex in nature and relies on many mechanical, electrical and electronic systems to create the high vacuum and dynamic thermal environments required for testing space hardware. This work effort provides engineering and technical support services that are necessary to maintain and operate the Space Power Facility, as well as to develop test-unique hardware, produce test conditions, and record test data as required by facility customers.

WBS Description

Description of Services to be procured and specific tasks to be performed

The contractor's responsibilities shall include, but not be limited to, program and project planning, cost estimating, scheduling, work control, reporting, design, procurement of hardware and services, facility operation, repair, maintenance and upgrades of test facility equipment, staffing and specialized training. The contractor shall provide research and test support, which includes on-going interaction with test customers to assure that customer objectives are met or exceeded. All work shall be performed in accordance with PBMO established policies and procedures and all applicable Federal, State and local codes, regulations and procedures, and in a manner consistent with the best practices for world-class test facilities. This work effort specifically pertains to the Space Power Facility (SPF) complex.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance, preventative maintenance (PM's), facility modifications and/or upgrades, research and test hardware build-up and installation; as well as facility operations. This facility shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and testing operations schedules. In particular, thermal vacuum test operations will occur on a 24hr per day 7 day per week schedule. Personnel who operate and/or perform hands-on work in/on Government facilities, research test articles and equipment shall have completed a state certified apprenticeship program in an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered "qualified" shall also possess a working knowledge of common computer software applications, basic thermodynamic physics and vacuum principles; and possess the ability and enthusiasm to work within a highly productive team environment. Security clearances will be required for designated personnel.

a. Description of Work – The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and facility) operations. The Contractor shall ensure the daily usability of the SPF complex by performing routine and non-routine maintenance in accordance with PM schedules and Work Orders; and identify needed repairs to accommodate planned operations' / run schedules. Support efforts shall include the build-up, assembly, installation, modification, calibration, troubleshooting, repair, removal, storage and inventory all mechanical, electrical and electronic components and data systems associated with the SPF complex. Additional support efforts shall include pre-run and post-run set-ups, inspections, check-outs, daily calibrations and complete squawk sheet procedures associated with the operation of the facility and test hardware. This work environment will have exposure to high-pressure gas systems, high vacuum systems, laser light, solar simulators, high voltage (AC and DC), as well as high temperature surfaces and cryogenic materials. If required, the Contractor shall maintain bonded storage areas and support and/or provide demonstrations and tours to PB visitors and personnel both onsite and offsite as required. The contractor shall perform modifications to test facilities and ancillary support equipment and shall maintain required documentation and records of all modifications. If Work Orders indicate, the Contractor shall also be required to perform test hardware or experiment assembly inside a Clean Room environment. The Contractor shall maintain the appropriate Class Clean Room environment by complying with established Clean Room standards and practices, as applicable. Other unique technical and maintenance certifications may be required, i.e. Flight System Assembly Training (FSAT) manual and critical lift certifications for flight hardware buildup, assembly and handling. The Contractor may also be required to perform work involving various welding and weld inspection processes.

The Contractor shall incorporate the MP-2 and /or EAM Work Order system (or their successor) requirements with OEM specifications in its' PM and Work Order schedule for the SPF complex.

The Contractor shall incorporate the test operation schedule (also referred to as the "run schedule") as established by facility management and engineering, into the "planned schedule".

The Contractor shall, in conjunction with the SPF Civil Service Staff, perform facility test operations for the SPF complex. Operations (run) schedules vary widely and may include multiple shift testing. The Contractor shall maintain the test operators run log for the facility and follow all established facility procedures, as well as ISO 9001 standards, for all required documentation. The Contractor shall maintain professional interactions with the internal and external customer base at all times.

b. Quality Standards – "Quality" shall be defined as – each Work Order performed and completed in a manner which assures the system / experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall have 97% of Work Orders completed IAW specifications listed on the Work Order. The Contractor shall have the pre-run and post-run check / squawk sheet tasks completed 100% accurately, with no check / squawk sheet anomalies. A check / squawk sheet anomaly is an item that is inaccurately documented i.e. valve is checked "closed", but is subsequently found to have been open.

c. Schedule Standards – The Contractor shall complete 95% of the routine jobs (PM's, Work Orders, check sheets, squawks) and 98% of the urgent jobs (Work Orders, squawks) by the Work Order due dates. Squawk sheets shall be completed 4 hours prior to the scheduled test run.

Engineering support efforts: Perform mechanical, fluid, electronic, computer, electrical, engineering associate and administrative activities to meet predetermined milestones as they relate to required Space Environment testing. Timely communication with the SPF Facility Manager, SPF Test Program Manager, Quality Assurance Evaluator (QAE), customers and team members, highlighting problems and issues is required. Cooperation with Civil Service team members and test customer

representatives to insure technical, cost and schedule objectives are met, and that team performance is maximized is essential.

- Project management
 - o Schedule
 - o Resources (staff and dollars)
 - o Active support: Planning, organizing, directing, tracking
 - o Communication and reporting

- Support for Test Programs
 - o Technical aspects of the test
 - o Safety
 - o Meeting Customer Expectations

- Facility Engineering
 - o Upgrades, Repairs, Maintenance
 - o Calibration (Equipment, Instrumentation, Airflow)
 - o Assure Safety, Capability, Reliability and Recertification efforts

- Staff Development

The Contractor shall perform specific activities required to meet milestones identified by the SPF Facility Manager and/or QAE. This WBS will include the following work elements:

1. Experimental engineering functions include working with customers to develop test requirements, development of test plans and test matrices, formulation of data computing requirements and instrumentation locations, test performance, data validation and analysis, and reporting results. Provide support for the operation of tests, support may be required during non-core hours.
2. Engineering necessary to translate research experimental requirements into designs and specifications for the fabrication, modification, documentation, and installation of instrumentation, electronic control and data systems and mechanical systems used in research facilities and experiments.
3. Prepare and present facility and test hardware Safety and Environmental permit data packages to GRC/PB Safety Committees as required, including certifications, recertification, analysis of potential hazards and determination of techniques required to ensure the safe operation of tests.
4. Prepare specifications and purchase documentation for commercially available equipment and monitor the installation of specified equipment.
5. Project test engineering with responsibility for coordination of activities including research hardware design oversight, instrumentation selection, hardware installation and checkout, development of operating procedures, scheduling, daily test operations, and associated maintenance.
6. Perform engineering maintenance on mechanical, fluid, electrical/electronic systems required for facility test operations.
7. Track facility metrics. Summarize and report results at the QAE and PB Operations level.
8. Aid in the production of facility marketing materials including brochures, pamphlets and digital media (CD-ROM's etc.)
9. Support PBMO in the tracking of facility usage agreements with outside NASA customers and gathering feedback on customer experience at PB facilities and reporting on metrics relative to this feedback.
10. Assist the QAE and Facility Manager in coordinating special events, facility tours and visitor receptions relative to the showcasing of PB ground test facility capabilities.
11. Adjust and maintain staffing levels commensurate with testing needs and schedules as communicated from the customer.

12. Purchase goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools and parts, such that they are available when required and meet stated specifications.
13. Maintain an awareness of the state-of-the-art of relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.
14. Direct, coordinate and oversee technical services personnel in the buildup and installation of facility and test hardware.
15. Travel and training as necessary. If travel and/or training are required, the cost should be budgeted in the accompanying cost plan, or an amendment to the WBS will be issued to cover the additional requirements.

For all the activities stated above:

The Contractor shall comply with the GRC /PB standard policy and procedures such as:

- a. PB BMS Business Management Systems (BMS) Procedures
- b. GRC /PB Safety and Environmental Policies"

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

- "1. A monthly technical project report describing work progress via milestones and deliverables on contract performed tasks shall be forwarded to the QAE, SPF Facility Manager and PB Operations Directorate at the end of each month.
2. A detailed monthly performance-based cost report will be provided to the QAE and SPF Facility Manager for this WBS. The cost figures represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year's remaining performance based tasks. Cost variances and funding status will be presented in this report.
3. All labor hours associated with the performance-based tasks shall be tracked with ability for individual project tracking, if requested, for each PB program supported in this facility. The breakdown of task technical hours by program shall be forwarded to the QAE and SPF Facility Manager for this WBS, if requested.
4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.
5. Meet the test schedules and requirements as determined by the test programs, the QAE, SPF Facility Manager and SPF Test Program Manager.
6. The Contractor shall procure subcontract services, consumables, equipment, tools, parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the QAE, SPF Facility Manager and COTR (or authorized designee) on a quarterly basis.

Documentation Standards – The Contractor shall obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation shall be stored in the Plum Brook Document Library.

The Contractor shall follow configuration control guidelines. The Contractor shall be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and

work by others as directed by the QAE, SPF Facility Manager, SPF Test Program Manager and/or COTR (or authorized designee). The Contractor shall utilize NASA specified software packages, as appropriate, to update documentation.

Refer to documentation requirements that are stated in 4.2 Work control Systems of the SOW."

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	65
Schedule	25
Facility Tour Support	10
None	0

Personnel Profile

Experienced mechanical, fluids, electronic or electrical technicians, associate engineering technicians, or administrative personnel as required.

Experienced engineering disciplines: mechanical, fluids, electrical, electronic, industrial/civil, test, engineering associates or administrative personnel as required. The Contractor may subcontract engineering support with concurrence from the QAE, PB Management Office, COTR and CO.

Government Furnished Property

The Contractor shall track GFE according to established GRC procedures and TFOME policies.

WBS: 2.02 SPACECRAFT PROPULSION RESEARCH FACILITY (B-2) MAINTENANCE, ENGINEERING AND OPERATIONS

Period of Performance:

Title: SPACECRAFT PROPULSION RESEARCH FACILITY (B-2) MAINTENANCE, ENGINEERING AND OPERATIONS

Background

Why the project is being pursued

The Plum Brook Management Office is responsible for providing engineering, technical and operations support services to a wide range of NASA and non-NASA Programs at NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio. The 6,400 acre Plum Brook Station is home to five world-class space environment and propulsion test facilities. One of these facilities, the Spacecraft Propulsion Research Facility (B-2), is the world's largest rocket engine test facility capable of true space simulation. It is also the third largest thermal vacuum test facility in NASA. This facility is complex in nature and relies on many mechanical, fluid, electrical and electronic systems to create the high vacuum and dynamic thermal environments required for testing space hardware. This work effort provides engineering and technical support services that are necessary to maintain and operate the B-2 Facility, as well as to develop test-unique hardware, produce test conditions, and record test data as required by facility customers

WBS Description

Description of Services to be procured and specific tasks to be performed

The contractor's responsibilities shall include, but not be limited to, program and project planning, cost estimating, scheduling, work control, reporting, design, procurement of hardware and services, facility operation, repair, maintenance and upgrades of test facility equipment, staffing and specialized training. The contractor shall provide research and test support, which includes on-going interaction with test customers to assure that customer objectives are met or exceeded. All work shall be performed in accordance with PBMO established policies and procedures and all applicable Federal, State and local codes, regulations and procedures, and in a manner consistent with the best practices for world-class test facilities. This work effort specifically pertains to the B-2 Facility (B-2) complex.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

"Technical support efforts shall include facility maintenance, preventative maintenance (PM's), facility modifications and/or upgrades, research and test hardware build-up and installation; as well as facility operations. This facility shall normally be operational 8 hours per day, Monday through Friday, but actual operations' schedules will vary (increase / decrease) to accommodate critical maintenance, buildup, testing, delivery of hardware and research operations schedules. Personnel who operate and/or perform hands-on work in/on Government facilities, research test articles and equipment shall have completed a state certified apprenticeship program in an associated aerospace trade or have a minimum of seven (7) years of verifiable technical experience in a related mechanical, electrical or electronic trade. All candidates considered "qualified" shall also possess a working knowledge of common computer software applications, basic thermodynamic physics and vacuum principles; and possess the ability and enthusiasm to work within a highly productive team environment. Security clearances will be required for designated personnel.

a. Description of Work – The Contractor shall provide facility and research mechanical, electrical and electronic maintenance support efforts and perform facility and research (test hardware and facility)

operations. The Contractor shall ensure the daily usability of the B-2 complex by performing routine and non-routine maintenance in accordance with PM schedules and Work Orders; and identify needed repairs to accommodate planned operations' / run schedules. Support efforts shall include the build-up, assembly, installation, modification, calibration, troubleshooting, repair, removal, storage and inventory all mechanical, electrical and electronic components and data systems associated with the B-2 complex. Additional support efforts shall include pre-run and post-run set-ups, inspections, check-outs, daily calibrations and complete squawk sheet procedures associated with the operation of the facility and test hardware. This work environment will have exposure to high-pressure gas systems, high vacuum systems, laser light, solar simulators, high voltage (AC and DC), as well as high temperature surfaces and cryogenic materials. If required, the Contractor shall maintain bonded storage areas and support and/or provide demonstrations and tours to PB visitors and personnel both onsite and offsite as required. The contractor shall perform modifications to test facilities and ancillary support equipment and shall maintain required documentation and records of all modifications. If Work Orders indicate, the Contractor shall also be required to perform test hardware or experiment assembly inside a Clean Room environment. The Contractor shall maintain the appropriate Class Clean Room environment by complying with established Clean Room standards and practices, as applicable. Other unique technical and maintenance certifications may be required, i.e. Flight System Assembly Training (FSAT) manual and critical lift certifications for flight hardware buildup, assembly and handling. The Contractor may also be required to perform work involving various welding and weld inspection processes.

The Contractor shall incorporate the MP-2 and /or EAM Work Order system (or their successor) requirements with OEM specifications in it's PM and Work Order schedule for the B-2 complex.

The Contractor shall incorporate the test operation schedule (also referred to as the "run schedule") as established by facility management and engineering, into the "planned schedule".

The Contractor shall, in conjunction with the B-2 Civil Service Staff, perform facility test operations for the B-2 complex. Operations (run) schedules vary widely and may include multiple shift testing. The Contractor shall maintain the test operators run log for the facility and follow all established facility procedures, as well as ISO 9001 standards, for all required documentation. The Contractor shall maintain professional interactions with the internal and external customer base at all times.

b. Quality Standards – "Quality" shall be defined as – each Work Order performed and completed in a manner which assures the system / experiment operates as it was designed to function, assures the safety of all personnel and displays the efficient use of time and materials. The Contractor shall have 97% of Work Orders completed IAW specifications listed on the Work Order. The Contractor shall have the pre-run and post-run check / squawk sheet tasks completed 100% accurately, with no check / squawk sheet anomalies. A check / squawk sheet anomaly is an item that is inaccurately documented i.e. valve is checked "closed", but is subsequently found to have been open.

c. Schedule Standards – The Contractor shall complete 95% of the routine jobs (PM's, Work Orders, check sheets, squawks) and 98% of the urgent jobs (Work Orders, squawks) by the Work Order due dates. Squawk sheets shall be completed 4 hours prior to the scheduled test run.

Engineering support efforts: Perform mechanical, fluid, electronic, computer, electrical, engineering associate and administrative activities to meet predetermined milestones as they relate to required B-2, Space Propulsion and Space Environment testing. Timely communication with the B-2 Facility Manager, Quality Assurance Evaluator (QAE), customers and team members, highlighting problems and issues is required. Cooperation with Civil Service team members and test customer representatives to insure technical, cost and schedule objectives are met, and that team performance is maximized is essential.

- Project management
 - o Schedule
 - o Resources (staff and dollars)
 - o Active support: Planning, organizing, directing, tracking
 - o Communication and reporting

- Support for Test Programs
 - o Technical aspects of the test
 - o Safety
 - o Meeting Customer Expectations

- Facility Engineering
 - o Upgrades, Repairs, Maintenance
 - o Calibration (Equipment, Instrumentation, Airflow)
 - o Assure Safety, Capability, Reliability and Recertification efforts

- Staff Development

The Contractor shall perform specific activities required to meet milestones identified by the B-2 Facility Manager and/or QAE. This WBS will include the following work elements:

1. Experimental engineering functions include working with customers to develop test requirements, development of test plans and test matrices, formulation of data computing requirements and instrumentation locations, test performance, data validation and analysis, and reporting results. Provide support for the operation of tests, support may be required during non-core hours.
2. Engineering necessary to translate research experimental requirements into designs and specifications for the fabrication, modification, documentation, and installation of instrumentation, electronic control and data systems and mechanical systems used in research facilities and experiments.
3. Prepare and present facility and test hardware Safety and Environmental permit data packages to GRC/PB Safety Committees as required, including certifications, recertification, analysis of potential hazards and determination of techniques required to ensure the safe operation of tests.
4. Prepare specifications and purchase documentation for commercially available equipment and monitor the installation of specified equipment.
5. Project test engineering with responsibility for coordination of activities including research hardware design oversight, instrumentation selection, hardware installation and checkout, development of operating procedures, scheduling, daily test operations, and associated maintenance.
6. Perform engineering maintenance on mechanical, fluid, electrical/electronic systems required for facility test operations.
7. Track facility metrics. Summarize and report results at the QAE and PB Operations level.
8. Aid in the production of facility marketing materials including brochures, pamphlets and digital media (CD-ROM's etc.)
9. Support PBMO in the tracking of facility usage agreements with outside NASA customers and the gathering of feedback on customer experience at PB facilities and reporting on metrics relative to this feedback.
10. Assist the QAE and Facility Manager in coordinating special events, facility tours and visitor receptions relative to the showcasing of PB ground test facility capabilities.
11. Adjust and maintain staffing levels commensurate with testing needs and schedules as communicated from the customer.
12. Purchase goods and services as necessary to maintain test schedules. Procure subcontract services, consumables, equipment, tools and parts, such that they are available when required and meet stated specifications.

13. Maintain an awareness of the state-of-the-art of relevant technology by reviewing scientific and engineering literature, as well as attending formal courses and training.

14. Direct, coordinate and oversee technical services personnel in the buildup and installation of facility and test hardware.

15. Travel and training as necessary. If travel and/or training are required, the cost should be budgeted in the accompanying cost plan, or an amendment to the WBS will be issued to cover the additional requirements.

For all the activities stated above:

The Contractor shall comply with the GRC /PB standard policy and procedures such as:

- a. PB BMS Business Management Systems (BMS) Procedures
- b. GRC /PB Safety and Environmental Policies"

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

1. A monthly technical project report describing work progress via milestones and deliverables on contract performed tasks shall be forwarded to the CPM, B-2 Facility Manager and PB Operations Directorate at the end of each month.

2. A weekly performance-based cost report will be provided to the CPM and B-2 Facility Manager for this WBS. The cost figures represent the fiscal year actual costs to date, broken down by week, as well as the cost forecast for the balance of the fiscal year's remaining performance based tasks. Cost variances and funding status will be presented in this report.

3. All labor hours associated with the performance-based tasks shall be tracked with ability for individual project tracking, if requested, for each PB program supported in this facility. The breakdown of task technical hours by program shall be forwarded to the CPM and B-2 Facility Manager for this WBS, if requested.

4. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.

5. Meet the test schedules and requirements as determined by the test programs, the CPM and B-2 Facility Manager.

6. The Contractor shall procure subcontract services, consumables, equipment, tools, parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the CPM, B-2 Facility Manager and COTR (or authorized designee) on a quarterly basis.

Documentation Standards – The Contractor shall obtain and maintain manufacturer's operating instructions and maintenance manuals on all new equipment installed. All documentation shall be stored in the Plum Brook Document Library.

The Contractor shall follow configuration control guidelines. The Contractor shall be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the CPM, B-2 Facility Manager and/or COTR (or authorized designee). The contractor shall use the Facility Change Request (FCR) process prior to initiation of facility changes. The Contractor shall utilize NASA specified software packages, as appropriate, to update

documentation.

Refer to documentation requirements that are stated in 4.2 Work control Systems of the SOW.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	55
Completion of painting of (5) steam accumulators by May 1, 2014	15
Completion of repair of the 11 ft valve, including activation, by May 1, 2014	10
V-203 Integration Complete by June 15, 2014	20

Personnel Profile

Experienced mechanical, fluids, electronic or electrical technicians, associate engineering technicians, or administrative personnel as required.

Experienced engineering disciplines: mechanical, fluids, electrical, electronic, industrial/civil, test, engineering associates or administrative personnel as required. The Contractor may subcontract engineering support with concurrence from the Contract Performance Monitor (CPM), PB Management Office, COTR and CO

Government Furnished Property

The Contractor shall disposition all GFE in accordance with established GRC procedures and TFOME policies.

WBS: 2.06 PLUM BROOK STATION INSTITUTIONAL SERVICES

Period of Performance:

Title: Plum Brook Station Institutional Services

Background

Why the project is being pursued

The Plum Brook Management Office is responsible for providing engineering, technical, operations and institutional support services to a wide range of NASA and non-NASA Programs at NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio. The 6,400 acre Plum Brook Station is home to four world-class space environment and propulsion test facilities. This Work Plan addresses the requirements to manage and maintain the infrastructure of Plum Brook Station and to provide Institutional Support Services throughout the station. Contractor shall perform all work in accordance with all Federal, State and local codes. The maintenance, operations and repair of these systems shall be in accordance with NASA Statement of Work # NAS3-00I23.

WBS Description

Description of Services to be procured and specific tasks to be performed

Contractor will be responsible for the effective and efficient use of manpower and materials. These resources are to include but not be limited to money, people, time, information, equipment and facilities. Contractor will be required to complete work task within timelines and budgets. Maximo will be utilized to gather information, generate reports and be used as a distribution tool to get such reports out in a timely fashion as to identify problems and make corrections as early as possible to minimize the cost impact to equipment and property.

General Scope of Work

SOW summary should define respective responsibilities of Government and Contractor

Perform mechanical, electrical, electronic, computer, engineering and administrative tasks to meet predetermined milestones as they relate to required Institutional Infrastructure activities. Timely communication with the Contract Performance Monitor (CPM), customers and team members; highlighting problems and issues is critical. Cooperation with the CPM, Facility Manager, Systems Managers, customers and team members to insure that team performance is maximized is essential.

Specific Work Elements:

The Contractor shall perform tasks required to meet milestones identified by the NASA CPM. Tasks will include the following work elements:

Contractor will maintain the continuous improvement process in all aspect of this contract. This process shall include the analysis of the current operation, improvement plans and appropriate measuring metrics. This process should include work processes, operations, resource management, equipment upgrades, system modifications and personnel development strategies. Specific elements of the plan will be prioritized and cost estimates will be provided. These plans will be updated in an ongoing manner and shall be submitted to the NASA Manager for concurrence and funding authorization as required.

Contractor will maintain plans and processes for obtaining and maintaining a skilled workforce to meet PBS requirements. Contractor will continually assess the staff skills and compare them to both the current and future skill requirements. Contractor will implement training plans to maintain and enhance the workforce skill set in a cost effective manner.

Institutional Support of Test Facilities

Contractor will provide test facility inspection, preventive maintenance, and emergency repairs to institutional equipment identified in the work plan. Contractor will supply NASA with facility inspection reports that identify emergency and remedial facility maintenance and repair work. The proposed repair activities shall be reviewed by NASA prior to the commencement of the repair activity. Contractor will continue to develop and implement a preventative maintenance program that will be planned through Maximo and reported in bi-weekly meetings for both work planning strategy and for compliance to the reporting metrics.

General Institutional Support Services

Contractor will provide Infrastructure and Institutional support services on a continuous and ongoing basis. Contractor will provide personnel with the proper certifications to operate and maintain the appropriate equipment and systems. Contractor will operate, maintain and repair the infrastructure systems, structures and equipment in accordance with manufacturer recommendations and all applicable codes to assure safe and reliable operation of the Plum Brook infrastructure. Contractor will perform routine inspections; maintain accurate system drawings and underground utility system maps in AutoCad format. Contractor will also maintain written operation, inspection and maintenance procedures while maintaining equipment and systems records and log books. Contractor will maintain written emergency response procedures for each system. These procedures will provide detailed descriptions of the necessary corrective and emergency actions required in the event of an emergency, including system isolation procedures, notification of gas or electric company and the local fire department, means for alerting personnel and for defining duties during the emergency. The work shall be accomplished in accordance with the latest revisions of OSHA regulations and related reference materials as applicable. These systems are described as follows and are in accordance with NAS3-00123.

A "Work Break Down Structure" (WBS) will be provided to the NASA Task Manger for review of the total work scope for both man hours and materials for each system falling under the Institutional scope of NASA Work Scope NAS3300123. These systems include but may not be limited to the items listed in Section 4.5 below. The WBS will not show reference to C of F projects that may be injected into the work plan by NASA Managers. These types of special projects will be defined and estimated in additional work plans with independent reporting and deliverables which will be identified in the task orders as to scope and measurables.

4.5.1 Electric Power Transmission and Distribution System.

The Contractor shall operate and maintain the electrical transmission system in accordance with the Electrical Applications Safety Committee guidelines. This system consists of a 34.5 kV transmission line on approximately 11 miles of wood pole construction; five 34.5 kV substations; associated relaying and protective circuits; and distribution transformers. The electrical distribution system consists of a 7.2 kV line on approximately 15 miles of wood pole construction, containing 5 active circuits, voltage regulators, protective circuits and facility service entrance transformers. The Contractor's responsibility begins at the secondary side of the 138 kV I 34.5 kV transformers and extends to the final point of use.

All personnel working on the Electric Power Transmission and Distribution System shall be trained in accordance with the GRC Electrical Systems safety requirements.

4.5.2 Natural Gas Distribution System

The Contractor shall operate and maintain the natural gas distribution system consisting of 7

Columbia Gas meter stations, gas buildings, piping, regulators, valves, safety devices, and 9 NASA internal meters. The contractor shall tabulate, maintain records and report the monthly usage of natural gas at each meter location. This usage report is due to the Government by the 15th of each month.

4.5.3 Raw Water Distribution System

The Contractor shall operate and maintain the raw water supply and distribution system consisting of 2 pumping stations located on Lake Erie, pumps, reservoirs, 150,000 gallon water storage tower, valves, piping, instrumentation, 80 active hydrants and sprinkler systems, heat exchangers and related equipment. The Contractor shall assure that the system supplies adequate pressure and flow rates to the areas requiring raw water. The Contractor shall maintain the fire protection and sprinkler systems in the raw system, including marking active and inactive hydrants, performing annual flushing and testing of all active fire hydrants and sprinkler systems in accordance with NFPA procedures.

4.5.4 Domestic Water Distribution System

The Contractor shall operate and maintain the domestic water system. The domestic water system consists of 2 meters, a 500,000 gallon reservoir, two elevated water towers (100,000 gallon and 150,000 gallon), distribution lines, 11 backflow preventers, 7 fire hydrants, and 1 sprinkler system. Plum Brook uses about 1,000,000 gallons of water per month. The Contractor shall perform routine valve operation, isolation, repair, trenching and backfill for the distribution system; perform annual flushing and testing of the fire hydrants and sprinkler system in accordance with NFPA; isolate water line breaks within 2 hours of detection; and perform routine pump maintenance and assure that Plum Brook Station is supplied with adequate pressure and flow to the areas requiring domestic water.

4.5.5 Storm and Sanitary Sewer System

The Contractor shall operate and maintain the sanitary and storm sewer systems, including two package treatment plants, sewage flow monitoring station, lift stations, sumps, distribution systems, ditches and culverts.

4.5.6 Cathodic Protection System

The Contractor shall maintain the cathodic protection system that protects the natural gas, domestic and raw water distribution lines. The Contractor shall provide an annual report detailing the test data and necessary repairs to the system.

4.5.7 Roads and Parking Lots

The Contractor shall maintain approximately 50 miles of roads (112 of the roads are considered main arteries), parking lots, guard rails, fencing, gates, traffic control signs, and all their associated hardware and supports. The Contractor shall provide snow and ice removal on the main traffic arteries, walkways and parking lots surrounding occupied buildings and locations where personnel are performing operations. The Contractor shall provide 24-hour crews to remove snow when snow conditions prevail. When ice conditions occur, salt shall be applied to hazardous locations only. Trees, limbs and other debris shall be removed from roadways immediately. The snow and ice removal, including salt spreading, shall be prioritized as directed by the Government.

4.5.8 General Grounds

The Contractor shall maintain all outdoor areas within the boundaries of Plum Brook Station,

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. The Contractor shall maintain approximately 15 miles of security fence and 13 gates in accordance with the Glenn Security Manual.

The Contractor shall provide services for control of pest, vegetation, undesirable birds, animals, and insects. All pesticide applications shall be scheduled and approved by the Government prior to application. The Contractor shall maintain a Pesticide Application Report.

4.5.9 HV AC and Refrigeration Systems

The Contractor shall operate, maintain, and repair the heating ventilating and air conditioning equipment in accordance with manufacturer recommendations. NFPA and ASHRAE. The Contractor shall ensure that the systems operate in the most energy efficient manner.

The Contractor shall operate, maintain, and repair boiler plants in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code Sections VI and VII. The Contractor is responsible for obtaining and/or continuing the operational license from the State of Ohio for each of the hot water or steam boilers. Boiler water treatment shall be outlined in the operating procedures. The Contractor shall ensure that boiler water chemical residuals are maintained for adequate control of scale and corrosion.

4.5.10 Compressed Air Distribution Systems

The Contractor shall operate and maintain the compressed air distribution system, including compressors, receivers, controls, valves, safety devices, piping and regulators in accordance with manufacturer recommendations. Safety, pressure reducing, and non-control valves shall be checked monthly to insure that the system operates safely within the maximum allowable working pressure.

4.5.11 Aircraft Warning Lights

The Contractor shall operate and maintain the aircraft warning lights. Aircraft warning lights exist on the SPF Stack (Building 1451) at 200 feet. The Contractor shall replace these lights every 6 months and repair a non-operating lamp within 24 hours after failure. The Contractor shall notify SprintCom when the lights on its tower are not working properly. SprintCom's tower has lights at the top and at the mid-point.

4.5.12 Elevators

The Contractor shall operate, inspect and maintain 3 hydraulic elevators and 2 cable elevators located within Plum Brook Station. The Contractor shall notify the Government in writing of any safety violations or the need for replacement parts and a cost estimate to replace such parts. The Contractor shall maintain a file on each elevator, including all preventive maintenance performed on the elevator including personnel doing the work, all parts replaced, and any drawings or changes made to the elevator. The Contractor shall provide an annual second party inspection of each elevator in accordance with ANSI A 17.1, Safety Code for Elevators and Escalators.

4.5.13 Cranes, Slings and Hoist

The Contractor shall inspect and maintain all cranes, slings and hoists within Plum Brook Station. There are approximately 100 lifting devices at Plum Brook, including overhead cranes, jibs, chains,

wire ropes, and 1 mobile crane. Some of the cranes at Plum Brook are subjected to vacuum conditions and some require special equipment to access the crane to perform the inspections. The Contractor shall notify the Government in writing of any safety violations or the need for replacement pans and a cost estimate to replace such pans. The Contractor shall maintain a file on each crane, including all preventive maintenance performed on the crane including personnel doing the work, all parts replaced, and any drawings or changes made to the crane. The Contractor shall follow the NASA Safety Standard for Lifting Devices and Equipment. The Government will provide all weights needed to perform the required load tests.

4.5.14 Communication Systems (refer to NAS3-00123 Sect. 4.2.6)

The Contractor shall operate, maintain, and provide user support to assure reliable specialized communications to all areas of the Station. These specialized communications services include support of fire, security and operations monitoring and alarm systems; custom systems required by test programs; and other communications services not addressed in the following paragraph. Telephone, radio, and basic computer systems (including networking) support will be provided under a separate contract that covers these services for all of GRC. The Contractor shall coordinate their efforts with the contractor supplying services for all of GRC at all interfaces, especially where shared assets such as copper and fiber optic cable plants are involved.

The Contractor shall perform routine inspection and maintenance as required on the Plum Brook Station specialized communication systems. The Contractor shall install and/or modify new and existing devices, network connections, and circuits as required. The Contractor shall maintain system prints, written procedures, equipment, and system logbooks.

4.5.15 Life Safety Systems

The Contractor shall inspect, test and maintain Plum Brook Station life safety systems, including the fire alarm system, fire extinguishers, fire hydrants and sprinkler systems. The Contractor shall prepare and submit a plan detailing the inspection, tests, and maintenance to be performed on each of these systems. The Contractor shall maintain a data base on each of these systems that includes inspection dates, deficiencies, preventive maintenance, alarms reponed, etc.

4.5.16 Vehicle / Equipment and Repair

The Contractor shall provide preventive and emergency maintenance and repair services on passenger vehicles, construction equipment, mobile crane, materials handling equipment, cryogenic and gas handling vehicles, as well as all portable tools and equipment used for grounds maintenance.

The Contractor shall perform preventive maintenance in accordance with manufacturer recommendations and NASA Glenn Vehicle Maintenance Report. Repairs shall be defined as any repair or adjustment not specified under preventive maintenance, including, but not limited to: body work, painting, tire repairs, repair or replacement of trailer running gear, and any repair required to maintain vehicles and equipment in a safe and operational condition. Repairs that exceed 20 percent of the acquisition cost of the vehicle equipment or \$500, whichever is less, must be approved by the Government.

The Government will provide a maintenance and service area and tools and equipment required for servicing of vehicles. The Contractor shall supply the required mechanic's hand tools. The Contractor shall regularly monitor the fuel levels in the storage tanks (gasoline and diesel) and shall maintain the Petrovend Fuel Recording System, and notify the Government when fuel is needed.

4.5.17 Custodial Services

The Contractor shall provide routine, emergency and special custodial services in the office buildings and research areas at Plum Brook Station to assure a safe, healthy, and attractive work environment.

The Contractor shall provide routine custodial services on an ongoing basis in all "Active areas" at Plum Brook Station. Routine custodial services shall include: regular cleaning, polishing, waxing, disinfecting, dusting and washing of floors, walls, surfaces, ceilings, interior and exterior windows, furniture, drapes, carpeting, and fixtures in offices, conference rooms, shops, laboratories, hallways, and restrooms. The Contractor shall keep all waste containers emptied and restroom dispensers stocked. Restroom mirrors shall be clean and streak free. All floors shall be free of dust and dirt. Resilient tile floors shall have a uniform luster either by buffing, spray cleaning or waxing and shall be free of dirt, dust, and traffic marks. Carpeting shall be free of unsightly spots; removal of any spot shall not discolor the carpeting. Horizontal surfaces shall be free of dust. Light fixtures shall be clean, free of bugs and shall be replaced as required.

The Contractor shall perform custodial services at inactive areas several times per year. These services include removal of all loose paper, bottles, trash, dead bugs, birds, rodents, and cobwebs. The Contractor shall perform custodial services in support of special events and emergencies. Special events include the arrival of guests, special functions and tours. Emergencies include clean up of overflowed rest room fixtures, spills, floods, muddy or wet entrances, broken glass, etc. The Contractor shall provide specialized custodial services at the four operating test facilities and at the Reactor Facility. The specialized services will usually be unique and non-routine, requiring special skill, training, and experience appropriate to the Plum Brook operations. Examples of specialized services include: cleaning the vacuum chambers at SPF, B-2, and K•Site prior to a critical pump down, or after an oil backstreaming incident, and performing custodial services in the Plum Brook Reactor Facility where special procedures and protocols are required.

4.5.18 Warehousing and Storage Services

The Contractor shall manage the Plum Brook Station warehousing and storage facilities. The Contractor shall maintain accurate inventories of items stored at Plum Brook Station; receive, unload, process and store material; assign and record the storage location; retrieve and load items from storage; secure material for transportation, and; remove and ship obsolete records to the National Archives when instructed by the Government.

4.5.19 PBMO Support Services

The Contractor shall maintain the Plum Brook Records Library. The Contractor shall receive, store, ship, issue, and retrieve various records, including operation manuals, standards, codes, and specifications, reports, references, test records, Station standby records, photographs, negatives, viewgraphs, videotapes and historical files. The Contractor shall ensure that all documents processed through PBS comply with NASA quality and format standards. The Contractor shall use the following handbooks in completing these tasks: NHB 1450.10, as revised Financial Management Manual (FMM) 9700, as revised NASA Records Retention Schedules (NRRS) NPG 1441 Ie, as revised

4.5.20 Engineering, Drafting and Construction Services

The Contractor shall provide engineering and drafting services. These services shall cover the

mechanical, structural, electrical, civil, and architectural disciplines. The Contractor shall have a working knowledge of AutoCad and WorkCenter systems and be able to interface with the Glenn-Cleveland engineering and drafting systems. The Contractor shall assure that Plum Brook is compliant with the Glenn-Cleveland engineering and drafting standards. The Contractor shall convert existing drawings from paper to digital formats. The Contractor shall maintain drawing files including filing, updating, configuration control, and maintaining the equipment. The Contractor shall use AutoCad on any new drawings and shall convert existing drawings to AutoCad when a change to that drawing is required. The Contractor shall provide construction management for construction projects including: specification writing, field inspection, evaluating change cost estimates; maintaining construction files; documenting and assuring drawings are changed to the "as-built" condition, performing facility change documentation, and; chairing pre-construction conference and construction status meetings.

4.5.21 Computer Support Services (refer to NAS3-00123 Sect. 4.2.14)

The Contractor shall operate, maintain, and provide user support to assure reliable specialized computer service support to all areas of the Station. These specialized computer services include off the shelf and custom software and hardware in support of fire, security and operations monitoring and alarm systems; custom systems required by Station operations; custom systems required by test programs; and other computer services not addressed in the following paragraph. Computer systems, including office and test computers and peripherals, standard productivity application software (i.e.; word processing, spreadsheet), system administration, and networking support (including maintenance, help desk, training, etc.) will be provided under a separate contract that covers these services for all of GRC. The Contractor shall coordinate their efforts with the contractor supplying services for all of GRC at all interfaces, especially where shared assets such as hardware and software are involved.

The Contractor shall perform routine inspection and maintenance as required on the Plum Brook Station specialized computer systems. The Contractor shall install and/or modify new and existing hardware and software as required. The Contractor shall maintain system prints, written procedures, equipment, and system logbooks.

4.5.22 Environmental Compliance Program

The Contractor shall manage an Environmental Compliance Program which ensures that Plum Brook Station's activities are carried out in a manner which complies with all applicable federal and state laws, NASA policies, and active permits. Specific references include: SLm _q:H.. -fS,StO IA LeR=M0540.001 Glenn Environmental Programs Manual LeR•P7030.03 1 Plum Brook Station Waste Site Management

The Contractor shall remain informed of current laws, regulations, and technologies related to environmental compliance. The Contractor shall continuously assess and evaluate the Environmental Compliance Program to identify areas of possible improvement, to recommend corrective action, and to implement corrective actions as approved by the Government. The Glenn Environmental Management Office will provide advice, guidance, and direction on the Environmental Compliance Program as needed.

4.5.23 Water Compliance Program

The Contractor shall perform monitoring, sampling, analysis, and reporting activities required by the active National Pollution Discharge Elimination System (NPDES) permits held by Plum Brook Station. There are currently eight permitted outfalls. Operations on Station shall be conducted to prevent any violations of the NPDES permits. Should a violation occur the Contractor shall act

promptly to identify and correct the cause.

The Contractor shall operate and maintain the package Wastewater Treatment Plant, Building 8336, which serves the Space Power Facility. This plant counts as one of the NPDES monitored outfalls.

The Contractor shall conduct annual sampling and analysis of all drinking fountains and janitor's sinks on Station for compliance with the Safe Drinking Water limits.

The Contractor shall operate and maintain the Chemical Laboratory, Building 7143, as needed to support the NPDES analytical activities, as well as other chemical analysis needs that may come up, such as monitoring a stream on Station after a spill, or analyzing the contents of a retention pond prior to discharging.

4.5.24 Air Compliance Program

The Contractor shall operate, maintain, and report on the following air sources in accordance with active air permits: Heated Degreaser in the Clean Room, Building 1491 Paint Booth, Building 7131 Steam Boilers, Building 5231

The Contractor shall provide air monitoring and reporting for hazards such as asbestos, lead, mercury, and hydrogen sulfide.

The Contractor shall provide information necessary to apply for any new or temporary air permits, for example to allow an engine-firing program in a test facility.

4.5.25 Waste Compliance Program

The Contractor shall operate, monitor, and report weekly on all Satellite Waste Sites (currently six) and the 90-Day Storage Site, Building 9206. These sites shall be operated and maintained in strict accordance with all applicable Federal and state regulations, and NASA procedures. The Contractor shall store, transport, handle, and dispose of all hazardous and non-hazardous waste. The Contractor shall provide training to all personnel involved in waste handling operations.

4.5.26 Recycling and Pollution Prevention Program

The Contractor shall manage the recycling program including monitoring and reporting specifics on amount of materials recycled. Recycling efforts currently include, but are not limited to, paper, 55-gallon drums, batteries, tires, cans, scrap metal, cardboard, solvents, oil, and fluorescent tubes.

The Contractor shall manage a pollution prevention program. Pollution prevention currently includes, but is not limited to, spill prevention and control and solvent substitution for the Clean Room.

4.5.27 Hazardous Substances Program

The Contractor shall monitor for lead, asbestos, mercury, and other hazardous substances in the workplace. The Contractor shall perform small-scale abatement and clean up jobs for these materials.

4.5.28 Miscellaneous Maintenance, Operations, and Repair as assigned by NASA Task Managers.

- Inventory all chemicals on-site and provide an annual report.
- Perform annual field burn of up to half the open field each spring, as directed by the Government.
- Provide occasional logistical support to sampling and remediation activities conducted by the Army Corps of Engineers and its subcontractors, and by NASA and its subcontractors. Support shall most

likely take the form of mowing, locating underground utilities, and transporting equipment on Station.

- Perform daily monitoring of the gasoline and diesel fuel Underground Storage Tanks. Provide monthly summary report to the Government.
- Provide immediate response to small chemical and oil spills. Have at least one employee who is trained and capable of acting as Emergency Response Coordinator. Emergency response functions for large oil spills or hazardous material spills will be provided by local community resources. Spill reports shall be filed with the Government for all incidents.
- Provide advice and guidance to the test facilities regarding environmental issues directly related to a test program.

For all the activities stated above:

The Contractor shall comply with the GRC standard policy and procedures such as:

- a. PB BMS/Procedures
- b. GRC Safety and Environmental Policies

Milestones and Deliverables

Examples include: reports, hardware/equipment deliverables

The milestones and deliverables for this period shall include:

The Contractor shall provide the following written reports.

- 1) General Reports
 - a) Service Contract Injury Experience Report- Monthly
 - b) Incident Report - One per incident/investigation
 - c) Mishap Report (NASA Form 1627)- One per reportable incident
 - d) Annual Report of Government Owned/Contractor Held Property - Annually
 - e) Miscellaneous Reports Required by Audit or Regulatory Agencies - As required
- 2) Test Facility Maintenance
 - a) Facility Inspection Report - As needed
 - b) Preventive Maintenance Plan – Annual
- 3) Infrastructure Systems
 - a) Maintenance Plan – Annual
 - b) Cathodic Protection System Test Data and Repair Report – annual
 - c) Pesticide Application Report – Annual
 - d) Utility Usage Report – Monthly
 - e) Energy Report – Quarterly
- 4) General Institutional Services
 - a) Life Safety System Inspection and Maintenance Plan – Annual
 - b) Glenn Vehicle Maintenance System Data Entry – Monthly
- 5) Environmental Compliance Program
 - a) NPDES Report – Monthly
 - b) Drinking Water - Annual (may be broken down into several different monthly reports)
 - c) Halogenated Degreaser Inspection Log – Weekly
 - d) Paint Booth Log - As it is used
 - e) Boiler Fuel Report – Annual
 - f) 90-Day Storage Site Inspection Log – Weekly

- g) Satellite Site Inspection Logs – Weekly
- h) Recyclable Count - As they occur
- i) Chemical Inventory – Annual
- j) Underground Storage Tank Logs – Monthly
- k) Spill Reports - As they occur

1. A detailed monthly performance-based cost report will be provided to the CPM for this WBS. The cost figures represent the fiscal year actual costs to date, broken down by month, as well as the cost forecast for the balance of the fiscal year’s remaining performance. Cost variances and funding status will be presented in this report.
2. Upon discovery of a new technology related to the work on a performance based task, a New Technology Discovery Report shall be provided within two months of the initial discovery.
3. Help meet the test schedules and requirements as determined by the test programs and the CPM
4. The Contractor shall procure subcontract services, consumables, equipment, tools, parts, such that they are available when required and meet specifications.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

The Contractor shall keep an inventory of Government Furnished Equipment (GFE) and maintain a quarterly inventory report. Copies of said report shall be sent to the CPM, and COTR (or authorized designee) on a quarterly basis.

Documentation Standards – The Contractor shall obtain and maintain manufacturer’s operating instructions and maintenance manuals on all new equipment installed. All documentation shall be stored in the Plum Brook Document Library.

The Contractor shall follow configuration control guidelines. The Contractor shall be responsible for updating and maintaining all record drawings, electrical and mechanical one-line wiring and elementary drawings, software ladder-logic schematics, manuals, reports, check-sheets, and all other documentation (including software documentation) for all work performed under this task, and work by others as directed by the CPM, and/or COTR (or authorized designee). The Contractor shall utilize NASA specified software packages, as appropriate, to update documentation.

Refer to documentation requirements that are stated in 4.2 Work control Systems of the SOW.

As part of the reporting requirements of this WBS, the Contractor shall include any open risks associated with cost, schedule, technical requirements, including any mitigation activities. No significant risks have been identified at this time.

Specific Milestones with Metrics desired for this award period

Milestones	Metrics
Quality of Performance	75
Schedule	25
NONE	0
NONE	0

Personnel Profile

Experienced mechanical, electrical, electronic, test engineers, engineering associates, or administrative personnel as required. The Contractor may subcontract engineering support with concurrence, as a courtesy, to the CPM and COTR.

Government Furnished Property

The Contractor shall disposition all GFE in accordance with established GRC BMS procedures and in accordance with established TFOME policies.