Marshall Space Flight Center
Engineering, Science & Technical Services

JACOBS ESTS Group

Task Order Plan (TOP)

Contract Number: *NNM05AB50C*
TO Title: *ET50 Special Test Equipment Design Support*
TO Number: *36-050002* **Revision:** *09*

Period of Performance: *10/02/2010* to *03/31/2011*
MSFC Initiator: *Scott McCluney*

(b)(4)

Emergency: *No*

Revision -09

The purpose of Revision -09 is to extend the task into Contract Year 6 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period October 2, 2010 through March 31, 2011. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised for the new period of performance

Revision -08

The purpose of Revision -08 is to administratively close subelements –CC, –CI, -CJ, -CK, and –CL, and to open subelement -02. The new subelement -02 (WBS 814060.08.11), ET50 Test Equipment Design and Support, continues the support for Test Stand 4550 design and hereby provides (b)(4) hours, an adjustment of (b)(4) to the task for the remainder of the period of performance.

Revision -07

The purpose of Revision -07 is to combine two task orders into one task order supporting ET50, add new work, and extend one subelement to accommodate the customer's updated schedule. This revision extends subelement –CC (Upper Stage SD06/SD08 Large Panel Compression Test) to the end of CY5 to accommodate the test initiators updated test plan. The update to subelement –CC adds (b)(4) hours to the task. The new subelement –CJ is the Upper Stage SD07A Bolted Interface Joint Test design support, which is adding (b)(4 hours to the task. Subelements –CK and –CL, being added herein, are formerly from Task Order 36-050001 (subelements –CA and –CB respectively), which is being closed, and the remaining hours moved to this task. Task Order 36-050001 is being closed because it is a duplication of this task, both of which define our support to ET50. Therefore, subelement –CK is the Integrated Vehicle Ground Vibration Test (IVGVT) equipment design, hereby moving (b)(4) hours to this task. Subelement –CL is the IVGVT Hydro-Dynamic Stand (HDS) Test Fixture design, adding (b)(hours to the task to accommodate the release of fabrication drawings. The net change is (b)(4) hours being added to this task.

Subelement	Description	WBS #
CC	SD06 – Large Panel Compression Test	136905.08.05.10.03.08.08
CI	CBATS Rotation Tooling Design Changes	136905.08.05.12.02.08.03
CJ	SD07A – Bolted Interface Joint Test	136905.08.05.10.03.08.09

CK	Integrated Vehicle Ground Vibration Test (IVGVT)	136905.10.30.20.22
CL	IVGVT Hydro-Dynamic Stand (HDS) Test Fixture	136905.10.30.20.22

Revision -06

The purpose of Revision -06 is to add subelement –CI, Common Bulkhead Automated Testing System (CBATS) Rotation Tooling Design Changes, to the task. (b)(4) hours were moved from subelement –CC and placed on subelement –CI for a net change of (b)(4) hours to the task.

Revision -05

The purpose of Revision -05 is to extend the task into Contract Year 5 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period October 3, 2009 through May 01, 2010. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.
Also, Subelements CA, CB, CG, and CH have been completed and are closed. This task is in support of the Ares I Program

Revision -04

The purpose of Revision -04 is to open a newly funded subelement, CH, Inspection Stands for Common Bulkhead Manufacturing Demonstration Article, to the task. Therefore, an additional (b)(4) hours is added to the task.

Revision -03

The purpose of Revision -03 is to increase the labor hours for subelement CG by (b)(and to add (b)(4) to subelement CB for training. Also, subelement CC is being extended by (b)(4) hours to accommodate additional task requirements. Subelements CD, CE, and CF are closed by this revision because of updated customer scheduling, which reduces the estimate by (b)(4) hours. No work was performed on these subelements which were supposed to have started in August and therefore they are not shown in the schedule in Section 9. The net reduction of hours on the task is (b)(4)

Revision -02

The purpose of Revision -02 is to open newly funded subelements and to decrease the labor hours by (b)(4 for work being moved to a different task. Additionally, (b)(4) is being added to account for travel on the task. The new subelements are:

- CA: Upper Stage SD01 Small Panel Compression Test (begins February 28th).
- CB: Upper Stage SD02 Wide Panel Compression Test (begins February 28th).
- CC: Upper Stage SD06 Large Panel Compression Test (begins February 28th).
- CD: Upper Stage SD19 Common Bulkhead Proof Test (begins August 1st).
- CE: Upper Stage SQ03A Common Bulkhead Damage Tolerance Test (begins August 1st).
- CF: Upper Stage SQ08 Instrument Unit Avionics Test (begins August 1st).
- CG: CLV Upper Stage Manufacturing Assembly Thermal Protection System (begins February 28th)

Subelement -01 is closed by revision 02 (ends February 27th).

Revision -01

The purpose of Revision -01 is to reduce the labor hours by (b)(4) to reflect the actual manpower needed to support this task.

Revision -00

The purpose of this new task is to continue the work from task 32-030502, which is discontinued because of an MSFC reorganization, and to extend it into Contract Year 4 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period September 27, 2008 through October 2, 2009. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.

1.0 Task Order Description & Objectives

This task provides for the design, analysis, and output (in the form of concepts, CAD and FEM models, stress packages, drawings, reports, etc.) of Special Test Equipment (STE), defined as any non-flight*, non-GSE*, or non-Facility** structure, hardware, or equipment intended to be used for testing or simulation, or associated with the manufacturing, process development, and preparation of MSFC facilities for testing or simulation. Designs include but are not limited to test stands, test beds, load reaction and application structures, load line components, flight hardware mockups and simulators, hardware support stands and dollies, personnel access stands, lifting and handling hardware, and tooling used to facilitate the fabrication and/or assembly of flight/non-flight hardware such as master drill templates or alignment/clamping fixtures used during machining and welding processes.

* Flight hardware and Ground Support Equipment (GSE) is defined in MSFC ISO9000 document MPD 1280.1 (Marshall Management Manual).

** Facility hardware is defined in MSFC ISO9000 document MPR 8823.1 (Design Control of Facilities).

Subelement 01 - Structural Strength Test Support
The objective of Subelement -01 is to provide structural design support to the Special Test Equipment Design branch within ET50. Subelement -01 is closed by revision 02.

Subelement CA - Upper Stage SD01 Small Panel Compression Test Support
(WBS 136905.08.05.10.03.08.03)
The objective of Subelement –CA is to provide structural design support to the Upper Stage SD01 Small Panel Compression Test. Subelement -CA is completed as noted in revision 05.

Subelement CB - Upper Stage SD02 Wide Panel Compression Test Support
(WBS 136905.08.05.10.03.08.04)
The objective of Subelement –CB is to provide structural design support to the Upper Stage SD02 Wide Panel Compression Test. Subelement -CB is completed as noted in revision 05.

Subelement CC - Upper Stage SD06 Large Panel Compression Test Support
(WBS 136905.08.05.10.03.08.08)
The objective of Subelement –CC is to provide structural design support to the Upper Stage SD06 Large Panel Compression Test. This subelement was administratively closed.

Subelement CD - Upper Stage SD19 Common Bulkhead Proof Test Support
(WBS 136905.08.05.10.03.08.19)
The objective of Subelement –CD is to provide structural design support to the Upper Stage SD19 Common Bulkhead Proof Test. Subelement -CD is closed by revision 03.

Subelement CE - Upper Stage SQ03A Common Bulkhead Damage Tolerance Test Support
(WBS 136905.08.05.10.03.08.22)

The objective of Subelement –CE is to provide structural design support to the Upper Stage SQ03A Common Bulkhead Damage Tolerance Test. Subelement CE is closed by revision 03.

Subelement CF - Upper Stage SQ08 Instrument Unit Avionics Test Support
(WBS 136905.08.05.10.03.08.26)
The objective of Subelement –CF is to provide structural design support to the Upper Stage SQ08 Instrument Unit Avionics Test. Subelement CF is closed by revision 03.

Subelement CG - CLV Upper Stage Manufacturing Assembly Thermal Protection System
(WBS 136905.08.05.12.07.08)
The objective of Subelement –CG is to provide structural design support to the CLV Upper Stage Manufacturing Assembly Thermal Protection System. Subelement -CG is completed as noted in revision 05.

Subelement CH - Inspection Stands for the Common Bulkhead Manufacturing Demonstration Article
(WBS 136905.08.05.12.02.08.07)
The objective of Subelement –CH is to provide structural design support to the MDA project. Subelement CH is closed by revision 05.

Subelement CI - Common Bulkhead Automated Testing System (CBATS) Rotation Tooling Design Changes
(WBS 136905.08.05.12.02.08.03)
The objective of Subelement –CI is to provide structural design support to the non-destructive evaluation (NDE) team for the modification of tooling used to rotate the dome of the common bulkhead during surface scanning operations. This subelement was administratively closed.

Subelement CJ - Upper Stage SD07A Bolted Interface Joint Test
(WBS 136905.08.05.10.03.08.09)
The objective of subelement –CJ is to provide structural design support to the Upper Stage SD07A Bolted Interface Joint Test. This subelement was administratively closed.

Subelement CK - Integrated Vehicle Ground Vibration Test (IVGVT)
(WBS 136905.10.30.20.22)
The objective of subelement –CK is to provide the structural design support of platforms, walkways, lifting apparatus, test fixtures, and other related hardware to accommodate the successful implementation of the IVGVT. This subelement was administratively closed.

Subelement CL - IVGVT Hydro-Dynamic Stand (HDS) Test Fixture
(WBS 136905.10.30.20.22)
The objective of subelement –CL is to provide structural design support in the creation of a test fixture to verify the function of the HDS. This subelement was administratively closed.

Subelement 02 - ET50 Test Equipment Design and Support
(WBS 814060.08.11)
The objective of subelement –02 is to provide structural design support to ET50 in the creation of test fixtures and equipment for Test Stand 4550.

2.0 Technical Approach (Including required input, guidelines & assumptions)

Required inputs for these designs will be developed as a collaborative effort with other members of the project team. It is assumed that the requirements and design inputs being developed by other members of the project will be available in a timely manner. Access of contractor generated design drawings and models to team members may be required as well as the use of design drawings and models

to compare contractor fabricated parts and assemblies to as-designed versus as-built. Engineering data will be delivered in electronic and/or paper media format as appropriate. It will be the responsibility of the NASA Project Team Lead to create the final report and to provide document control over the deliverables provided by this task.

Evaluation of design concepts and feasibility studies will be accomplished by a combination of the following methods:

- Calculations to verify that the design meets required load, size, and functional constraints.
- Comparisons with any similar designs.
- Discussions with stress, materials and fabrication personnel.
- Creation of, or use of, 3D CAD models to verify part interface requirements.
- Contacts with vendor sources for off-the-shelf solutions.

Guidance on GDT will be accomplished by review of detail drawings generated by ESTS Group or MSFC personnel, creation of suggested tolerance methods for common problems, and meetings with MSFC personnel to discuss specific problems.

Office automation software will be utilized as appropriate to create the associated design documentation and calculations. This software will include but not be limited to Microsoft Office (Word, Excel, and PowerPoint) and MathCAD.

MSFC will schedule all design reviews. The MSFC Initiator and/or MSFC Requestor will be responsible for providing design requirements and schedule milestones.

Design and Fabrication Drawings should adhere to applicable sections of the latest versions of the following MSFC ISO9000 Documents:

- MPR 8060.2, Non-Flight and Non-Facility Design and Development
- MWI 8060.2, Special Equipment Design Branch Support Request (MSFC FORM 4405)
- ET01-STE-001, ET50 Design and Development
- ET01-STE-002, ET50 Design Requirements
- ET01-STE-003, ET50 Control of Quality Records
- ET01-STE-004, ET50 Drawing Standards

3.0 Discussion of Skills Required

Design Engineers supporting this task must be well-versed in standard engineering practices, familiar with current steel and aluminum design and welding codes and techniques (including welded and bolted connections), knowledgeable about industry-standards, vendor-supplied structural and mechanical components (such as structural steel and aluminum shapes, steel fasteners, linear and rotational bearings, hydraulic cylinders, screw jacks, hoisting equipment, etc.), and proficient in producing models and detailed drawings using Pro/Engineer CAD software.

4.0 Special Tools Required

Hardware capable of efficiently running Pro/Engineer CAD software, FEMAP, PATRAN, NX/NASTRAN, etc. will be provided as necessary by ET50.

5.0 Participating Subcontractors

None.

6.0 Milestones & Deliverables

Monthly Activity Reports (MARs) will be available via the on-line (b)(4)
Specific design activities are chosen by the project team according to the immediate need for a particular test to be conducted. Therefore, specific milestones are not set by the project team. Deliverables for this task include fabrication drawings and other reports, presentations, and/or status updates as required. The fabrication drawings will be provided in accordance with the project team's priorities and in-situ development of requirements and are to be released prudently throughout the duration of each design activity. Solid Models, and the detailed drawings produced from these models, will be generated using Pro/Engineer and stored on the MSFC/ET50 server which is maintained by the Task Initiator.

7.0 Special Considerations (Recruiting, Special Equipment / Material, Safety, etc.)

One or more on-site visits to a part or fabrication vendors could become necessary during the execution of this task. Software and/or computer aided design (CAD) training could also be needed for the execution of this task.

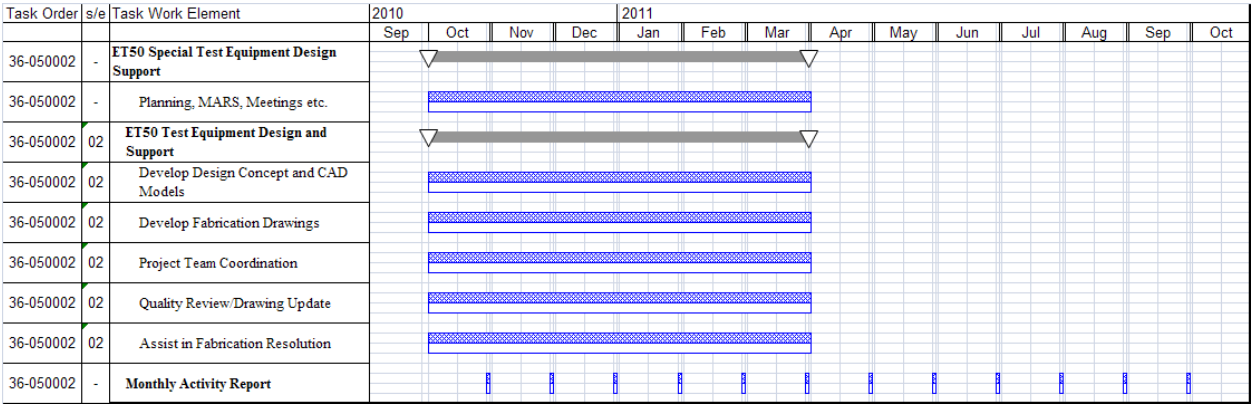
8.0 Work Shelf

The following activities could be accomplished as part of the Task Order performance by personnel that are temporarily available due to program or funding delays on other Tasks. Specific assignments will be coordinated with the Task Initiator to ensure appropriate skills and experience.

TO/Subelement	Description	Due Date	Skill

9.0 Schedule

The project team's milestones are reflected in the monthly activity report (MAR) after each specific design activity is assigned.



ESTS Contract Task Order Request Performance Plan

Task Order Title: ET50 Special Test Equipment Design Support

Task Order Number: 36-050002 Revision: 09

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X 65% =
a) Demonstration of technical aptitude (examples: task planning; concept viability; deliverable output in the form of concepts, drawings, reports; etc.). b) Adherence to applicable Branch and Center ISO requirements or other regulating documentation. c) Professionalism in liaison activities with customer and manufacturing organizations (examples: timely resolution to problems or conflicts in design, stress, manufacturing, etc.; representation of Special Test Equipment Design Branch interests at meetings; etc.). d) Clear and factual presentation of technical reports (written and oral).		**Justification**
Schedule Objectives (Milestones)	**Weighting Schedule %** 10% *(min 10%)*	**Schedule Score** X 10% = **Justification**
a) To provide all necessary output deliverables (in the form of concepts, drawings, reports, etc.) within the time frame negotiated with the customer at the start of each task. Schedule slips due to uncontrollable circumstances (examples: time required for stress or other external review cycles; changing or missing design requirements; etc.) will not be factored negatively in assessing schedule objectives.		
Cost (actual vs. negotiated)	**Weighting Cost%** 25% *(min.25%)*	**Cost Score** X 25% = **Justification**
	Weighting Total %	**Total Score**

ESTS Contract Task Order Request Performance Plan

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100.00%

Technical, Schedule, and Cost Grading Scale

Score	Description
9.0-10.0	Exceeded TO Performance Plan objectives resulting in major benefit(s)
8.0-8.9	Exceeded TO Performance Plan objectives resulting in modest benefit(s)
7.0-7.9	Met TO Performance Plan objectives
3.0-6.9	Did not meet all TO Performance Plan objectives resulting in minimal impact or requiring additional agency funds
0.0-2.9	Did not meet TO Performance Plan objectives resulting in substantial impact and/or requiring additional agency funds

ESTS Contract Task Order Request Performance Plan

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Comments:

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Risk Assessment

Contract Number: *NNM05AB50C*
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TO Number: *36-050002* **Revision:** *09*

Period of Performance: *10/02/2010* to *03/31/2011*

MSFC Initiator: *Scott McCluney*

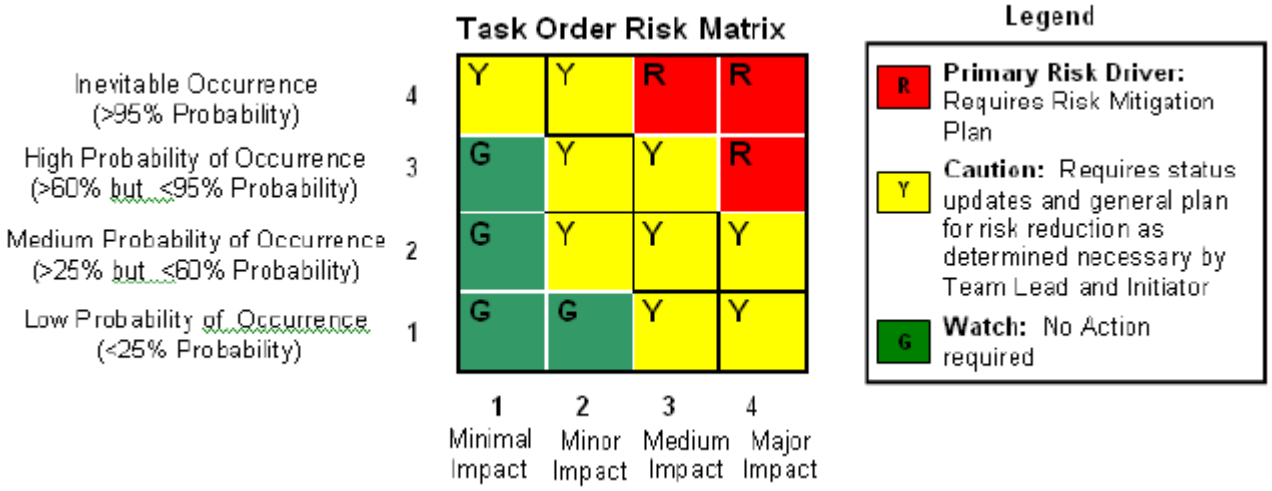
(b)(4)

Task Order Risk Assessment to Cost, Technical, and Schedule

List identified risk associated with Task Order performance as related to task cost, technical, and schedule. Classify the risk(s) according to probability of occurrence and impact as defined below and enter the risk into risk matrix.

Risk	Risk Type	Probability (1-4)	Impact (1-4)	Risk Description
Risk C1	Cost			
Risk C2	Cost			
Risk T1	Technical			
Risk T2	Technical			
Risk S1	Schedule			
Risk S2	Schedule			

*Note: See page 2 for risk mitigation plan for those risks which are Primary Risk Drivers.



Impact Level	Cost Impact Definition	Technical Impact Definition	Schedule Impact Definition
(1) Minimal Impact	No significant cost impact	No significant technical impact	No significant schedule impact
(2) Minor Impact	Potential to recover cost	Potential to gain required technology without impact	Minor delay in deliverables but no impact to customer
(3) Medium Impact	>0 but <10% subtask cost overrun	Some technical impact but potential to recover	Delay in subtask deliverables but work arounds available and acceptable to customer
(4) Major Impact	>10% subtask cost overrun	Unable to meet technical requirements to perform subtask	Delay in subtask deliverables with impact to customer

Risk Mitigation Plan

Complete the following chart for those risks identified on page 1 as “Primary Risk Drivers”. The following chart will serve as the Risk Mitigation Plan.

Risk No.: Risk Description:		
Mitigation Step No.	Planned Completion Date	Mitigation Step Description