Marshall Space Flight Center
Engineering, Science & Technical Services

JACOBS
ESTS Group

Task Order Plan (TOP)

Contract Number: *NNM05AB50C*
TO Title: *WRS/UPA Design Support*
TO Number: *37-020103* **Revision:** *10*

Period of Performance: *10/02/2010* to *9/30/2011*

MSFC Initiator: *Andre Miller*

(b)(4) [redacted]

Emergency: *No*

Revision -10: The purpose of this revision is to extend this task into Contract Year 6 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period October 2, 2010 through September 30, 2011. Additionally, the Schedule, Performance Plan and Risk Assessment have been revised to reflect changes in task activities for the new period of performance. This revision affects the ECLSS Program.

The subelements have been renumbered to conform to the project/program naming convention that has been established for FY11.

Sub-element Mapping and WBS funding

Subelement	Previous Subelement	WBS	Program
JA	00	401769.06.03.03.02.07	ISS
JB	02	401769.06.08.02.04.05	ISS

Revision -09: The purpose of this revision is to adjust estimate based on changes in scope and requirements.

1. Subelement -00: An estimate of (b)(4) hours was added due to an increase in scope to provide design support for the revision of the ECLSS Rack models and drawings (included in Item l. of the Task Order Objectives) and to support the Distillation Assembly failure investigation and subsequent redesign. The (b)(4) hours include a decrease in (b)(4) and an (b)(4) [redacted] (b)(4) [redacted] to obtain the required skills for the new tasking. In addition, the Performance Plan, and the schedule has been updated to reflect the increase in scope.
2. Subelement -02: An estimate of (b)(4) hours was added to due to an increase in support for the manufacture of UPA mechanical ORUs. The (b)(4) hours include a decrease in (b)(4) and an (b)(4) [redacted] hours to obtain the required skills for the new tasking.

This revision affects the ECLSS Program.

Revision -08: The purpose of this revision is to adjust estimate based on changes in scope and requirements.

1. Subelement -00: A travel estimate of (b)(4) was added due to a new requirement to support the STS-130 Bench Review at KSC.
2. (b)(4) hours were shifted from Subelement -02 to Subelement -00 to support the ongoing failure investigation of the DA.
3. (b)(4) originally estimated at the (b)(4) (b)(4) due to a reduction in task requirements.
4. The estimate for (b)(4) for the previously mentioned new employees has been reduced from (b)(4) on Subelement -00 and from (b)(4) to (b)(4) on Subelement -02.

This revision affects the ECLSS Program.

Revision -07: The purpose of this revision is to add hours due to increased support to the UPA Spares Program. The following changes have been made to the task order hours: (b)(4) hours have been added to Subelement -00 and (b)(4) ours have been added to Subelement -02. Additionally, an estimate of (b)(4) has been added to Subelement -00 and an estimate of has been added to Subelement -02. This revision affects the ECLSS Program.

Revision -06: The purpose of this revision is to extend this task into Contract Year 5 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period October 03, 2009 through October 14, 2010. This revision closes Subelement -01. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance. This revision affects the ECLSS Program.

Revision -05: The purpose of this revision is to add hours due to increased support to the contingency hardware. The following change has been made to the task order hours: (b)(4) hours have been added to Subelement -00. In addition, the schedule has been updated accordingly. This revision affects the ECLSS Program.

Revision -04: The purpose of this revision is to adjust hours to reflect changes in the scope of work. The following changes have been made to the task order hours: (b)(4) hours have been added to Subelement -00 and (b)(4) hours have been added to Subelement -02. Additionally, an estimate of (b)(4) (b)(4) for travel has been added to Subelement -00. This revision affects the ECLSS Program.

Revision -03: The purpose of this revision is to adjust hours to reflect changes in the scope of work. The following changes have been made to the task order hours: (b)(4) hours have been added to Subelement -00, (b)(4) hours have been removed from Subelement -01, (b)(4) hours have been removed from Subelement -02. Travel money has been added to Subelement -01 in the amount of (b)(4) was removed from Subelement -02. Additionally the MSFC initiator was updated to reflect ES21 personnel changes. This revision affects the ECLSS Program.

Revision -02: The purpose of this revision is to extend this task 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. Also, Subelement 02, 2010 Spares Program Design Support, has been added to reflect a new scope of work to support the new spare hardware initiative. The MSFC Initiator was updated to reflect ES21 personnel changes. This revision affects the ECLSS Program.

Revision -01: The purpose of this revision is to adjust the objectives and the manpower for Subelement -00, Sustaining Engineering Support and Subelement -01, Spares Program Design Support. (b)(4) hours were added to Subelement -00 due to increased scope involving the design of new hardware. (b)(4) hours were added to Subelement -01 due to adjustments in the project schedule. In addition, the Task Order Description and Objectives as well as the schedule and Risk Assessment have been updated.

Revision -00: This Task Order (TO) is a continuation of work being performed on TOs 31-010103 and 31-010201 of the NNM05AB50C ESTS contract. This TO realigns work performed previously in EI11 and EI12, and now supports ES21 within the new ED organizational structure. This TO defines and estimates work for the period 1 March 2008 through 26 September 2008. TOs 31-010103 and 31-010201 will be revised for closure in March with an effective date of 29 February 2008.

1.0 Task Order Description & Objectives

Engineering support is required for the International Space Station (ISS) Environmental Control and Life Support System (ECLSS). The effort specifically supports the Urine Processor Assembly (UPA) and the integration efforts of the UPA into the Water Recovery System (WRS). Sustaining Engineering support will be provided for the first flight Orbital Replacement Units (ORUs) and the integration of WRS Rack 2. The ORU being supported is Distillation Assembly (DA) with ancillary support for the remainder of the UPA mechanical ORUs. Engineering support will be provided for the Baseline Spares Program and the STaR Spares Program for the ORUs noted above.

The specific objectives are as follows;

Subelement -JA, Sustaining Engineering Support

a. Provide technical support for the DA at the ORU and system level. Generate Engineering Orders (EOs), maintain Pro-ENGINEER (Pro-E) CAD model, and assist in trouble-shooting as needed. Support the close-out of build and quality assurance documents, including the development of deviations and waivers as required.
b. Provide technical support for quick disconnects (QDs) and flex line assemblies required to build the WRS.
c. Update the UPA Mechanical Fluid Schematic, if required.
d. Provide engineering support to ensure that the designed ORUs and system interfaces meet requirements applying to; safety, reliability, performance, test requirements, and interface agreements.
e. Support soft stowage coordination efforts for the launch of the DA.
f. Provide sustaining engineering support for the WRS Rack 2, FCPA, PCPA, RFTA, SPA and DA prior to and after launch.
g. Provide design support for contingency hardware to recover from microbial upset. Provide engineering support for the design and testing of Microbial Check Valve (MCV) and pump assemblies. Provide design support and integration for flex line assemblies, which interface with MCV, Contingency Water Container (CWC), and WRS Rack 1.
h. Provide design support for UPA flex line assemblies to bypass the RFTA, SPA, and WSTA.
i. Provide technical support for the investigation of the failure of the DA during WRS startup.
j. Provide technical support for the rebuild of the flight DA and provide design support for configuration changes identified as a result of the failure investigation.
k. Provide technical and integration support for the redesign of the RFTA at the ORU and system level. Support the hardware development by collaborating with the vendor and providing technical oversight for system integration.
l. Provide sustaining engineering support for the WRS Racks 1 and 2 as well as the OGS Rack 3. This support includes the update of CAD models for all Racks as well as the update of all drawings associated with these Racks.

Subelement -01, Baseline Spares Program Design Support (Closed Per Revision -06)
This subelement provided technical support for the manufacturing, assembly and testing of a spare DA. Efforts included to ORU level functional and environmental testing, Material Review Boards, fabrication and assembly, and verification closeout activity.

Subelement -JB, 2010 Spares Program Design Support

a. Provide technical support for the manufacturing, assembly and testing of UPA mechanical ORUs and kits. Support ORU level functional and environmental testing. Participate in Ma-

terial Review Boards and provide technical support for fabrication and assembly. Review test procedures. Generate Engineering Orders and assist in trouble shooting as required.

b. Incorporate outstanding EOs into drawing revisions for the major subassemblies.
c. Support verification closeout activity and development of deviation and waivers as needed.
d. Provide technical support for the procurement of spare QDs, flex lines.
e. Develop a DA assembly procedure as schedule and resources permit.
f. Provide design inputs in support of the 2010 spares plan.

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

2.1 Input

ESTS Group task members will gather inputs from project team meetings, review of ECLSS Project reports, test plans and specifications, and from email and phone contact with NASA project team members. Required inputs include:

a. Geometric and environmental interface constraints
b. Operational requirements
c. Review comments to data packages
d. Materials and process recommendations
e. Test results and/or recommendations
f. Analytical evaluations requiring skills outside the scope of design services such as; stress, vibration/acoustic performance, and thermal performance

2.2 Assumptions

Subelement -JA

a. Review of vendor supplied products is not included nor is support for test, integration, and system level verification.
b. Support required for technical issues at the project level are commensurate with the funding provided.

Subelement -JB

a. No major re-design efforts are included in the estimate. A limited number of record EOs are to be generated.
b. Support required for technical issues at the project level are commensurate with the funding provided.

2.3 Guidelines

Design deliverables prepared under this task will consist of drawings, Engineering Parts Lists (EPLs), schematics, Engineering Orders (EOs), and Engineering Change Requests (ECRs). Geometric dimensioning and tolerance for all drawings will be prepared in accordance with MSFC-STD-555B. Format for all non-geometric aspects of drawings will be per latest revision of MSFC-STD-555. Flight hardware drawings will be produced using Pro-E CAD software. Microsoft Word will be used to create and edit forms consistent with standard MSFC formats for EOs when the Informed forms do not allow addition of graphic detail.

2.4 Other categories of Technical Support

a. Provide the project personnel with progress status and inputs regarding significant technical issues.
b. Provide a technical interface with component vendors during design identified in Subelements JA, and JB.
c. Provide inputs to project design reports such as; Mass properties, and Materials in Usage Lists (MIULs).
d. Provide mechanical design input to project team members responsible for test and verification planning.
e. Support MSFC in-house assembly and test operations for fluid component hardware described in Subelement JA and JB.

3.0 Discussion of Skills Required

Engineers with mechanical design experience and/or fluid flow systems and fluid component design will provide technical support for this task. Engineers and paraprofessionals acting under the supervision of an engineer, will prepare design data packages. Designers must have experience with design of multi-part assemblies using Pro-Engineer computer aided design (CAD) software.

4.0 Special Tools Required

Pro Engineer CAD must be used for the creation of models and drawings. Computers allocated to the CAD operators on this task shall be the SE2E configuration.

5.0 Participating Subcontractors

None.

6.0 Milestones & Deliverables

Monthly Activity Reports will be prepared and submitted at the end of each month. Presentations and/or status updates will be provided as needed. Documentation and hardware evaluations to support manufacturing and assembly will be submitted in a timely manner. Engineering and design support to be provided to meet the current project priorities and schedule.

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

Travel estimate to KSC has been added to Subelement -JA and Subelement -JB to provide technical assessment of launch configuration of the spare DA.

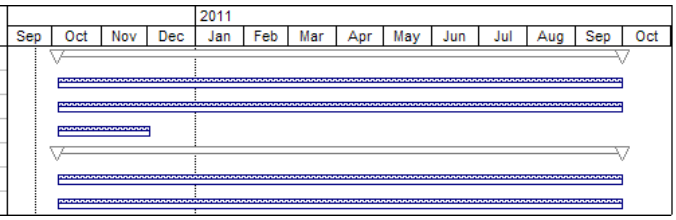
8.0 Work Shelf

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

Task Order #	SubElement	Task Work Element
37-020103	**JA**	**Subelement -00 Sustaining Engineering Support**
37-020103	JA	Sustaining Engineering Support
37-020103	JA	Support Contingency Hardware Design
37-020103	JA	Support Rack Model Updates
37-020103	**JB**	**Subelement -02 2010 Spares Program Design Support**
37-020103	JB	Support Fab/Assy/Test of spare ORUs
37-020103	JB	Fluid Component Technical Support



ESTS Contract Task Order Request Performance Plan

Task Order Title: WRS/UPA Design Support

Task Order Number: 37-020103 Revision: 10

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X 65% =
		Justification
(a) Sustaining Engineering in preparation for launch of spare ORUs. (b) Support manufacturing, assembly and testing of spares. (c) Support procurement of QDs, Flex Lines and check/relief valves, etc. (d) Support design of WRS Contingency Hardware. (e) Support failure investigation of flight DA (f) Support refurbishment of flight DA (g) Support Rack model updates		
	Weighting Schedule %	**Schedule Score**
Schedule Objectives (Milestones)	10% *(min 10%)*	X 10% =
		Justification
(a) Support manufacturing with timely documentation submittals and hardware evaluations. (b) Support spare ORU testing with timely procedure review and anomaly investigation support. (c) Submit Monthly Activity Reports with significant accomplishments recorded. (d) Support design of WRS Contingency Hardware. (e) Support refurbishment of flight DA (f) Support redesign of RFTA		
	Weighting Cost%	**Cost Score**
Cost (actual vs. negotiated)	25% *(min.25%)*	X 25% =
		Justification
	Weighting Total %	**Total Score**
	100.00%	

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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

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Comments:

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Risk Assessment

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(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	2	1	Estimated hours are based on preliminary values supplied by the customer. Actual estimates are subject to change pending budget approvals.
Risk T1	Technical	2	1	Loss of personnel involved in original design resulting in loss of information on design approach and reasoning.
Risk S1	Schedule	2	2	Task personnel may not be available to support unplanned issues or changing project priorities due to commitments to other tasks or medical leave.

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

Task Order Risk Matrix

		1 Minimal Impact	2 Minor Impact	3 Medium Impact	4 Major Impact
Inevitable Occurrence (>95% Probability)	4	Y	Y	R	R
High Probability of Occurrence (>60% but <95% Probability)	3	G	Y	Y	R
Medium Probability of Occurrence (>25% but <60% Probability)	2	G	Y	Y	Y
Low Probability of Occurrence (<25% Probability)	1	G	G	Y	Y

Legend

- R — **Primary Risk Driver:** Requires Risk Mitigation Plan
- Y — **Caution:** Requires status updates and general plan for risk reduction as determined necessary by Team Lead and Initiator
- G — **Watch:** No Action required

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