

Task Order Plan (TOP)

Contract Number: NNM05AB50C
TO Title: ECLSS Structural Analysis
TO Number: 37-020208 **Revision:** 10

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

MSFC Initiator: Doug Fox

(b)(4)

Emergency: No

Revision -10

The purpose of this revision, -10, is to add subelement -JB in response to the new scope for sustaining engineering structural analysis support requested by the customer. The labor estimate for subelement -JB is (b)(4) hours.

This revision affects the program listed in the table below:

New Subelement	Previous FY10 Subelement	WBS	Program
JA	00	401769.06.08.02.04.05	ISS
JB	N/A	401769.06.03.03.02.07	ISS

Revision -09

The purpose of this revision, -09, 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 Scope, Schedule, Performance Plan and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.

The subelement has been renamed to conform to the project/program naming convention that has been established for FY11.

Revision -08

The purpose of this revision, -08, is to update the estimates for the additional customer requested engineering support starting in January 2010. The updates include a labor category change from an (b)(4) (b)(4) and a decrease in the labor estimate by (b)(4) hours. In addition the other estimate was decreased by (b)(4). The labor category was decreased because an individual was found that had the proper mixture of skills but with fewer years of experience than initially expected.

Revision -07

The purpose of this revision, -07, is to increase the labor estimate by (b)(4) hours and the other estimate by (b)(4). The customer requested additional engineering support due to the expanded scope of the task for the foreseeable future.

Revision -06

The purpose of this revision, -06, is to extend this task into Contract Year 5 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period October 3, 2009 through October 14, 2010. 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 following science project:

- Environmental Control Life Support System (ECLSS), subelement -00.

Revision -05

The purpose of this Task Order (TO) revision, -05, is to decrease the hourly estimate by (b) hours due to changing customer requirements. No other changes were made in this revision.

Revision -04

The purpose of this Task Order (TO) revision, -04, is to adjust the hourly estimate. More senior staff (b)(4) than originally planned were used in the ISS Distillation Assembly Anomaly/Failure Investigation, which required the conversion of (b)(4). In addition, (b)(4) (b)(4) and a travel estimate of (b)(4) were deleted due to a previously planned ECLSS Spares Technical Interchange Meeting being cancelled. The material estimate of (b)(4) which was originally included to cover miscellaneous material expenses, was identified as no longer being necessary and was removed. No other changes were made in this revision.

Revision -03

The purpose of this Task Order (TO) revision, -03, is to increase the hourly estimate by (b)(4) hours to cover work that was not anticipated and increase the level of effort to a (b)(4) for the current period of performance. Travel estimate of (b)(4) was added for an ECLSS Spares Technical Interchange Meeting. No other changes were made in this revision.

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. This revision affects the following Science programs(s) or Project(s):

- International Space Station (ISS) Environmental Control and Life Support System (ECLSS)

Revision -01

This Task Order (TO) revision, -01, decreased the ODC material estimated from (b)(4). No other changes were made in this revision.

Revision -00

This Task Order (TO) is a continuation of work being performed on TO 31-010307-00 of the NNM05AB50C ESTS contract. This TO realigns work performed previously in E113, and now supports

ES22 within the new ED organizational structure. This TO defines and estimates work for the period 1 March 2008 through 26 September 2008. For Subcontracted efforts, this TO shall authorize work for the same period. TO 31-010307-00 will be revised for closure in March with an effective date of 29 February 2008.

1.0 Task Order Description & Objectives

This Task Order provides structural, dynamic, and thermal analysis support for resolving design, manufacturing, testing, and refurbishment issues of the International Space Station (ISS) Environmental Control and Life Support System (ECLSS) hardware. The two portions of the ECLSS hardware considered Government Furnished Equipment (GFE) are the primary focus of this task. The first portion is the Water Recovery System (WRS). The second portion is the Oxygen Generation System (OGS).

The WRS comprises the Urine Processor Assembly (UPA) GFE equipment and the Water Processor Assembly (WPA) contractor-provided equipment. The UPA and WPA have been designed, manufactured, and structurally verified. Baseline Spares and Sustaining (STaR) ECLSS Orbital Replacement Units (ORUs) will be launched on the space shuttle or on other launch vehicles (such as the Russian Progress vehicle, etc.). ECLSS GFE contingency hardware (pumps, bypass manifolds, etc.) is also being designed and manufactured to handle on-orbit contingencies. The primary focus of this task will be structural, dynamic, and thermal analysis support for the launch, return to earth, and refurbishment of Baseline Spares Program and the STaR Spares Program UPA ORUs as well as for the design, testing, and verification of ECLSS contingency hardware. In addition, sustaining engineering support will be provided for the integration of WRS Rack 2.

Stress, dynamic, thermal, and fracture analysis support covers primary and secondary structural components, as well as pressurized lines and fittings, rotating components, rack interfaces, and fastening systems. Analysis will consider stress, deflection, buckling, fracture, fatigue and other appropriate structural performance or material failure mechanisms. Analytical support will also be provided for the design and verification of Ground Support Equipment (GSE), ECLSS contingency hardware, and special tools as required. In addition, analysis provided by the WPA contractor and the ISS rack integration contractor will be reviewed as needed for requirements compliance.

The OGS comprises the Oxygen Generation Assembly (OGA) contractor-provided equipment and the Power Supply Module (PSM) GFE equipment. The OGS has been launched to the International Space Station. No additional work is anticipated other than problem resolution as required.

The engineering support is delineated in two subelements:

Subelement, -JA, Spares ECLSS Structural, Dynamic, and Thermal Support
Subelement, -JB, Sustaining ECLSS Structural, Dynamic, and Thermal Support

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

The ESTS Group will support the manufacture, test, and refurbishment of ECLSS functional assemblies and secondary structures by performing structural analyses as needed to verify that design requirements are met and to support resolution of design, manufacturing, refurbishment, or testing issues. These analyses will include the determination of structural stresses and deflections, characterization of thermal responses based on development of thermal mathematical models, and dynamic responses. Analytical assessment will also include verification that deflection, fracture, fatigue, dynamic response, thermal response, and other failure mode requirements have been satisfied. The MSFC Task Order Initiator will coordinate specific ESTS Group assignments with the Task Order Lead.

3.0 Discussion of Skills Required

This task order will require personnel with experience in structural, thermal, and dynamic loads analysis. In particular, the personnel must be familiar with structural analysis of space flight hardware, standard methods of modal analysis, frequency response analysis, random vibration analysis for linear, damped structures, and have experience in thermal design and heat transfer.

4.0 Special Tools Required

MathCAD, FEMAP, MSC PATRAN, MATLAB, Thermal Desktop, SINDA/FLUINT, and NX/NASTRAN Software.

5.0 Participating Subcontractors

None

6.0 Milestones & Deliverables

Analytical support will be required for the planning and design of ECLSS spares and STaRs launch configurations on vehicles other than the space shuttle after the shuttle is retired in 2010. Potential alternative vehicles include the Russian Progress vehicle. Schedules have not been developed as of yet for launch of ECLSS spares and STaRs after 2010. Engineering support to be provided to meet the current project priorities and schedule. Monthly Activity Reports (MARs) will summarize analysis reports, meeting support, presentation inputs, etc., which will be delivered as required.

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

Other estimate was included to cover engineering recruiting cost, which can include relocation, advertising, and interview travel expenses.

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

ID	Charge #	SubElement	Task Work Element	2011											
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	37-020208-JA	JA	ECLSS Spares Structural, Dynamic, and Thermal Analysis Support	[Gantt bar spanning Oct to Sep]											
2	37-020208-JB	JB	ECLSS Sustaining Structural, Dynamic, and Thermal Analysis Support	[Gantt bar spanning Oct to Sep]											

ESTS Contract Task Order Request Performance Plan

Task Order Title: [ECLSS Structural Analysis](#)

Task Order Number: [37-020208](#) Revision: 10

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X <u>65%</u> = Justification
<p>Provide structural, thermal, and dynamic analysis support for UPA design, manufacture, and testing issues as required.</p> <p>Provide structural, thermal, and dynamic analysis support analysis support for manufacture, testing, refurbishment, and launch of UPA spare ORUs, and ECLSS contingency hardware as required.</p> <p>Analysis provided by UPA or WPA contractors will be reviewed as needed for requirements compliance.</p>		
Schedule Objectives (Milestones)	Weighting Schedule % <u>10%</u> (min 10%)	Schedule Score X <u>10%</u> = Justification
<p>Provide structural, dynamic, and thermal analyses in a timely manner to support Project Milestones.</p>		
<u>Cost (actual vs. negotiated)</u>	Weighting Cost% <u>25%</u> (min.25%)	Cost Score X <u>25%</u> = Justification
	Weighting Total % 100.00%	Total Score

ESTS Contract Task Order Request Performance Plan

Task Order Title: [ECLSS Structural Analysis](#)

Task Order Number: [37-020208](#) Revision: [10](#)

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

Task Order Number: [ECLSS Structural Analysis](#)

Task Order Number: [37-020208](#) Revision: [10](#)

Comments:

Risk Assessment

Contract Number: NNM05AB50C
TO Title: ECLSS Structural Analysis
TO Number: 37-020208 **Revision:** 10

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

MSFC Initiator: Doug Fox

(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.



