

**Task Order Plan (TOP)**

**Contract Number:** NNM05AB50C  
**TO Title:** Constellation Support to Space Systems  
**TO Number:** 37-000002 **Revision:** 00

**Period of Performance:** 10/02/2010 to 09/30/2011

**MSFC Initiator:** Scott Moore (Task Initiator)

(b)(4)

**Emergency:** No

<u>Subelement #</u>	<u>Subelement Title</u>	<u>Old Subelement #</u>	<u>Subelement Lead</u>
37-000002-CA	ES13 Ares I US Systems Engineering Support	37-000001-CA	(b)(4)
37-000002-CB	ES13 Ares I VI Systems Engineering Support	37-000001-CB	
37-000002-CC	ES21 Ares I US Design Support	37-000001-CC	
37-000002-CD	ES22 Ares I US Analysis Support	37-000001-CD	
37-000002-CE	ES22 Ares I FITO Analysis Support	37-000001-CE	
37-000002-CF	ES31 Ares I FS Imaging Support	37-000001-CF	
37-000002-CG	ES32 Ares I US Avionics Support	37-000001-CG	
37-000002-CH	ES42 Ares I US Technical Support	37-000001-CH	
37-000002-CI	ES42 Ares I VI Technical Support	37-000001-CI	
37-000002-CJ	ES42 Ares I J2X Technical Support	37-000001-CJ	
37-000002-CK	ES43 Ares I J2X Technical Support	37-000001-CK	
37-000002-CL	ES51 Ares I VI Flight Software Systems Engineering Support	37-000001-CL	
37-000002-CM	ES51 Ares I J2X Software Insight Support	37-000001-CM	
37-000002-CN	ES52 Ares I VI Flight Software Development Support	37-000001-CN	
37-000002-CO	ES52 Ares I VI ICD Support	37-000001-CO	
37-000002-CP	ES53 Ares I VI SIL Support	37-000001-CP	

**1.0 Task Order Description & Objectives**

This task order is a continuation of the work performed on Task Order 37-000001, which has been closed in order to capture all costs incurred thru October 1, 2010. This work is being funded under WBS # 136905.01.01.08.11.

This task order provides engineering and technical support to the MSFC Space Systems Department (ES) for Constellation with current support only provided to the Ares I project. Support is provided through the documented subelements, which are established by Branch, and then by the Ares I element being supported.

The general objective of this task is to provide Analysis, Mechanical and Software Design Services, Systems Engineering, Fabrication and Test support to the Space Systems Department in support of MSFC in-house Constellation products, insight/oversight of vendor provided products, as well as tool and process development used to create or manage products. Systems supported include ground systems, flight test systems, and manned flight systems.

Analysis support will include systems, subsystems, components, and detail hardware performance and address: thermodynamics; stress; dynamics; Electromagnetic Environmental Effects (E3), and Electrical, Electronic and Electromechanical (EEE) Parts application.

Mechanical Design Services support will include the development of flight and ground system, subsystem, component, assembly, and piece part 3 dimensional and 2 dimensional Computer Aided Design models and drawings. Support is also provided to electrical system design and imaging.

Software Design Services support will include the development of requirements, design and code to support ground simulation, ground systems, and flight systems.

Systems Engineering will include support for the planning, design, development, analysis, review, test, characterization, requirement and verification definition and flow down, evaluation of design features and proposed design changes, development and evaluation of system, element and component level test plans, development and evaluation of system, element and component level specifications, hardware integration, anomaly resolution, trade studies, and insight/oversight.

Fabrication support will be provided for non-critical hardware, components, assemblies, subsystems, and systems in support of test and development activities.

Test support will be provided for test planning and procedures development, test system development, integration and checkout, test conduct, test system maintenance, and post test system disposition.

#### **-CA, ES13 Ares I Upper Stage (US) Systems Engineering Support**

This subelement provides systems engineering support to the Systems Engineering Branch (ES13) for the US. Typical work will include, but not be limited to the following:

- Serving as book manager for the US Avionics & Software Subsystem Specification (ASSS, AS3).
- Participation in review sessions, avionics team and project team meetings, teleconferences, Working Groups, and Technical Interchange Meetings (TIMs) as needed or required.

#### **-CB, ES13 Ares I Vehicle Integration (VI) Systems Engineering Support**

This subelement provides systems engineering support to the Systems Engineering Branch (ES13) for Vehicle Integration. The objectives of this subelement include, but not limited to, provide senior level support to the Instrumentation Program and Command List (IP&CL) and continue development of the Integrated Measurement and Command System (IMACS) Database. This support will include, but not be limited to:

- IP&CL requirements definition.
- IP&CL Data Specification document (CxP 72264) and user documentation
- Interfacing with Level II working groups for IP&CL definition and products.
- IP&CL data collection, analysis, loading into the database and validation.
- IP&CL database design, definition, and development.
- Automated tools for data validation, bus loading, and report generation as resources permit.

- Database administration.
- Database configuration management.
- IMACS Database Design Document delivery.
- Production/product development IP&CL products/reports.
- Participation in ICD reviews and synchronization of IPCL data with ICD content.

#### **-CC, ES21 Ares I US Design Support**

This subelement provides mechanical design support to the Structural and Mechanical Design Branch (ES21) for the US. Design support is provided for the US and Ground Support Equipment (GSE). The objectives of this subelement include, but are not limited to, provide engineering support for the mechanical design and layout/integration of US elements and US GSE; provide modeling and drawing support; provide engineering support for the evaluation/incorporation of requirements and associated verification planning; support coordination/planning efforts with the project, and provide insight support for vendor mechanical design, fabrication, test and verification activities.

#### **-CD, ES22 Ares I US Analysis Support**

This subelement provides analysis support to the Thermal and Mechanical Analysis Branch (ES22) for thermal, stress and dynamics analysis of the US, GSE, tooling and Special Test Equipment (STE). The objectives of this subelement include, but are not limited to, providing mechanical analysis support for the design of systems, subsystems and components within the US and GSE; provide engineering support for the evaluation/incorporation of requirements and associated verification planning; support coordination/planning efforts with the project, and provide insight/oversight support for vendor mechanical design and analyses.

#### **-CE, ES22 Ares I Flight and Integrated Test Office (FITO) Analysis Support**

This subelement provides analysis support to ES22 for the FITO for the structural assessment of ground and flight test articles and facilities. Current objectives include, but are not limited to analysis of Integrated Vehicle Ground Vibration Test (IVGVT) structures and support for the special test equipment associated with the 5% Ares 1 Scale Model Acoustic Test (ASMAT).

#### **-CF, ES31 Ares I First Stage (FS) Imaging Support**

This subelement provides technical support to the Sensors, Imaging and Optics Branch (ES31) for the First Stage activities. Objectives for this subelement include, but are not limited to, investigations of advanced imaging systems and the design, development, and test of video and imaging systems for the First Stage element of Ares I.

#### **-CG, ES32 Ares I US Avionics Support**

This subelement provides avionics systems engineering support to the Controls and Signal Conditioning Branch (ES32) for the Ares I Upper Stage. Objectives for this subelement include, but are not limited to, the design of the Reaction Control System (RCS) electronics for the Ares I Guidance, Navigation and Control (GN&C) Systems by developing specifications at the system, subsystem, end item and component levels. Electrical design expertise will be provided to develop electronics to control valves and heaters and acquire sensor data for the RSC and for the Main Propellant System (MPS). Support will include a release of the Combined Control System Electronics (CCSE) specification.

#### **-CH, ES42 Ares I US Technical Support**

This subelement provides Electromagnetic Environmental Effects (E3) and electrical integration engineering support to the E3 & Electrical Integration Branch (ES42) for the Ares I Upper Stage.

The E3 function includes the following electromagnetic compatibility (EMC) and electromagnetic interference (EMI) discipline areas:

- Electrical bonding
- Grounding

- Wire routing
- Lightning protection
- Electrostatic discharge analysis and mitigation
- EMI test services
- Computational electromagnetics

Activities in these discipline areas include requirements development and implementation, EMC/EMI analysis, and design and test support.

The avionics engineering support will include, but not be limited to the following:

- Electrical integration and interfaces, power distribution, grounding and Electrical Ground Support Equipment (EGSE).
- Inputs on, and review of, subsystem concepts, trade studies, team reports, and presentations.
- System and subsystem engineering support will be provided in design, development and test support.
- Wire harness design, development and analysis will be provided for in-house hardware.
- Attendance at review sessions, avionics team and project team meetings, teleconferences, and TIMs.
- Review contractor developed drawings and documentation, evaluate for satisfaction of requirements, provide comments/change paperwork to the Avionics team.
- Creation, development, and documentation of design and verification requirements and the tracking of those requirements.
- Creation of vehicle level Cable Interconnect Diagrams, various System Schematics, and other drawings as required.
- Serve as the primary avionics point of contact for various Integrated Product Team (IPT) and design working groups.

#### **-CI, ES42 Ares I VI Technical Support**

This subelement provides E3 and electrical integration engineering support to the NASA MSFC E3 & Electrical Integration Branch (ES42) for the Ares I Vehicle Integration. The E3 function includes the same EMC/EMI discipline areas noted above for subelement –CH. Activities in these discipline areas include requirements development and implementation, EMC/EMI analysis, and design and test support. The avionics engineering support will include, but not be limited to the same noted above in subelement –CH.

#### **-CJ, ES42 Ares I J2X Technical Support**

This subelement provides E3 support described above to ES42 for the Ares I Upper Stage J-2X engine. Activities in these discipline areas include requirements development and implementation, EMC/EMI analysis, and design and test support.

#### **-CK, ES43 Ares I J2X Technical Support**

This subelement provides Electrical, Electronic and Electromechanical (EEE) Parts and Advanced Electronic Packaging support to the Parts Packaging and Fabrication Branch (ES43) for the Ares I J-2X engine. The objectives of this subelement include, but are not limited to, provide engineering support for the electrical design to meet J2X EEE parts requirements; provide advanced packaging support to address packaging and workmanship requirements for EEE components used on the J2X program; provide engineering support for the evaluation/incorporation of requirements and associated verification planning; and support coordination/planning efforts with the project.

#### **-CL, ES51 Ares I VI Flight Software Systems Engineering Support**

This subelement provides software systems engineering support to the Software Systems Engineering Branch (ES51) for the Ares I Flight Software. The objectives of this subelement include, but are not limited to, requirements definition, define and perform software tests on Ares I Flight Software, performing software technical assessments on flight software work products (such as project software schedules, software requirements analyses and documentation, software design and coding analyses, methodologies, software configuration and data management, software testing, software processes,

and software inspection data); produce software work products (such as project software schedules, software test documentation and reports, software metric data, software inspection data and other project data as required); perform selected work product evaluations and trade studies; report metrics; supporting software process improvement plans and activities; support software and project reviews, working groups, technical interchange meetings, peer reviews, walkthroughs, and other project meetings

#### **-CM, ES51 Ares I J2X Software Insight Support**

This subelement provides software insight support to ES51 for the Ares I J-2X engine. The objectives of this subelement include, but are not limited to, perform software technical assessments on flight software products (such as project software schedules, methodologies, software requirements analyses and documentation, software design and coding, software configuration and data management, software testing, software processes, and software review and inspection data); evaluate work product and trade studies; report/review metrics; supporting internal and project reviews, working groups, technical interchange meetings (TIMs), peer reviews, walkthroughs, and other project meetings.

#### **-CN, ES52 Ares I VI Flight Software Development Support**

This subelement provides software design and development support to the Flight Software Design Branch (ES52) for the US. Software design support is provided for the development of Flight Computer (FC) software and Command and Telemetry Computer (CTC) software. The objectives of this subelement are to provide software engineering support including, but not limited to the following areas: planning and status reporting, requirements definition, design, code development, integration and test. Also required is the integration of the software on the software development facility hardware and with the SIL hardware and software.

#### **-CO, ES52 Ares I VI Interface Control Document (ICD) Support**

This subelement provides design support to ES52 for Vehicle Integration. Design support will be provided for development of the Interface Control Document (ICD) as well as engineering support for design of the interfaces for the Ares I Flight Software. Also included is engineering support for the evaluation, incorporation and verification of requirements and associated planning; and support coordination/planning efforts with the project.

#### **-CP, ES53 Ares I VI System Integration Laboratory (SIL) Support**

This subelement provides design support to the Avionics and Ground Systems Test Branch (ES53) for Vehicle Integration. Design support will be provided for the System Integration Laboratory automation software development for user interface and scenario file capabilities for ARTEMIS and MAESTRO. The objectives of this subelement are to provide software engineering support to all areas of software development including requirements definition, design, implementation, test, and documentation as well as SIL test support activities including test planning, test setup, test execution, and test documentation.

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

The technical approach for the support provided centers on utilizing skilled and experienced personnel to complete the detailed scope that is based on the general scope within this task order which is further defined thru constant communication and coordination with both branch and project level customers. The approach in general involves defining the requirements, gathering the inputs, developing the products and providing the services, performing technical and quality peer reviews/verification and delivering the product. The products are developed/provided per the ESTS Performance Management System (EPMS) processes and customer ISO procedures/work instructions as tailored for the task in the Product Quality Plan (PQP) thru coordination with the customer. The quality and technical reviews of the products are completed at an internal ESTS/task level and/or as part of the customer/project process. Shown below are generic technical approaches for applicable categories of ESTS products:

Analysis:

1. Attend technical interchange, project planning, design review and other appropriate meetings to maintain a current knowledge base of design, requirements, issues, action items, and resolution activities. Identify issues, pursue resolutions, and provide supporting analyses.
2. Identify customer objective and requirements for analyses.
3. Collect inputs: hardware/software configurations, propellant characteristics, launch / test conditions, launch / test telemetry, thermal fluids properties, and other boundary conditions, etc.
4. Identify analysis methodology, develop tools as needed, create and/or modify modeling algorithms as appropriate.
5. Generate model and model inputs.
6. Perform analyses.
7. Compare results to requirements, historical experience, statistical analyses, and results of other analyses.
8. Update databases as appropriate.
9. Document and deliver results with recommendations.

#### Mechanical/Electrical Design Services:

1. Attend technical interchange, project planning, design review and other appropriate meetings to maintain a current knowledge base of design, requirements, issues, action items, and resolution activities. Identify issues, pursue resolutions, and provide supporting analyses.
2. Assist in the development and/or review of system or component design requirements and objectives.
3. Prepare preliminary schematics, sketches, and descriptive documentation.
4. Perform or review analyses, studies, and evaluations as required for maturing the design concepts.
5. Interface with other disciplines to verify compliance with design requirements and component interfaces and evaluate the designs compliance with thermal, stress, materials, fluid flow, and other design related aspects.
6. Evaluate component specifications and recommend component selection alternatives.
7. Develop detailed models and design drawings using Pro-E CAD.
8. Develop integrated layout drawings and detailed design drawings using Pro-E CAD.
9. Document and deliver results with recommendations.

#### Software Design Services:

1. Attend technical interchange, project planning, design review and other appropriate meetings to maintain a current knowledge base of design, requirements, issues, action items, and resolution activities. Identify issues, pursue resolutions, and provide supporting analyses.
2. Assist in the development and/or review of system or component design requirements and objectives.
3. Prepare preliminary schematics, sketches, and descriptive documentation.
4. Perform or review analyses, studies, and evaluations as required for maturing the design concepts.
5. Develop software requirements, architectures, designs, and source code in accordance with NASA EI32-OI-001 Software Design Process Description Document (SDPDD) and other applicable NASA and project requirements.
6. Document and deliver results with recommendations.

#### Systems Engineering

1. Attend technical interchange, project planning, design review and other appropriate meetings to maintain a current knowledge base of design, requirements, issues, action items, and resolution activities. Identify issues, pursue resolutions, and provide supporting analyses. Complete assigned action items. Develop requirements and implement risk management processes.
2. Translate higher level requirements into lower level functional requirements and design options. Conduct trade studies/assessments to determine the optimal design solutions.
3. Collect data and perform assessments on the system to continually assess compliance against requirements.

4. Support relevant testing, including design, fabrication, documentation, analysis and assessments of test plans, test procedures, and test reports. Identify and pursue resolution of issues.
5. Support relevant anomaly investigations and failure investigation teams. Identify and pursue resolution of issues.
6. Identify and document customer objectives and product requirements.
7. Collect required inputs.
8. Develop draft product per customer requirements.
9. Conduct stakeholder review.
10. Modify/update draft product based on stakeholder reviews.
11. Document and deliver results with recommendations.

#### Fabrication:

1. Receive and review CAD drawing, shop traveler, or customer electronic work, etc., in order to fully understand requirements (including traceability requirements if necessary) and verify that quantity of item requested and product requirements are clearly and completely defined and item is producible.
2. Acquire necessary suitable materials for fabrication.
3. Fabricate the item.
4. Perform initial inspection checking functional characteristics versus requirements.
5. Release item to end user for use.

#### Test:

1. Attend technical interchange, project planning, design review and other appropriate meetings to maintain a current knowledge base of design, requirements, issues, action items, and resolution activities. Identify issues, pursue resolutions, and provide supporting analyses.
2. Support component and/or system level test planning, post test data reviews and evaluation of anomalous test events as required. This includes performing post test data reviews, specialized analysis/evaluation of unique or out of family test conditions and test request presentations.
3. Support test and flight hardware acquisition, tracking, and integration.
4. Provide integration insight, evaluation and review for test article and facility interfacing.
5. Provide real time and post test/flight data evaluation using WinPlot or other MSFC provided software.
6. Document and deliver results with recommendations.

### 3.0 Discussion of Skills Required

#### **-CA, ES13 Ares I US Systems Engineering Support**

(b)(4)

#### **-CB, ES13 Ares I VI Systems Engineering Support**

Personnel performing this subelement of this Task must be proficient with the software tools listed above in section 2.0. (b)(4)

(b)(4)

#### **-CC, ES21 Ares I US Design Support**

Engineers with mechanical design and/or integration experience will provide technical support for this subelement. Engineers and paraprofessionals/designers acting under the supervision of an engineer, will prepare design data packages. Engineers and designers must have (b)(4) with design of multi-part assemblies using Pro-E CAD software with knowledge of the current design of the IU, AS and GSE. Designers will have at least (b)(4) utilizing Pro-E, be proficient in DDMS, and be capable of providing input to Center and Agency level CAD procedures, processes and requirements.

#### **-CD, ES22 Ares I US Analysis Support**

Senior engineers with experience in thermal design and heat transfer will provide support for the thermal objectives. Engineers will have experience in analytical tools, particularly Thermal Desktop and SINDA/FLUINT, have experience in thermal testing and system development, and be very knowledgeable about NASA programs and requirements.

Senior engineers with experience in structural and dynamic loads analysis will provide support for the thermal objectives. Engineers must be familiar with Nastran and Matlab methods of modal, frequency response, random vibration, acoustic, and pyroshock analysis. Personnel must be familiar with the IU dynamics model and avionics box models.

Senior, Journeyman, and Junior level engineers with experience in stress analysis will provide support for the stress tasking. The team of engineers must be familiar with NASTRAN, ABAQUS, and ANSYS linear/nonlinear stress and buckling analyses. In addition, knowledge of NASA, OSHA, and industry standards for GSE is required.

#### **- CE, ES22 Ares I FITO Analysis Support**

Engineers with experience in structural analysis of metallic structures, welded joints, and knowledge of AISC and ASME code requirements.

#### **-CF, ES31 Ares FS Imaging Support**

Personnel supporting this subelement must have (b)(4)

(b)(4)

(b)(4) Personnel performing this subelement must also be proficient with the following design and imaging software tools: Solid Edge, Image Java, DXO Analyzer, and Vision NOW. Personnel should be familiar with test instrumentation to analyze analog and High Definition Serial Digital Interface (HD-SDI) types of imaging systems. Personnel must also have some experience in project support.

#### **-CG, ES32 Ares I US Avionics Support**

Personnel providing support to this subelement must have experience in space avionics system engineering with an electrical design background. Experience in requirements definition and verification, hardware design and development, and the integration of flight hardware are required. Experience in design and development of space flight electronic hardware is required.

#### **-CH, ES42 Ares I US Technical Support**

Scientists or engineers with (b)(4)

(b)(4)

(b)(4) Familiarity with MIL-STD-461/462, EMI test requirements and planning, is required. Support also requires personnel with paraprofessional skills and a familiarity with computer systems.

#### **-CI, ES42 Ares I VI Technical Support**

Scientists or engineers with (b)(4)

(b)(4)

(b)(4) Familiarity with MIL-STD-461/462, EMI test requirements and planning, is required. Support also requires personnel with paraprofessional skills and a familiarity with computer systems.

#### **-CJ, ES42 Ares I J2X Technical Support**

Scientists or engineers with electrical engineering and/or physics skills with EMC background including EMI/EMC analysis required. Familiarity with MIL-STD-461/462, EMI test requirements and planning, is required. E3 support also requires personnel with paraprofessional skills and a familiarity with computer systems.

#### **-CK, ES43 Ares I J2X Technical Support**

Personnel performing EEE Parts effort must be (b)(4)

(b)(4)

(b)(4) Personnel supporting this task must have significant experience in EEE parts including part utilization, parts obsolescence, failure analysis and experience

in part specification for all part types listed in MIL-STD-975 and MSFC-STD-3012. Knowledge of NASA and Military standards is required.

Personnel performing the advanced packaging and workmanship work must have (b)(4)  
(b)(4)

Personnel supporting this subelement must exhibit a high level knowledge of solder alloy testing, packaging reliability testing, advanced packaging and the history of electronics packaging for aerospace applications. Knowledge of NASA standards and current state-of-the-art packaging technologies is required.

**-CL, ES51 Ares I VI Flight Software Systems Engineering Support**

Personnel performing this subelement must be proficient with the software tools listed above. Most support personnel must have (b)(4)  
(b)(4)

**-CM, ES51 Ares I J2X Software Insight Support**

Personnel performing this subelement must be proficient with the software tools listed above. Most support personnel must (b)(4)  
(b)(4)

**-CN, ES52 Ares I VI Flight Software Development Support**

Personnel performing this subelement (b)(4)  
(b)(4)

**-CO, ES52 Ares I VI ICD Support**

Personnel performing this subelement must (b)(4)  
(b)(4)

**-CP, ES53 Ares I VI SIL Support**

All personnel assigned to this subelement (b)(4)  
(b)(4)

**4.0 Special Tools Required**

All computer hardware and software will be provided by NASA MSFC. Subelement specific notes are provided below:

**-CB, ES13 Ares I VI Systems Engineering Support**

The following customer provided tools will be needed to support this subelement: Microsoft SQL Server Management Studio, Visual Studio 2005, SQL Server 2005 (Management studio express), Altova XMLSpy 2008, GemBox.Spreadsheet Professional (a DLL), Compare Spreadsheets for Excel (by Office Assistance LLC).

**-CC, ES21 Ares I US Design Support**

Customer provided hardware and software will be required to provide the capability of running Pro-Engineer CAD software and DDMS data management software. Computers allocated to the subelement will be SE2E configurations to support integrated assembly models.

**-CD, ES22 Ares I US Analysis Support**

The following customer provided tools will be needed to support this subelement: Thermal Desktop, SINDA/FLUINT, MSFC PATRAN, NX/NASTRAN, FEMAP, AutoSEA2, MATLAB or equivalent MATH-CAD, ABAQUS, and ANSYS.

**-CE, ES22 Ares I FITO Analysis Support**

The following customer provided tools will be needed to support this subelement: MathCAD, EXCEL, ABAQUS/CAE, FEMAP, NASTRAN, ANSYS and MSC PATRAN Software.

**-CF, ES31 Ares FS Imaging Support**

Customer provided hardware and software will be required to perform tests and analyze various imaging systems.

**5.0 Participating Subcontractors**

**-CA, ES13 Ares I US Systems Engineering Support**

(b)(4)

**-CF, ES31 Ares FS Imaging Support**

(b)(4)

**-CN, ES52 Ares I VI Flight Software Development Support**

(b)(4)

**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. Trip/travel reports will be delivered where major activities significant to this task were performed. Documentation will be provided per project schedules, need dates and coordinated with branch level customers. Work is primarily driven by milestones that are set by the respective project customers, and are not within the control of the Task. Deliverables will be formatted as presentations, reports, drawings, models and letters documenting designs, findings, issues, meetings, trips, etc., as scheduled on a case by case basis. Reports documenting significant tasks will be provided as they are completed. Progress of efforts and significant issues will be formally documented in Monthly Activity Reports provided in the (b)(4)

(b)(4)

Milestones for technical products as specified above, will be coordinated between NASA and technical personnel to perform the efforts, and negotiated with the subelement lead and branch level customer on a case-by-case basis.

The current agreed to Milestones and Deliverables are reflected in the schedule in Section 9.

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

**-CC, ES21 Ares I US Design Support**

The estimate includes resources for 6 trips to support design meetings at other NASA centers or vendor facilities. Estimate is also included under (b)(4)

**-CD, ES22 Ares I US Analysis Support**

The estimate includes resources for 2 trips to support design meetings at other NASA centers or vendor facilities. Estimate is also included under (b)(4)

**-CI, ES42 Ares I VI Technical Support**

The estimate includes resources for 2 trips to support design meetings at other NASA centers or vendor facilities. Estimate is also included under (b)(4)

**-CL, ES51 Ares I Flight Software Systems Engineering Support**

The estimate includes resources for 4 trips to support design meetings at other NASA centers or vendor facilities. Estimate is also included under (b)(4)

**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
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**9.0 Schedule**

Task Order	SubElement	Task Work Element	2011														
			Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
37-000002	CA	ES13 Ares I US Systems Engineering Support	[Gantt bar]														
37-000002	CB	ES13 Ares I VI Systems Engineering Support	[Gantt bar]														
37-000002	CC	ES21 Ares I US Design Support	[Gantt bar]														
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37-000002	CL	ES51 Ares I VI Flight Software Test Support	[Gantt bar]														
37-000002	CM	ES51 Ares I J2X Software Insight Support	[Gantt bar]														
37-000002	CN	ES52 Ares I VI Software Development Support	[Gantt bar]														
37-000002	CO	ES52 Ares I VI Interface Control Document (ICD) Support	[Gantt bar]														
37-000002	CP	ES53 Ares I VI System Integration Laboratory (SIL) Support	[Gantt bar]														

# ESTS Contract Task Order Request Performance Plan

Task Order Title: [Constellation Support to Space Systems](#)

Task Order Number: [37-000002](#) Revision: 00

Category	Weighting Technical %	End of Period Technical Score
<b>Technical Objectives</b>	65%	X <u>65%</u> = <b>Justification</b>
<p>Provide responsive and sound technical support for the Ares I Upper Stage, First Stage, J2X, Vehicle Integration, and Flight and Integrated Test Office elements. Provide specific support for the following: book manager of the AS3; the senior level support for the IP&amp;CL; design support for the IU, AS, GSE and vendor oversight; thermal, stress and dynamics analysis support for the IU, AS, IS, IVGVT structures, tooling, GSE and vendor oversight; imaging support for FS; Avionics subsystem specifications; E3 and electrical integration support; EEE parts and electronics packaging support; flight hardware development and test support for flight and ground software; J2X software insight support; ICD support; and software support for the SIL.</p>		
<b>Schedule Objectives (Milestones)</b>	Weighting Schedule % <u>10%</u> (min 10%)	Schedule Score X <u>10%</u> = <b>Justification</b>
<p>Provide technical support and provide products to meet the Ares I and element level milestones as coordinated with the project and branch customers.</p>		
<b><u>Cost (actual vs. negotiated)</u></b>	Weighting Cost% <u>25%</u> (min.25%)	Cost Score X <u>25%</u> = <b>Justification</b>

# ESTS Contract Task Order Request Performance Plan

Task Order Title: [Constellation Support to Space Systems](#)

Task Order Number: [37-000002](#) Revision: 00

Weighting	Total Score
Total %	
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

Task Order Number: [Constellation Support to Space Systems](#)

Task Order Number: [37-000002](#)      Revision: [00](#)

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**Comments:**

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**Risk Assessment**

**Contract Number:** NNM05AB50C  
**TO Title:** Constellation Support to Space Systems  
**TO Number:** 37-000002 **Revision:** 00

**Period of Performance:** 10/02/2010 to 09/30/2011

**MSFC Initiator:** Scott Moore (Task Initiator)

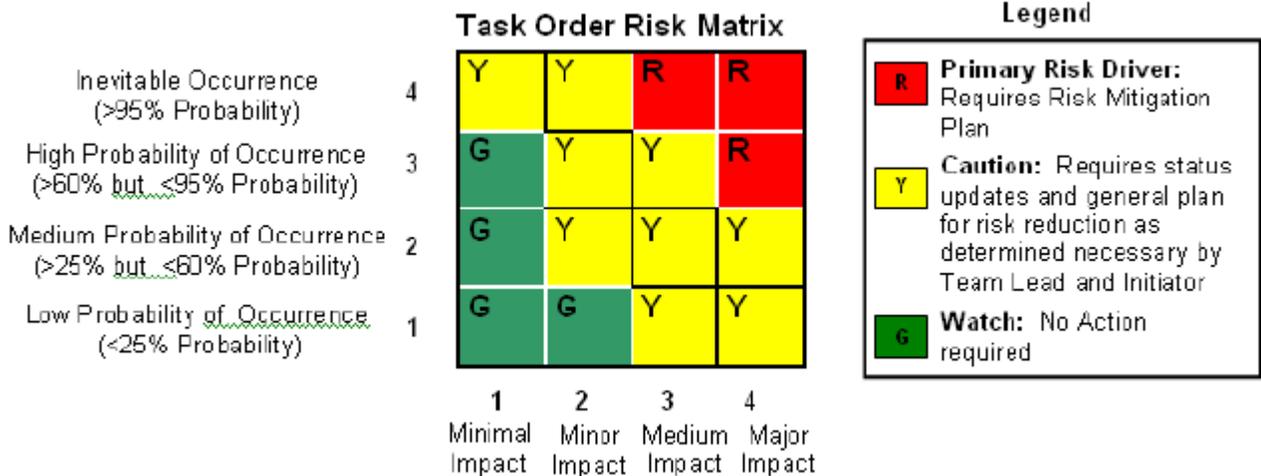
(b)(4)

**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			No cost risks have been identified for this Task Order.
Risk C2	Cost			
Risk T1	Technical	3	3	Loss of experienced personnel and resulting detail knowledge may impact quality/technical maturity of task products.
Risk T2	Technical			
Risk S1	Schedule	2	3	Low fidelity of scope and schedule definition during the planning process for this effort will likely impact the ability to fully meet schedule requirements if not definitized quickly at the branch/subelement level.
Risk S2	Schedule			

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



<b>Impact Level</b>	<b>Cost Impact Definition</b>	<b>Technical Impact Definition</b>	<b>Schedule Impact Definition</b>
(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.

(b)(4)

