

**Task Order Plan (TOP)**

**Contract Number:** NNM05AB50C  
**TO Title:** Space Environments Engineering Products and Services  
**TO Number:** 32-040401 **Revision:** 10

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

**MSFC Initiator:** Rob Suggs

(b)(4)

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**Emergency:** No

WBS funding:

Subelement	WBS
02	397424.07.02.01.04
05	943396.05.03.02.08.02
06	378710.05.02
40	763115.08.04.01.06
52	724297.20.27.08
SA	197009.10.01.01.04

**Revision 10:**

The purpose of this revision is to adjust the scope on Subelements 05, 40 and 52 as requested by the customer. Specific updates are described below:

- Subelement -05: Increased scope to provide analysis for the Engineering Test Unit (ETU) test scheduled in March, resulting in a labor increase of (b)(4)
- Subelement -40: Increased the labor estimate by (b)(4) to provide the additional scope required by the customer.
- Subelement -52: Decreased the labor estimate by (b)(4) to reflect the reduced scope required by the customer.

**Revision 09:**

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.

32-040401-XA and 32-040401-CD were administratively closed on July 2, 2010 due to the Constellation/Ares budget replan. The scope was discontinued.

32-040401-CB was administratively closed on July 2, 2010 due to the Constellation/Ares budget replan. The scope was transferred at a reduced effort to 32-000001-CE.

The revision affects the follow subelement:

- Shuttle: 32-040401-50 has been renamed 32-040401-SA.

### Revision 08:

This revision includes Contract Year 5 (CY05 or FY10) adjustments to the estimate and schedule to reflect the addition of a new task: Glast Burst Monitor/32-040401-06. There are no changes to FY11. All modifications were at the request of and coordinated with the customer.

- Added subelement -06 – Glast Burst Monitor. Total estimate of (b)(4) which corresponds to (b)(4)
- Subelement –XA – decreased labor estimate of (b)(4). Hours were moved to -06.

These changes do not result in any net increase or decrease to the TO revision. The estimate remains at (b)(4) for FY10. There were no changes to FY11.

### Revision 07:

This revision is only for FY2010. There are no changes to FY2011. The CY05 revision includes adjustments to the cost estimate and schedule to reflect budget allocations and adjustments in scope:

- Subelement -02 – Deleted the travel cost of (b)(4) with the elimination of travel requirement for a local conference. Increased the “Other” cost by (b)(4) due to increased conference fee for the local conference. All changes result in a net decrease of (b)(4)
- Subelement -40 – Increased the labor estimate by (b)(4) due to temporary increase in personnel support to provide additional efforts within the Space Environments Analysis scope, supporting MSFC involvement with FastSAT-2 and evaluation of recently released space environment models. “Other” costs of (b)(4) and travel costs of (b)(4) were deleted due to elimination of a requirement for foreign conference attendance. All changes result in a net increase of (b)(4)
- Subelement -50 – Labor estimate decreased by (b)(4) due to less space environments analysis support required for the shuttle program. “Other” costs of (b)(4) were deleted and travel costs reduced by (b)(4) due to the elimination of the requirement for attendance at three domestic conference. All changes result in a net decrease of (b)(4)
- Subelement -52 – Increased the labor estimate by (b)(4) and added a materials estimate of (b)(4) These changes are due to an originally unforeseen task assigned to MEO by NASA Headquarters (OSMA) to extend the NASA fireball networks to the mid-Atlantic states. The NTE for CY05 for –52 increased to (b)(4) All changes result in a net increase of (b)(4)
- Subelement -XA – Labor estimate decreased by (b)(4) due to less space environments analysis support required for the Constellation program. Travel costs were reduced by (b)(4) due to the elimination of the need for attendance at one domestic conference and three domestic meetings. “Other” costs were adjusted due to the reduction of one domestic conference fee and the addition new required costs associated with recruiting, yielding a net increase of (b)(4). These changes result in a net decrease of (b)(4)

The result of all subelement changes is a CY05 net increase of (b)(4) for a CY05 total of (b)(4) FY2011 estimate did not change. The Task Order Descriptions & Objectives, Special Considerations and the Schedule have been revised in accordance with the changes listed above.

This revision affects the no APO elements.

#### **Revision 06:**

This revision includes Contract Year 5 (CY05 or FY2010) and FY2011 adjustments to estimate and schedule to reflect budget allocations, adjustments in scope, and changes in personnel assignments:

- Subelement -40 – No changes to FY2011. For CY05, added travel and other direct cost of (b)(4) to support one foreign conference. All changes result in a net increase of (b)(4)
- Subelement -50 – No changes to FY2011. For CY05, increased the labor estimate by (b)(4) and subcontractor estimate increased by (b)(4). These changes are due to an adjustment to the scope of the work to accommodate previously unplanned for software programming needs. Added (b)(4) in Material costs for materials identified in Section 7. All changes result in a net increase of (b)(4)
- Subelement -52 – No changes to FY2011. For CY05, decreased the labor estimate by (b)(4) and increased the subcontractor estimate by (b)(4) due to an adjustment to the scope of the work to support the installation of a meteor observatory in (b)(4). Added (b)(4) in travel and (b)(4) in other direct cost, for a total of (b)(4) to support two domestic conferences. All changes result in a net decrease of (b)(4)
- Subelement -CD – Added new subelement CD, entitled Ares First Stage with labor estimates of (b)(4) for CY05 and (b)(4) for FY2011. The WBS is 136905.08.01.03.
- Subelement -XA – Reduced labor estimate by (b)(4) for CY05 and (b)(4) for FY2011 due to the anticipated additional work not coming to fruition and thereby eliminated the requirement for new hire position. This also resulted in a decrease of subcontractor estimate by (b)(4). Additionally, resources were subsequently reallocated to subelements 50 and 52 at the customer's request. All changes result in a net decrease of (b)(4) for CY05 and a net decrease of (b)(4) for FY2011.

The result of all subelement changes is a CY05 net decrease of (b)(4) for a CY05 total of (b)(4) and a FY2011 net decrease of (b)(4) for a FY2011 total of (b)(4) including all changes listed above. The Task Order Descriptions & Objectives, Special Considerations and the Schedule have been revised in accordance with the changes listed above.

This revision affects the following APO elements:

- First Stage (Subelement –CD)

#### **Revision 05:**

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 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 APO elements:

- Vehicle Integration (Subelement –CB)

#### **Revision 04:**

This revision includes Contract Year 4 adjustments to estimate and schedule to reflect final budget allocations, adjustments in scope, and changes in personnel assignments:

- Subelement -XA – added 168 manpower hours, yielding an increase in manpower cost of (b)(4). The NTE for CY04 for –XA remains at (b)(4). All changes result in a net increase of (b)(4).

The result of all subelement changes is a net increase of (b)(4) for a CY04 total of (b)(4) including all changes listed above.

### Revision 03:

This revision includes Contract Year 4 adjustments to estimate and schedule to reflect final budget allocations, adjustments in scope, and changes in personnel assignments:

- Subelement -02 – added (b)(4) hours, increasing labor costs by (b)(4). The NTE for CY04 for –02 increased to (b)(4). All changes result in a net increase of (b)(4).
- Subelement -40 – reduced travel by (b)(4) added material cost of (b)(4) and removed (b)(4) decreasing labor costs by (b)(4). The NTE for CY04 for –40 decreased to (b)(4). All changes result in a net decrease of (b)(4).
- Subelement -50 – added ODC cost of (b)(4) removed (b)(4) decreasing labor costs by (b)(4) and increased subcontractor manpower cost by (b)(4). The NTE for CY04 for –50 remained at (b)(4). All changes result in a net increase of (b)(4).
- Subelement -52 – added materials cost of (b)(4) adjusted manpower hours yielding a (b)(4) but decreasing labor costs by (b)(4) and decreased subcontractor manpower cost by (b)(4). A subcontract estimate was added for meteoroid modeling work of (b)(4). The NTE for CY04 for –52 remained at (b)(4). All changes result in a net increase of (b)(4).
- Subelement -CB – removed (b)(4) decreasing labor costs (b)(4). The NTE for CY04 for –CB remains at (b)(4). All changes result in a net decrease of (b)(4).
- Subelement -XA – added ODC cost of (b)(4), decreased travel by (b)(4) added subcontractor manpower cost of (b)(4) and added (b)(4) increasing labor costs by (b)(4). The NTE for CY04 for –XA remains at (b)(4). All changes result in a net increase of (b)(4).

The result of all subelement changes is a net increase of (b)(4) for a CY04 total of (b)(4) including all changes listed above.

### Revision 02:

This revision includes Contract Year 4 adjustments to estimate and schedule to reflect final budget allocations, adjustments in scope, and changes in personnel assignments:

- Added new subelement -04, entitled International Space Station (ISS) Environmental Control And Life Support System (ECLSS) with a labor estimates of (b)(4). The NTE is (b)(4) and the WBS is 401769.06.08.02.04.05.
- Subelement -XA – removed (b)(4) decreasing labor costs by (b)(4). The NTE for CY04 for –XA remains at (b)(4). All changes result in a net decrease of (b)(4).

The result of all subelement changes is no net change for a CY04 total of (b)(4) including all changes listed above.

### Revision 01:

This revision includes Contract Year 4 adjustments to estimate and schedule to reflect final budget allocations, adjustments in scope, and changes in personnel assignments:

- Subelement -40 – added (b)(4) increasing labor costs by (b)(4) The NTE for CY04 for –40 was decreased to (b)(4) All changes result in a net increase of (b)(4)
- Subelement -50 – removed (b)(4) decreasing labor costs by (b)(4) resulting in a net decrease of (b)(4)
- Subelement -52 – added (b)(4) increasing labor costs by (b)(4) The NTE for CY04 for –52 was increased to (b)(4) All changes result in a net increase of (b)(4)
- Subelement -CB – removed (b)(4) decreasing labor costs by (b)(4) The NTE for CY04 for –CB was decreased to (b)(4) All changes result in a net decrease of (b)(4)
- Added new subelement CD, entitled Ares First Stage with a labor estimates of (b)(4) The NTE is (b)(4) and the WBS is 136905.08.01.03.
- Subelement -XA – removed (b)(4) decreasing labor costs by (b)(4) The NTE for CY04 for –XA was decreased to (b)(4) All changes result in a net decrease of (b)(4)

The result of all subelement changes is a net decrease of (b)(4) for a CY04 total of (b)(4) including all changes listed above.

### Revision 00:

This Task Order (TO) is a continuation of work being performed on TO 32-010302 of the NNM05AB50C ESTS contract. This TO realigns work performed previously in EV13, and now supports EV44 within the new ED organizational structure. This TO defines and estimates work for the period 27 September 2008 through 2 October 2009. For Subcontracted efforts, this TO authorizes work for the same period.

### Sub-element Mapping and WBS funding

New Subelement	Previous TO	WBS
02	32-010302-02	397424.07.02.01.04
40	32-010302-40	763115.08.04.01.06
50	32-010302-50	197009.10.01.01.04
52	32-010302-52	939904.06.08.01
CB	32-010302–CB	136905.02.02.08.05
CD	New	136905.08.01.03
XA	32-010302-CA	604746.02.06.06.08

This revision affects the following APO elements:

- Vehicle Integration, Ares V-I.

## 1.0 Task Order Description & Objectives

The Jacobs ESTS Group will provide engineering support to the NASA/Environments Group (EV44) in a variety of space environments related discipline areas including:

- Ionizing radiation environment
- Ionosphere and plasma environment
- Neutral thermosphere environment
- Orbital debris environment
- Meteoroid environment

Thermal environment  
External contamination environment  
General space physics including orbital mechanics, impact mechanics, charging effects analysis, space weather.

Activities in these discipline areas include data analysis and computer modeling to define the environment and its effects, requirements inputs, design review, design analysis, design support, testing support and operations support. In addition, staff will prepare space environments and effects training materials including presentations, example model runs, and other educational materials as well as participate in presentations to project personnel (both NASA and contractor) to help programs adequately address space environments issues in their design, development, and operations work.

### **Subelement Specific Objectives:**

#### **32-040401-02 Chandra X-Ray Observatory**

This subelement provides space environments and analysis support for the Chandra X-Ray Observatory program. There are no specific deliverables identified at this time at MSFC request. The not to exceed cost for Contract Year 6 is (b)(4) (WBS 397424.07.02.01.04).

#### **32-040401-05 Magnetospheric Multiscale Science (MMS)**

This subelement provides support for the MMS project. There are no specific deliverables identified at this time at MSFC request. The not to exceed cost for Contract Year 6 is (b)(4) (WBS 943396.05.03.02.08.02).

#### **32-040401-06 Glast Burst Monitor (GBM)**

This subelement provides support for the GBM project. There are no specific deliverables identified at this time at MSFC request. The not to exceed cost for Contract Year 6 is (b)(4) (WBS 378710.05.02).

#### **32-040401-40 Space Environments Analysis**

This subelement provides space environments analysis in support of EV44. The not to exceed cost for Contract Year 6 is (b)(4) (WBS 763115.08.04.01.06).

#### **32-040401-52 Meteoroid Environment Office (MEO)**

This subelement provides video analysis and general support for the meteoroid environment office. There are no specific deliverables identified at MSFC request. The not to exceed cost for Contract Year 6 is (b)(4) (WBS is 724297.20.27.08).

#### **32-040401-SA Shuttle Support (previously 32-040401-50)**

Formerly 32-040401-50. This subelement provides space environments and analysis support for the NASA space transportation system program. There are no specific deliverables identified at MSFC request. The not to exceed cost for Contract Year 6 is (b)(4) (WBS 197009.10.01.01.04).

#### **CLOSED SUBELEMENTS:**

**32-040401-04 International Space Station (ISS) Environmental Control And Life Support System (ECLSS)**

This subelement provides ionizing radiation support for the ECLSS project in the ISS program. There are no specific deliverables identified at this time at MSFC request. (WBS 401769.06.08.02.04.05).

### **32-040401-CB Constellation Level III**

This subelement provides space environments and analysis support for level III projects of the Constellation program. There are no specific deliverables identified at this time at MSFC request. (WBS 136905.02.02.08.05)

### **32-040401-CD Ares I First Stage**

This subelement provides ionizing radiation support for the First Stage Element of the Ares I project. There are no specific deliverables identified at this time at MSFC request. (WBS 136905.08.01.03)

### **32-040401-XA Constellation Level II**

This subelement provides space environments and analysis support for the Constellation program. There are no specific deliverables identified at this time at MSFC request. (WBS 604746.02.06.06.08)

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

1. Assess program definition and/or requirements to determine applicable space environments. Engineers will assess the mission characteristics (orbit, launch data, duration, operations, etc.) and spacecraft design (materials, power system voltages, component specifications, etc.) to identify relevant ionizing radiation environments. Assessment will use expertise in spacecraft mission analysis, spacecraft design, risk management, and natural and induced space environments.
2. Define the space environment and environment effects. Definition of the environment for the spacecraft/mission will be performed using models/databases of the environments and/or scientific expertise. Assessment of the environment effects will be performed using engineering expertise and the appropriate models. The models themselves will be reviewed and updated as new data become available. New models will be created where necessary if standard or applicable models do not exist.
3. Provide inputs to requirements, specifications, and designs. Prepare reports, briefing, and project documentation that documents the analyses performed in support of the project. Additional outputs will include an analysis of the available component radiation response data to permit a determination of the suitability for use in the ionizing radiation environment. This will be performed using models of the environments and/or scientific expertise, and available component radiation test data.
4. The ESTS Group will participate in design and safety reviews scheduled by the MSFC Project Office. This participation may include the review of design data and analyses and the development of Review Item Discrepancies (RIDs). Each RID written by the ESTS Group will be coordinated with the MSFC Task Initiator. The ESTS Group will also respond to bring to closure RIDs written against data and analyses submitted by the ESTS Group.
5. Provide overall project planning, including resource planning and management, master and detailed scheduling, cost estimating and planning, risk management, WBS development, day-to-day task planning, and reporting.

### 3.0 Discussion of Skills Required

Engineers/scientists with degrees in space physics, physics, electrical engineering, aerospace engineering, or equivalent. Relevant experience includes space environments and effects, skill in applying complex engineering models and databases associated with natural and induced space environments including ionizing radiation environment definition, ionizing radiation effects on EEE (electronic, electrical, electromechanical) parts, thermosphere/ionosphere environment modeling, orbital mechanics, hypervelocity impact physics, and other disciplines listed in Section 1.0. Experience in space environments (e.g. magnetosphere, solar wind, and solar energetic particles) and their effects on spacecraft systems and subsystems. Experience with relevant space environment codes, analysis of space environment data, and the ability to develop new environment codes is desired.

### 4.0 Special Tools Required

None.

### 5.0 Participating Subcontractors

None.

### 6.0 Milestones & Deliverables

Products include monthly activity reports, computer models, spacecraft and geophysical data analyses, design analyses, Review Item Discrepancies, test plans, test data analyses, presentations, and technical papers where appropriate. Delivery dates and milestones, specific to individual programs and projects, will be completed, as required, to meet program and project schedule requirements.

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

-40 Estimate includes travel cost for one domestic conference.

### 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
32-04040	00	<b>Space Environments Engineering Products &amp; Services</b>	▼											
32-04040	02	Chandra X-ray Observatory (CXO)	▶											
32-04040	05	MMS	▶											
32-04040	06	Gamma Burst Monitor (GBM)	▶											
32-04040	40	Space Environments Analysis (SEA)	▶											
32-04040	52	Meteoroid Environment Office (MEO)	▶											
32-04040	SA	Shuttle Support	▶											

# ESTS Contract Task Order Request Performance Plan

Task Order Title: [Space Environments Engineering Products and Services](#)

Task Order Number: [32-040401](#) Revision: 10

Category	Weighting Technical %	End of Period Technical Score
<b>Technical Objectives</b>	65%	X <u>65%</u> = <u>0.00</u> <b>Justification</b>
1) Design analyses, assessments and reviews are comprehensive (they cover all relevant hardware and applicable environment requirements). 2) Environment definitions, data analyses, and computer models accurately represent space environment conditions and variation within project accepted levels of uncertainty and risk. 3) Requirements inputs are comprehensive and based on established engineering practices and accepted environments models.		
<b>Schedule Objectives (Milestones)</b>	<b>Weighting Schedule %</b> <u>10%</u> (min 10%)	<b>Schedule Score</b> X <u>10%</u> = <u>0.00</u> <b>Justification</b>
Deliver products identified in SOW on schedule.		
<b>Cost (actual vs. negotiated)</b>	<b>Weighting Cost%</b> <u>25%</u> (min.25%)	<b>Cost Score</b> X <u>25%</u> = <u>0.00</u> <b>Justification</b>
	<b>Weighting Total %</b> 100.00%	<b>Total Score</b> <b>0.00</b>

## 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: [Space Environments Engineering Products and Services](#)

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**Comments:**

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**Risk Assessment**

Contract Number: NNM05AB50C

TO Title: Space Environments Engineering Products and Services

TO Number: 32-040401 Revision: 10

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

MSFC Initiator: Rob Suggs

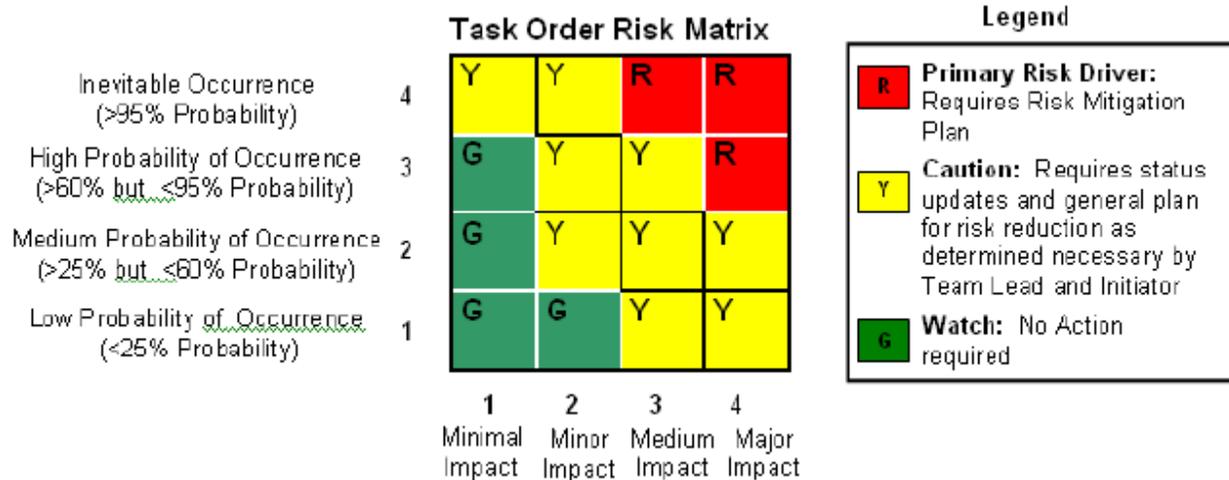
(b)(4)

**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			No Technical risks have been identified for this Task Order.
Risk T2	Technical			
Risk S1	Schedule			No Schedule risks have been identified for this Task Order.
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	Potential to gain required tech-	Minor delay in deliverables but

