

Task Order Plan (TOP)

Contract Number: NNM05AB50C

TO Title: Terrestrial and Planetary Environments Team Project Support

TO Number: 32-040402 **Revision:** 08

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

MSFC Initiator: Barry Roberts

(b)(4)

Emergency: No

| Subelement | WBS |
|------------|-------------------------|
| 04 | 892840.04.08.01 |
| 06 | 833011.02.08.11.EE93.11 |
| SA | 197009.10.01.01.03 |

Revision 8:

The purpose of this revision is to add a subelement for support to X-37 and to reallocate support to other projects. The Task Order Description, Schedule and estimate have been updated to implement the specific changes described below:

- Subelement 04: Revised the mix of support needed to provide terrestrial and planetary environments and effects engineering for the Mars GRAM project resulting in a labor increase of (b)(4) and a subcontractor deletion of (b)(4)
- Subelement 06: Added to provide terrestrial and planetary environments and effects engineering support for the X-37 project. The subelement estimate is (b)(4)
- Subelement SA: Revised the mix of support needed to provide terrestrial and planetary environments and effects engineering support for the Shuttle program resulting in a labor decrease of (b)(4) and a subcontractor decrease of (b)(4). In addition revised the schedule to support through June.

Revision 7:

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.

32-040402-XA and 32-040402-CB were administratively closed on July 2, 2010 due to the Constellation/Ares budget replan. The scope was discontinued.

The revision affects the follow subelement:

- Space Shuttle Integration: 32-040402-01 has been renamed 32-040402-SA.

Revision 6:

This revision includes Contract Year 5 (CY05 or FY10) adjustments to the estimate and schedule to reflect the addition of a new task: Mars Gram/32-040402-04. There are no changes to FY11. All modifications were at the request of and coordinated with the customer.

- Added subelement -04 – Mars GRAM. Total estimate of (b)(4) which corresponds to (b)(4)
- Subelement –XA – decreased labor estimate of (b)(4). Hours were moved to -04.

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 5:

This revision includes Contract Year 5 (CY05 or FY10) adjustments to the estimate and schedule to reflect budget allocations and adjustments in scope. There are no changes to FY11. All modifications were at the request of and coordinated with the customer.

- Subelement -01 – “Other” costs of (b)(4) were deleted due to elimination of a need for conference attendance. This resulted in a net decrease of (b)(4).
- Subelement -03 – Planetary Atmospheric Modeling and Analysis is a new subelement to support autonomous aerobraking atmospheric density estimates. Labor is estimated to be (b)(4). One domestic trip is included in the estimate. The period of performance for Subelement -03 is May 1, 2010 to September 30, 2010.
- Subelement -05 – “Other” costs of (b)(4) were deleted due to elimination of a need for conference attendance. This resulted in a net decrease of (b)(4).
- Subelement –CB – “Other” costs of (b)(4) and travel costs of (b)(4) were deleted due to elimination of a need for conference attendance. This resulted in a net decrease of (b)(4).
- Subelement –CC – Schedule was extended to reflect the possibility of additional support for the final Ares I-X flight performance report. Estimate was not changed because there is currently enough labor estimated in the preceding months to cover this.
- Subelement –XA – Labor costs were reduced by (b)(4) (to reflect the labor increase in -03). Assignments of duties for this subelement have been distributed to personnel on the task so no loss of continuity will occur. “Other” costs of (b)(4) have been deleted due to elimination of a need for conference attendance. This resulted in a net decrease of (b)(4).

These changes result in a net TO cost estimate decrease from (b)(4)

Revision 4:

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:

- Ares I, Vehicle Integration (-CB)
- Ares I-X (-CC)

The new subelement WBS funding matrix is as follows:

| Subelement | WBS |
|------------|--------------------------|
| XA | 604746.02.22.03.01.01.08 |
| CB | 136905.02.02.08.05 |
| CC | 136905.10.10.50 |
| 01 | 197009.10.01.01.03 |
| 05 | 281945.02.19.01.03 |

Revision 3:

The purpose of this revision is to adjust estimates and schedules to reflect changes in personnel and tasking assignments. Some estimated hours and associated costs have been redistributed among the subelements to reflect evolving customer priorities. No changes in the not to exceed costs were required for any subelement. Specific changes made are as follows:

- Estimated hours for subelement -01 have been reduced from (b)(4). The corresponding cost estimate has been reduced from (b)(4).
- Estimated hours for subelement -XA have been increased from (b)(4). The corresponding cost estimate has been increased from (b)(4).
- Estimated hours for subelement -CB have been increased from (b)(4). An estimated ODC charge of (b)(4) has been added to subelement -CB. The corresponding cost estimate, including the increased hours and the ODC charge, has been increased from (b)(4).
- An estimated ODC charge of (b)(4) has been added to subelement -CC. The corresponding cost estimate has been changed from (b)(4).

These changes resulted in a net TO cost estimate increase from (b)(4).

Revision 2:

The purpose of this revision is to open a new subelement and to adjust estimates and schedules to reflect the new subelement, adjustments in scope, and changes in personnel assignments.

- Subelement -05, *Satellite Data Downlink Support*, has been opened and populated with 457 estimated hours. The not to exceed cost for subelement -05 is (b)(4).
- Estimated hours for subelement -CC have been reduced (b)(4). The corresponding cost estimate for this subelement has been reduced from (b)(4). No change in the not to exceed cost for this subelement is required.
- Estimated hours for subelement -XA have been increased from (b)(4) with a corresponding total cost estimate increase from (b)(4). No change in the not to exceed cost for this subelement is required.
- Estimated hours for subelement -CB have been increased from (b)(4) with a corresponding total cost estimate increase from (b)(4). No change in the not to exceed cost for this subelement is required.

The new subelement WBS funding matrix is as follows:

| Subelement | WBS |
|------------|--------------------------|
| XA | 604746.02.22.03.01.01.08 |
| CB | 136905.02.02.08.05 |
| CC | 136905.10.10.50 |
| 01 | 197009.10.01.01.03 |
| 05 | 281945.02.19.01.03 |

Revision 01:

The purpose of this revision is to revise hours to better reflect the requirements of the tasks.

Specific changes include the following:

- The not to exceed cost for subelement -XA has been increased to (b)(4).
- The not to exceed cost for subelement -CB has been increased from (b)(4).
- Approximately (b)(4) and associated costs have been moved from subelement -XA to subelement -CB in order to better reflect the requirements of the tasks. No net cost changes resulted from this redistribution.

This Task Order (TO) is a continuation of work being performed on TO 32-010301 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 |
|----------------|----------------|--------------------------|
| XA | 32- 010301 -CA | 604746.02.22.03.01.01.08 |
| CB | 32- 010301 –CB | 136905.02.02.08.05 |
| CC | 32- 010301 –CC | 136905.10.10.50 |
| 01 | 32- 010301 -01 | 197009.10.01.01.03 |

This revision affects the following APO elements:

- Flight & Integrated Test Office/Ares I-X
- Vehicle Integration, Ares VI.

1.0 Task Order Description & Objectives

This task provides system engineering support to MSFC flight vehicle projects (Space Shuttle Program, Constellation Program, Mars exploration projects and other flight vehicles, spacecraft, payloads, and systems requiring terrestrial and planetary environments and effects engineering support) by establishing appropriate terrestrial and planetary environment definitions, developing requirements which specify thresholds for which flight vehicle systems must accommodate the environmental factors established, performing trade studies to evaluate the ruggedness of the vehicle design and its operability, and supporting engineering activities to assure proper interoperation and implementation of terrestrial and planetary environment requirements.

Meeting the objectives of work in this Task Order will require 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.

Products include monthly activity reports, technical analysis reports, documentation reviews, computer models, and supporting analyses as required on a project by project basis. Milestone and deliverable dates are indicated in the Subelement Specific Objectives.

Subelement Specific Objectives:

32-040402-04 Mars Global Reference Atmosphere Model (GRAM) (WBS 892840.04.08.01)

This Subelement provides terrestrial environments modeling and analysis in support of EV44. There are no specific deliverables or milestones defined at this time at MSFC's request. The not to exceed cost for the period of performance is (b)(4)

32-040402-06 X-37 (WBS 833011.02.08.11.EE93.11)

This Subelement provides terrestrial environments modeling and analysis in support of EV44. There are no specific deliverables or milestones defined at this time at MSFC's request. The not to exceed cost for the period of performance is (b)(4)

32-040402-SA Space Shuttle Integration (WBS 197009.10.01.01.03)

Formerly 32-040402-01. The Subelement provides terrestrial environments support for the Space Shuttle program and day of launch terrestrial winds support. There are no specific deliverables or milestones defined at this time at MSFC's request. The not to exceed cost for the period of performance is (b)(4)

Closed:

32-040402-03 Planetary Atmospheric Modeling and Analysis (WBS 869021.05.08.01.14)

This Subelement provides terrestrial environments modeling and analysis in support of EV44. There are no specific deliverables or milestones defined at this time at MSFC's request.

32-040402-05 Satellite Data Downlink Support (WBS 281945.02.19.01.03)

This Subelement provides software, hardware, and data analysis support to the Earth Science Office. There are no specific deliverables or milestones defined at this time at MSFC's request.

32-040402-XA Constellation Level II (WBS 604746.02.06.06.08)

The Subelement provides terrestrial environments support for the Constellation Level II activities. There are no specific deliverables or milestones defined at this time at MSFC's request.

32-040402-CB Constellation Ares I (WBS 136905.02.02.08.05)

The Subelement provides terrestrial environments support for the Constellation Ares I / Level III activities. There are no specific deliverables or milestones defined at this time at MSFC's request.

32-040402-CC Constellation Ares I X (WBS 136905.10.10.50)

The Subelement provides terrestrial environments support for the Constellation Ares I X / Level III activities. There are no specific deliverables or milestones defined at this time at MSFC's request.

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

- 1.0 Perform computer analyses involving fluid dynamics, constituent transport phenomena, and atmospheric processes with emphasis on engineering design and development for aerospace vehicles.
- 2.0 Conduct comprehensive fluid dynamics, ambient environment analyses, and optimization studies of wind environment interactions with engineering structural and control systems necessary to establish optimized design input requirements.
- 3.0 Evaluate wind, wind shear, gust, turbulence models, and databases to establish capability of these inputs to satisfy performance requirements for space transportation vehicle concepts and configurations.
- 4.0 Maintain technical awareness of developments regarding fluid dynamics aspects of new measurements and models for wind, wind shear, gust, turbulence, and transport processes.
- 5.0 Prepare reports, briefings, and project documentation which describe the analysis performed in support of the project. Papers and presentations will be prepared for technical interchange with the scientific/engineering community.
- 6.0 These objectives will include performing analyses, computer modeling, developing environments definitions, establishing requirements inputs, and supporting project meetings.
- 7.0 Train for and provide day of launch support for the Space Shuttle program in the area of terrestrial wind dynamics and its impact on launch vehicles. Participate in in-house enrichment activities as scheduled by MSFC.
- 8.0 Provide overall project planning, including resource management and planning, 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 knowledge of fluid dynamics and mechanical engineering principles and practice relative to aerospace vehicle design and development are required. A working knowledge of atmospheric processes including wind dynamics, heat transfer, atmospheric ther-

modynamics, and atmospheric electricity are also necessary to carry out the duties associated with this task. The engineers are expected to possess programming skills and be familiar with the McIDAS software tool. In addition, a background in atmospheric sciences, with capabilities in data management and computer science applications of meteorological information is necessary for the task.

4.0 Special Tools Required

None.

5.0 Participating Subcontractors

(b)(4)

6.0 Milestones & Deliverables

No specific milestones or deliverables are identified for this task. Typical products generated include analysis reports, data tables, document compilations, and technical presentations. All products are delivered according to customer schedule requirements.

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

None.

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 | 2010 | | | | | | | | | | | | | |
|--------------|------------|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
| 32-040402 | 00 | [Gantt bar spanning from Sep to Sep] | | | | | | | | | | | | | |
| 32-040402 | 04 | [Gantt bar spanning from Oct to Aug] | | | | | | | | | | | | | |
| 32-040402 | 06 | [Gantt bar spanning from Nov to Dec] | | | | | | | | | | | | | |
| 32-040402 | SA | [Gantt bar spanning from Oct to May] | | | | | | | | | | | | | |

ESTS Contract Task Order Request Performance Plan

Task Order Title: [Terrestrial and Planetary Environments Team Project Support](#)

Task Order Number: [32-040402](#) Revision: 08

| Category | Weighting Technical % | End of Period Technical Score |
|--|--|---|
| Technical Objectives | 65% | X 65% = Justification |
| 1) Establish and specify appropriate terrestrial & planetary environment definitions and requirements. 2) Trade studies and analysis used to evaluate a systems design and operation. 3) Assure proper operation and implementation of terrestrial environment requirements. | | |
| Schedule Objectives (Milestones) | Weighting Schedule % 10% (min 10%) | Schedule Score X 10% = Justification |
| Deliver defined products on schedule. | | |
| Cost (actual vs. negotiated) | Weighting Cost% 25% (min.25%) | Cost Score X 25% = Justification |
| | | |
| | Weighting Total % 100.00% | Total Score |

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: [Terrestrial and Planetary Environments Team Project Support](#)

Task Order Number: [32-040402](#) Revision: [08](#)

Comments:

Risk Assessment

Contract Number: NNM05AB50C

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MSFC Initiator: Barry Roberts

(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 are identified for this task. |
| Risk C2 | Cost | | | |
| Risk T1 | Technical | | | No technical risks are identified for this task. |
| Risk T2 | Technical | | | |
| Risk S1 | Schedule | 1 | 1 | Delays due to late inputs from outside collaborators. |
| Risk S2 | Schedule | | | |

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



