Marshall Space Flight Center
Engineering, Science & Technical Services

JACOBS ESTS Group

Task Order Plan (TOP)

Contract Number: *NNM05AB50C*
TO Title: EM41 *Nonmetallic Materials Branch Polymeric Materials Team Support*
TO Number: *34-040006* **Revision:** *13*

Period of Performance: *10/02/2010* to *3/31/2011*

MSFC Initiator: *Jeffry S. Sparks*

(b)(4) [redacted]

Emergency: *No*

Revision 13

The purpose of this revision is to modify the labor to match the funding provided by the customer. The overall estimate has been decreased from (b)(4) [redacted] primarily coming from a reduction in work for the –SB and –SM subelements. The scope of work on these subelements has been reduced to according to customer direction to match the available funding. Primary support for –SB and –SM subelements will focus on post flight support (section 2,3) materials obsolescence resolution (section 2.7), and flight hardware reviews (2.11) for the remaining space shuttle launches. Other areas of support (sections 2.1, 2.2, 2.4 thru 2.6, and 2.8 thru 2.10) will have reduced support as the level of need is expected to be minimal, but could arise as a result of in flight anomalies.

<u>Subelement -SB: Shuttle SRB</u>
Labor has decreased (b)(4) [redacted] due to a decrease in available funding.
ODC has decreased (b)(4) [redacted] because funding is not available to support technical training and seminars.
Travel has decreased (b)(4) [redacted] because funding is only available to support one trip.

Subelement -SM: Shuttle RSRM
Labor has decreased (b)(4) [redacted] due to a decrease in available funding.
ODC has decreased (b)(4) [redacted] because funding is not available to support technical training and seminars.
Travel has decreased (b)(4) [redacted] because funding is only available to support one trip.

<u>Subelement -ST: Shuttle External Tank</u>
Labor has increased (b)(4) [redacted] hours but decreased by (b)(4) [redacted] due to a redistribution of the labor and replanning of the support. Increased (b)(4) [redacted] hours and reduced (b)(4) [redacted] hours to more accurately reflect the level of support needed for the External Tank, as directed by the customer.

Revision 12

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 3, 2010 through March 31, 2011.

Additionally, the Schedule, Performance Plan and Risk Assessment have been revised to reflect changes in task activities for the new period of performance. Subelement -00 is closed and replaced with subelements –SB and SM. Subelement -03 is closed and replaced with subelement –ST.

This revision establishes and affects support for the following Space Shuttle Project Offices.

- Shuttle SRB (subelement SB)
- Shuttle RSRM (subelement SM)
- Shuttle ET (subelement ST)

Revision 11

The purpose of this revision is to modify the task descriptions and subelements to reflect the change in scope of this task order. Subelements -00 and -03 will remain in place. The scope of the work for -00 subelement was reduced due to the changes in Shuttle Program manifest schedule. Therefore, the associated support requirements will be moved to the next fiscal year. In addition, travel for the -00 was reduced for the same reason. The details to the changes in the -00 labor and direct charges are described below. In addition, all Ares subelements (-CA, -CC, -CE, -CH, -CP, and -DI) were administratively closed and the work corresponding to these is being continued under the new TO # 34-000001 Subelement BF. The Orion subelement (-EA) was also closed due to a reduction in scope for this task order. The Task Initiator was also changed to Jeffrey S. Sparks.

Subelement -00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites
Labor has decreased (b)(4) hours (b)(4) due to a reduced requirement for RSRM/SRB Postflight evaluation support. This reduction in support is a direct effect of the program schedule changes moving the launches to the next fiscal year. Travel was also decreased (b)(4) for the same change in postflight support. The net change for Subelement -00 is a decrease of (b)(4)

<u>Subelement EA – Orion Launch Abort System Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08) (Closed)</u>
Labor has decreased (b)(4) due to a decrease in scope for this task order. No further support is required from the project office from this task order.
The net change for Subelement -EA is a decrease of (b)(4).

Revision 10

The purpose of this revision is to change the TO Title to reflect the reorganization of the Materials and Processes Laboratory, reallocate resources based on identification of required support for EM41 Polymeric Materials Team, open subelement –DI (supporting Ares I First Stage Separation and Deceleration), and close subelement –CG (supporting Ares I-X). The overall estimate has been increased from (b)(4) The Schedule, Performance Plan and Risk Assessment have been revised to reflect the changes in scope and TO Title. The estimate changes include:

<u>Subelement -00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites</u>
Labor has decreased (b)(4)) due to a reduction in required support. This decrease is primarily caused by RSRM manufacturing completion thus reducing problem resolution support requirements. Travel was increased (b)(4) due to additional planned travel for SRB/RSRM post flight evaluations. ODC was reduced by (b)(4) due to inability to support scheduled seminars.
The net change for Subelement -00 is a decrease of (b)(4)

Subelement 03: Nonmetals Engineering Branch External Tank Materials and Processes
Labor was increased (b)(4) due to increased requested support for technology transfer discussions, Technical Interchange Meetings and increased support to Integrated Product Teams.

Subelement CA – Ares I Upper Stage Adhesives, Polymers, and Composites
(WBS: 136905.08.05.12.01.08)
Labor has decreased (b)(4) due to a reduction in required support for integrated product teams meetings and document reviews.

Subelement CC – Ares I Upper Stage Thermal Protection System (TPS) Support
(WBS: 136905.08.05.12.07.08)
Labor was decreased by (b)(4) due to a reduction in support required for integrated product teams meetings and document reviews.

Subelement CE – Ares I 1st Stage –RSRMV Adhesives, Polymers, and Composites
(WBS: 136905.08.01.11)
Labor has increased (b)(4) due to an increase in required support for postfire evaluations and anomaly resolution.
Travel has increased (b)(4) due to additional travel requirements for postfire evaluations and anomaly investigations.
ODC was reduced by (b)(4) due to inability to support scheduled seminars.
The net change for Subelement – CE is an increase of (b)(4)

Subelement CG – Ares I-X First Stage Adhesives, Polymers, and Composites (closed).
(WBS: 136905.08.01.09)
This subelement was closed because all post flight support for Ares I-X is complete. Labor has decreased (b)(4) due to closure of the subelement and elimination of estimated labor for future months. The work performed by this task was less than expected due to post flight evaluation support that was cancelled by the customer.

Subelement CH: - Ares I First Stage Structures and Mechanical Systems Adhesives, Polymer and Composites (WBS 136905.08.01.02.01)
Labor has increased (b)(4) due to an increase in required support for First Stage TPS development.
Travel was increased (b)(4) due to increase in planned travel.
The net change for Subelement -CH is an increase of (b)(4)

Subelement CP - Ullage Settling Motor (USM) Adhesives, Polymers and Composites
(WBS: 13905.08.05.13.02.01.08)
Labor has decreased (b)(4) due to a decrease in required support for integrated product teams meetings and document reviews.
Travel was increased (b)(4) due to increase in planned travel for Technical Interchange Meetings and Hardware Acceptance Reviews.
The net change for Subelement -CP is a decrease of (b)(4)

Subelement DI – Ares I First Stage Separation & Deceleration System
(WBS: 136905.08.01.02.01.08)
Subelement was created.
Labor estimated at (b)(4)
Travel estimated at (b)(4)
The net impact of Subelement –DI is (b)(4)

Subelement EA – Orion Launch Abort System Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08)
Labor has increased (b)(4) due to an increase in required support for integrated product teams meetings and document reviews.
Travel was increased (b)(4) ue to increase in planned travel for Technical Interchange Meetings and Hardware Acceptance Reviews.
The net change for Subelement -EA is an increase of (b)(4)

Revision 09

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 Upper Stage (subelements CA)
- Ares I Upper Stage TPS Support (subelement CC)
- Ares I First Stage – RSRMV (subelement CE)
- Ares I-X First Stage (subelement CG)
- Ares I First Stage Structures and Mechanical Systems (subelement CH)
- Ullage Settling Motor (subelement CP)
- Orion - Launch Abort System (subelement EA)

Revision 08
The purpose of this revision is to more accurately reflect the level of effort for this performance period. The overall estimate has been reduced from (b)(4) The Performance Plan and Risk Assessment have not been revised since they are not impacted by the changes reflected in this revision. The estimate changes include:

Subelement -00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites
Labor has increased (b)(4) due to refining the distribution of effort among subelements.
Travel was decreased (b)(4) due to planned travel not being required.
ODC was increased (b)(4) to align the estimate with the actual expenses incurred.
Material was decreased (b)(4) due to not incurring any expenses this year.
The net change for Subelement -00 is an increase of (b)(4)

Subelement 03: Nonmetals Engineering Branch External Tank Materials and Processes
Labor was decreased (b)(hours with an increase of (b)(4) due to staffing the position at a level higher than originally planned (b)(4) and establishing a starting date later than originally planned.

Subelement CA – Ares I Upper Stage Adhesives, Polymers, and Composites (WBS: 136905.08.05.12.01.08)
(b)(4) due to refining the distribution of effort among subelements.

Subelement CE – Ares I 1st Stage –RSRMV Adhesives, Polymers, and Composites (WBS: 136905.08.01.11)
Labor has decreased (b)(4) due to refining the distribution of effort among subelements.
Travel has increased (b)(4) ue to additional travel requirements.
The net change for Subelement – CE is a decrease of (b)(4)

Subelement CG – Ares I-X First Stage Adhesives, Polymers, and Composites (WBS: 136905.08.01.09)
Labor has decreased (b)(4) due to refining the distribution of effort among subelements.

Travel has increased (b)(4) due to unplanned travel requirements to support hardware problem resolution.
The net change for Subelement –CG is a decrease of (b)(4)

Subelement CH: - Ares I First Stage Structures and Mechanical Systems Adhesives, Polymer and Composites (WBS 136905.08.01.02.01)
Labor has decreased (b)(4) due to refining the distribution of effort among subelements.
Travel was reduced (b)(4) due to planned travel not being required.
The net change for Subelement -CH is a decrease of (b)(4)

Subelement CP - Ullage Settling Motor (USM) Adhesives, Polymers and Composites (WBS: 13905.08.05.13.02.01.08)
No change to the estimate for this subelement.

Subelement EA – Orion Launch Abort System Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08)
No change to the estimate for this subelement.

Revision 07
The purpose of this revision is to add subelements-03 Nonmetals Engineering Branch External Tank Materials and Processes, –CH 1st Stage Structures and Mechanical Systems and –CP Ullage Settling Motor (USM) Adhesives, Polymers and Composites support to the task order and adjust the labor estimate for the (b)(4) to reflect a later start and lower labor category from what was originally planned. A (b)(4) will be (b)(4) to work subelement -03. Also, relocation expenses that were planned for the (b)(4) (Revision 6) are not required due to hiring an internal candidate. The overall estimate has decreased from (b)(4) (b)(4) The estimate changes include:

Subelement -00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites
Labor has decreased (b)(4) due to the redistribution of effort among subelements.
Travel was decreased (b)(4) due to adjusting the planned travel schedule.
ODC was reduced (b)(4) due to relocation expenses planned for the new position not being required.
The net change for Subelement -00 is a decrease of (b)(4)

Subelement 03: Nonmetals Engineering Branch External Tank Materials and Processes
The subelement was established.
Labor of (b)(4) was added to fund a (b)(4)

Subelement CA – Ares I Upper Stage Adhesives, Polymers, and Composites
(WBS: 136905.08.05.12.01.08)
Labor has decreased (b)(4) due to the redistribution of effort among subelements.

Subelement CE – Ares I 1st Stage –RSRMV Adhesives, Polymers, and Composites
(WBS: 136905.08.01.11)
Labor has increased (b)(4) due to the redistribution of effort among subelements, but some (b)(4) hours were moved to (b)(4) hours to reflect the actual labor category of the (b)(4) (reduction of (b)(4)
ODC has decreased (b)(4) due to not requiring relocation expenses for the (b)(4)

The net change for Subelement – CE is a decrease of (b)(4)

Subelement CG – Ares I-X First Stage Adhesives, Polymers, and Composites (WBS: 136905.08.01.09)
Labor has increased (b)(4) due to increased support requirements for hardware problem resolution and design reviews.
Travel has decreased (b)(4) due to postponement of planned trip.
The net change for Subelement –CG is an increase of (b)(4)

Subelement CH: - Ares I First Stage Structures and Mechanical Systems Adhesives, Polymer and Composites (WBS 136905.08.01.02.01)
Subelement was created.
Labor established at (b)(4)
Travel established at (b)(4)
The net change for Subelement -CH is an increase of (b)(4)

Subelement CP - Ullage Settling Motor (USM) Adhesives, Polymers and Composites (WBS: 13905.08.05.13.02.01.08)
Subelement was created.
Labor estimated at (b)(4)

Subelement EA – Orion Launch Abort System Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08)
Labor has decreased (b)(4) due to the redistribution of effort among subelements.

Revision 06
The purpose of this revision is to add a (b)(4) to support Subelement -00 (b)(4) and –CE (b)(4) The overall estimate has increased from (b)(4) an increase of (b)(4) The estimate changes include:

Subelement -00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites
ODC was reduced (b)(4) due to relocation expenses planned for this period of performance being realized during contract year 03.
Travel was reduced (b)(4) due planned travel not being incurred.
Labor has increased (b)(4) for the effort of the (b)(4)

The net change for Subelement -00 is decrease of (b)(4)

Subelement CE – Ares I 1st Stage Adhesives, Polymers, and Composites (WBS: 136905.08.01.11)
Labor has increased (b)(4)
ODC has increased (b)(4) for recruiting and relocation expenses for the (b)(4)
Travel has increased (b)(4) to support the new position.

The net change for Subelement – CE is an increase o (b)(4)

No other subelements are affected by this revision. The Schedule, Performance Plan and Risk Assessment have not been revised since they are unaffected by these changes.

Revision 05
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 APO elements:

- Ares I Upper Stage (subelements CA)
- Ares I First Stage (subelement CE)

- Ares I-X First Stage (subelement CG)
- Orion - Launch Abort System (subelement EA)

Revision 04
The purpose of this revision is to more accurately reflect the level of effort for this performance period. The overall estimate has been reduced from (b)(4) a reduction of (b)(4) No additional budget is required for any of the subelements. The Performance Plan and Risk Assessment have not been revised since they are not impacted by the changes reflected in this revision.

Also, the (b)(4)

<u>Subelement 00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites</u>

Material was reduced by (b)(4) due to not incurring the planned material expenditures during this period of performance.

ODC was reduced by (b)(4) due to planned relocation expenses not being realized during this period of performance. This estimate will be incorporated in the next period of performance.

Labor was increased by (b)(4) to more accurately reflect the effort required during this period of performance.

The net impact to this subelement is a reduction in estimate of (b)(4)

Revision 03 is written to close subelements -01, -02, -CB and -CC. The effort is complete. The (b)(4) (b)(4) work is more appropriately placed in the task order 34-040005, and so it will be moved to that task order under multiple subelements. Subelements –CA and –CE have been revised to include a minimal amount of engineer support to design and manufacturing for Ares I and remove the no longer required technician support. (b)(4) support has been removed from subelement -00. Travel expectations for subelement -00 are higher than originally anticipated, and so an additiona (b)(4) travel estimate has been added. Anticipated costs of (b)(4) or hiring and relocation for an (b)(4) (b)(4) o support subelement -00 have been added.

Revision 02 is being written to extend this task into Contract Year 3 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period 29 September 2007 through 26 September 2008. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance. (b)(4) has been hired, and direct costs associated with his relocation have been included. (b)(4) has been moved to here from task order 34-040005 to functionally group him with the (b)(4) The debris analysis effort (1/2 WYE) has been moved here from task order 34-040001. This has been done to better track the effort.

Revision 01 is being written to revise the estimate associated with engineering support on this task. Originally, two engineers were anticipated, starting in June 2007. At this time, (b)(4) has been hired and will start 24 September 2007.

1.0 Task Order Description & Objectives

The Jacobs-ESTS Group Nonmetals Engineering Team will provide engineering and technical support for the MSFC EM41-Nonmetals Engineering Branch for the following Shuttle projects:

<u>Subelement SB: Shuttle Solid Rocket Booster</u>
<u>Subelement SM: Shuttle Reusable Solid Rocket Motor</u>
<u>Subelement ST: Shuttle External Tank</u>

The Jacobs-ESTS Group Nonmetals Engineering Team will provide support to all subelements for the following material classes.

- Adhesives and Bonding processes
- Polymeric and Elastomeric materials and associated manufacturing processes
- Protective finishes (paints and ablative seal coats) and application processes
- High temperature Phenolic based composite and ablative materials and associated manufacturing processes
- Cryogenic and general foam materials and associated manufacturing processes
- Ablative, ceramic, and fabric thermal protection materials and associated fabrication and manufacturing processes
- Solvents and cleaning processes
- Nonmetallic materials (other materials like fabrics used in parachutes) and processes.

Subelement 00: Nonmetals Engineering Branch SRB/RSRM Adhesives, Polymers, and Composites (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team.

Subelement 03: Nonmetals Engineering Branch External Tank Materials and Processes (Closed)
Provide adhesives, foam, and nonmetallic materials support to the MSFC EM41 Polymeric Materials Team for the ET design revision and manufacturing.

Subelement CA – Ares I Upper Stage Adhesives, Polymers, and Composites
(WBS: 136905.08.05.12.01.08) (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for Upper Stage design and manufacturing.

Subelement CC – Ares I Upper Stage (US) TPS Support (WBS: 136905.08.05.12.07.08) (Closed)
Provide nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for development of TPS materials for the Ares I US.

Subelement CE – Ares I First Stage RSRMV Adhesives, Polymers, and Composites
(WBS: 136905.08.01.11) (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for RSRMV design and manufacturing.

Subelement CG – Ares I-X First Stage Adhesives, Polymers, and Composites (closed)
(WBS: 136905.08.01.09) (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for Ares I-X 1ST Stage design and manufacturing.

Subelement CH: - Ares I First Stage Structures and Mechanical Systems Adhesives, Polymer and Composites (WBS 136905.08.01.02.01) (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for 1ST Stage structural and mechanical systems design and manufacture.
Subelement CP - Ullage Settling Motor (USM) Adhesives, Polymers and Composites
(WBS: 13905.08.05.13.02.01.08) (Closed)
Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for USM design and manufacturing.

Subelement DI – Ares I First Stage Separation & Deceleration System Support
(WBS: 136905.08.01.02.01.08) (Closed)

Provide Ares First Stage-related non-metallic materials development and qualification support to EM41, relative to the structures and mechanisms deceleration sub-system (DSS).

Subelement EA – Orion Launch Abort System Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08) (Closed)

Provide adhesives and nonmetallic materials engineering support to the MSFC EM41, Polymeric Materials Team for Orion Launch Abort System design and manufacturing.

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

Support for this task for all subelements will include the following:

2.1 Review element contractor engineering test plans, test reports and problem resolution recommendations
2.2 Review of new and revised flight hardware engineering designs, processes and materials.
2.3 Post-fire and flight evaluation and disassembly oversight of full and subscale propulsion test and flight hardware
2.4 Testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.5 Materials engineering analysis of data from laboratory and subscale testing of adhesively bonded components, structures and nonmetallic materials.
2.6 Oversight/expertise at the government and contractor facilities
2.7 Materials obsolescence issue resolution
2.8 Vehicle integration and processes development
2.9 Develop test plans and perform testing or provide oversight for internal (MSFC M&P) test programs for nonmetallic materials. Generate test reports to document results.
2.10 Observe the production and refurbishment of related hardware as appropriate.
2.11 Support the review of flight hardware engineering designs and updates

<u>Subelement 00: Nonmetallic Materials Branch SRB/RSRM Adhesives, Polymers, and Composites (Closed)</u>

2.0.1 Provide engineering support in the area of adhesive and nonmetallic materials and processes used in the Space Shuttle Solid Rocket Booster (SRB) and Reusable Solid Rocket Motor (RSRM) systems.
2.0.2 Review element contractor engineering test plans for technical content and engineering rigor.
2.0.3 Support the review of flight hardware engineering changes and updates involving adhesives and non-metallic materials used on Space Shuttle Solid Rocket Booster and Reusable Solid Rocket Motor.
2.0.4 Provide engineering support for the post flight/fire evaluation of SRB and RSRM hardware in the areas of adhesives and nonmetallic materials.
2.0.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.0.6 Provide materials engineering analysis of data from laboratory and subscale testing of adhesively bonded rocket motor components, structures and nonmetallic materials.

<u>Subelement 03: Nonmetallic Materials Branch External Tank Materials and Processes (Closed)</u>

2.3.1 Provide engineering and technical support in the coordination and review of design and process changes for non-metallic materials used in the fabrication of the external tank.
2.3.2 Provide engineering and technical support for normal foam processing and problem resolution.
2.3.3 Facilitate knowledge transfer of external tank foam materials and processes to the Ares Upper Stage foam material qualification and process development effort.

<u>Subelement CA: Nonmetallic Materials Branch Ares I/Upper Stage (US) (WBS: 136905.08.05.12.01.08) (Closed)</u>

2.CA.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the Ares I Upper Stage systems.
2.CA.2 Review engineering test plans for technical content and engineering rigor.
2.CA.3 Support the review of upper stage flight hardware design and updates involving adhesives and non-metallic materials.

2.CA.4 Provide analytical support in fracture mechanics as applicable to flaw characterization and tolerance for nonmetallic systems used in structural applications.
2.CA.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.CA.6 Provide materials engineering analysis of data from laboratory and subscale testing of upper stage adhesively bonded rocket motor components and structures.

Subelement CC – Ares I Upper Stage (US) TPS Support
(WBS: 136905.08.05.12.07.08) (Closed)

2.CC.1 Support the development of TPS materials for the Ares I US.

Subelement CE: Nonmetallic Materials Branch Ares I RSRMV Adhesives, Polymers, and Composites (WBS: 136905.08.01.11) (Closed)

2.CE.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the Ares I Reusable Solid Rocket Motor – 5 segment (RSRMV) systems.
2.CE.2 Review element contractor engineering test plans for technical content and engineering rigor.
2.CE.3 Support the review of flight hardware engineering designs and updates involving adhesives and non-metallic materials.
2.CE.4 Provide engineering support for the post fire evaluation of RSRMV hardware in the areas of adhesives and nonmetallic materials..
2.CE.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.CE.6 Provide materials engineering analysis of data from laboratory and subscale testing of adhesively bonded rocket motor components, structures and nonmetallic materials.
2.CE.7 Publish Engineering Test Plans and Engineering Test Reports for the nonmetals lab to perform characteristic testing of RSRMV materials. Provide engineering oversight to performance of the test plans by MSFC contractors.

Subelement CG – Ares I-X First Stage Adhesives, Polymers, and Composites (WBS: 136905.08.01.09) (Closed)

2.CG.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the Ares I-X systems.
2.CG.2 Review engineering test plans for technical content and engineering rigor.
2.CG.3 Support the review of Ares I-X flight hardware design and updates involving adhesives and non-metallic materials.
2.CG.4 Provide engineering support for the post flight evaluation of the Ares I-X hardware in the areas of adhesives and nonmetallic materials.
2.CG.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.CG.6 Provide materials engineering analysis of data from laboratory and subscale testing of Ares I-X adhesively bonded rocket motor components, structures and nonmetallic materials.

Subelement CH: - Ares I First Stage Structures and Mechanical Systems Adhesives, Polymer and Composites (WBS 136905.08.01.02.01) (Closed)

2.CH.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the Ares I First Stage systems.
2.CH.2 Review engineering test plans for technical content and engineering rigor.
2.CH.3 Support the review of Ares I First Stage flight hardware design and updates involving adhesives and non-metallic materials.

2.CH.4 Provide engineering support for the post flight evaluation of the Ares I First Stage hardware in the areas of adhesives and nonmetallic materials.
2.CH.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.CH.6 Provide materials engineering analysis of data from laboratory and subscale testing of Ares I First Stage adhesively bonded components, structures and nonmetallic materials.

Subelement CP - Ullage Settling Motor (USM) Adhesives, Polymers and Composites (WBS: 13905.08.05.13.02.01.08) (Closed)

2.CP.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the USM.
2.CP.2 Provide engineering and technical support for graphite nozzle material characterization and testing.

Subelement DI – Ares I First Stage Separation & Deceleration System Support (WBS: 136905.08.01.02.01.08) (Closed)

2.DI.1 Coordinate with Ares I First Stage deceleration sub system integrated product team.
2.DI.2 Review current status of the design, development, and test programs for Ares I First Stage DSS.
2.DI.3 Provide materials support for the thermal protection of the altitude switch assemblies and plenum textile webbing used in the pilot, drogue, and main parachute canopies, suspension lines, dispersion bridles, and risers, and any other DSS non-metallic materials.
2.DI.4 Review DSS Manufacturing and Assembly related specification, verification plans, performance specifications, and engineering change packages for DSS design and assembly/installations.
2.DI 5 Assess parachute webbing material development.
2.DI 6 Evaluate/assemble test plans and test reports as required.

Subelement EA – Orion Launch Abort System (LAS) Adhesives, Polymers, and Composites (WBS: 644423.06.03.10.08) (Closed)

2.EA.1 Provide engineering and technical support in the area of adhesive and nonmetallic materials and processes used in the LAS.
2.EA.2 Review engineering test plans for technical content and engineering rigor.
2.EA.3 Support the review of LAS flight hardware design and updates involving adhesives and non-metallic materials.
2.EA.4 Provide engineering support for the post fire evaluation of the LAS hardware in the areas of adhesives and nonmetallic materials.
2.EA.5 Provide testing guidance and analytical support of the development of statistically significant design mechanical properties for nonmetallic systems used in structural applications.
2.EA 6 Provide materials engineering analysis of data from laboratory and subscale testing of LAS adhesively bonded rocket motor components, structures and nonmetallic materials.

3.0 Discussion of Skills Required

Personnel supporting this task must have experience in design and manufacture of nonmetallic materials. The personnel selected should have experience with adhesives, bonding systems, foams, sealants and the characterization of nonmetallic materials and systems. Direct experience with the Space Shuttle SRB, RSRM is desired. Experience with polymer/rubber formulation & cure, solid rocket motor propellant and liner systems is desired.

4.0 Special Tools Required

All projects/subelements require access to the M&P data products server and Materials and Processes Technical Information System (MAPTIS). The Ares I project may require access to the project Integrated Collaborative Environment (ICE)/data documents server and the SharePoint Manufacturing and Assembly web portal.

5.0 Participating Subcontractors

None.

6.0 Milestones & Deliverables

Provide periodic updates of task activities to EM management. Provide reports documenting results of development programs in accordance with project requirements. Provide technical memorandums, papers, reports and test plans as required to satisfy the goals of material development in EM. Provide formal monthly activity reports. Task schedule slips due to uncontrollable circumstances (examples: reprioritization of fabrication projects by customer; etc.) will not be factored negatively in assessing schedule objectives.

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

Subelements –SB/-SM:
Travel - to Utah/Kennedy Space Center for flight hardware problem resolution and post flight assessment support.

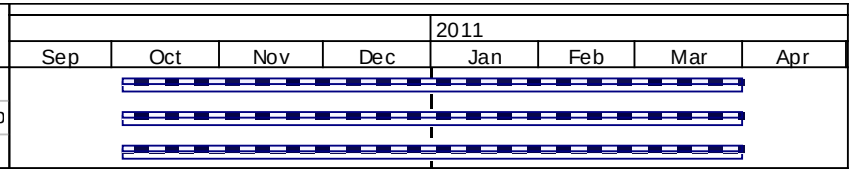
8.0 Work Shelf

The following activities could be accomplished as part of the Task Order performance by personnel that are temporarily available due to program or funding delays on other Tasks. Specific assignments will be coordinated with the Task Initiator to ensure appropriate skills and experience.

TO/Subelement	Description	Due Date	Skill

9.0 Schedule

Task Order #	Subelement	Task Work Element
34-040006	SB	Shuttle Solid Rocket Booster Nonmetallic Materials Support
34-040006	SM	Shuttle Reusable Solid Rocket Motor Nonmetallic Materials Sup
34-040006	ST	Shuttle External Tank Nonmetallic Materials Support



ESTS Contract Task Order Request Performance Plan

Task Order Title: EM41 Nonmetallic Materials Branch Polymeric Materials Team Support

Task Order Number: 34-040006 Revision: 13

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X 65% =
		Justification
Provide Technical Support to EM 41 Polymeric Materials Team including: Materials processing support to RSRM/RSRB for manufacturing, assembly, and postflight evaluations performed by NASA MSFC contractors;		
Schedule Objectives (Milestones)	**Weighting Schedule %** 10% *(min 10%)*	**Schedule Score** X 10% =
		Justification
Frequent oral and written communications of activities are required. Formal monthly and informal weekly activity reports should be typical and sufficient. Documented support to major milestone meetings and activities (post flight evaluations, Technical Interchange Meetings, Element Acceptance Reviews) shall be required. Reviews of significant issues which require SrMRB review and significant M&P review for acceptance of hardware or condition will be required.		
Cost (actual vs. negotiated)	**Weighting Cost%** 25% *(min.25%)*	**Cost Score** X 25% =
		Justification
	Weighting Total % 100.00%	**Total Score**

ESTS Contract Task Order Request Performance Plan

Task Order Title: EM41 Nonmetallic Materials Branch Polymeric Materials Team Support

Task Order Number: 34-040006 Revision: 13

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: EM41 Nonmetallic Materials Branch Polymeric Materials Team Support

Task Order Number: 34-040006 Revision: 13

Comments:

Marshall Space Flight Center
Engineering, Science & Technical Services

JACOBS ESTS Group

Risk Assessment

Contract Number: *NNM05AB50C*
TO Title: *EM41 Nonmetallic Materials Branch Polymeric Materials Team Support*
TO Number: *34-040006* **Revision:** *13*

Period of Performance: *10/02/2010* to *3/31/2011*

MSFC Initiator: *Scotty Sparks*

(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	There is a risk that the Subtask cost estimate will increase due to unanticipated overtime, travel, material and ODC charges
Risk C2	Cost			
Risk T1	Technical			No technical risks have been identified
Risk T2	Technical			
Risk S1	Schedule			No schedule risks have been identified
Risk S2	Schedule			

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

Task Order Risk Matrix

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

Legend

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

Impact Level	Cost Impact Definition	Technical Impact Definition	Schedule Impact Definition
(1) Minimal Impact	No significant cost impact	No significant technical impact	No significant schedule impact
(2) Minor Impact	Potential to recover cost	Potential to gain required technology without impact	Minor delay in deliverables but no impact to customer
(3) Medium Impact	>0 but <10% subtask cost overrun	Some technical impact but potential to recover	Delay in subtask deliverables but work arounds available and acceptable to customer
(4) Major Impact	>10% subtask cost overrun	Unable to meet technical requirements to perform subtask	Delay in subtask deliverables with impact to customer

Risk Mitigation Plan

Complete the following chart for those risks identified on page 1 as “Primary Risk Drivers”. The following chart will serve as the Risk Mitigation Plan.

Risk No.: Risk Description:		
Mitigation Step No.	Planned Completion Date	Mitigation Step Description