Marshall Space Flight Center
Engineering, Science & Technical Services

Task Order Plan (TOP)

Contract Number: *NNM05AB50C*
TO Title: *Aerodynamic and Aerothermodynamic Analysis and Reviews*
TO Number: *32-030301* **Revision:** *19*

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

MSFC Initiator: *Mark D'agostino*

(b)(4)

Emergency: *No*

Subelement	WBS #	Change
-07: Miscellaneous Vehicle Studies	869021.03.08.01.10	yes
-08: Aerosciences Support for Launch Vehicle Acoustics Insight	725932.08.01.02.01	no
-XA: Flame Trench Launch Loads Analyses	292360.09.09	no

Revision 19;
The purpose of this revision is to extend the period of performance of subelement -07 in order to provide Task Initiator requested support to a Technical Interchange Meeting (TIM) rescheduled by the NASA Engineering and Safety Center (NESC). The period of performance is extended to the end of the calendar year. Only section 9 and the cost estimate are affected in this revision.

Revision 18;
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.

The affected programs and projects are indicated in the table above.

The following subelements have been removed from this Task Order: CA, CB, CD, CG, CH, CI, CJ, AA, and 02.

Revision 17;
The purpose of this revision is to provide additional support for the Miscellaneous Vehicle Studies (subelement -07), reflect the change in status relative to the Ares I subelements (-CA, -CB, -CD, -CG, -CI, and -CJ), and provide a subelement lettering change to be consistent with the Constellation program naming convention.

The increase in scope on subelement -07 will focus on performing an independent assessment of the Orbital Sciences Corporation (OSC) plans for testing their Taurus II rocket at the request of the NASA Engineering and Safety Center (NESC).

Subelement -XA replaces what was formerly labeled as -CK, without impact to any resource estimates. Affected sections in this revision include 1.0, 2.0, 3.0, 5.0, 7.0, and 9.0 to reflect the necessary changes.

The Ares subelements -CA, -CB, and -CD were administratively closed and the scope shifted to Task Order 32-000001-CS. Similarly, subelement -CG was also administratively closed and the scope shifted to 32-000001-CD.

Subelements -CI and -CJ were administratively closed and the work was discontinued.

Revision 16;
The purpose of this revision is to create two new subelements, –CK and –08, to reapportion efforts of the Ares aerothermodynamic and aeroacoustics analyses per direction of the Task Initiator. Subelement –CK will focus on the prediction of launch-induced thermal and pressure loads on the main flame deflector and flame trench due to launch of the Ares I vehicle and utilize resources transferred from subelement –CB. Subelement –CB has also been re-scoped per direction of the Task Initiator through a transfer of resources to provide additional technical support on subelement -02 for Space Shuttle aerothermal analyses. Subelement –08 will focus on Evolved Expendable Launch Vehicle (EELV) and Commercial Orbital Transportation Services (COTS) vehicle acoustics analyses, estimation, and prediction. This effort will utilize resources transferred from subelement –CD. Additionally, Sections 1.0, 2.0, 3.0, 5.0, and 9.0 have been revised to reflect the changes in task activities.

Revision 15;
The purpose of this revision is to create subelement –CJ to reapportion efforts of the Upper Stage venting analyses per direction of the Upper Stage Element Manager. The new subelement –CJ will focus on venting analyses specifically related to the Upper Plane Isolator (UPI) and utilize resources transferred from subelement –CI. In addition, numerous travel requirements have been cancelled by Ares project direction and the Travel estimates for subelements –CB, –CD, and –CI have been reduced accordingly. The registration cost for a customer-directed short course on Deceleration Subsystems has been added to subelement –CG as Other. Additionally, sections 1.0, 2.0, 3.0, 5.0, and 9.0 were revised for the addition of subelement –CJ, and section 7.0 was revised for changes to Travel and Other.

Revision 14;
The purpose of this revision is to realign the scope of work by the addition of two new subelements, closure of one subelement, and adjustment of the resources accordingly. Also, an adjustment to resources since the original Contract Year (CY) 5 estimate is necessary to reflect additional travel requirements (-CG) and scope addition (-CA). Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect any changes in task activities.

The following subelements are affected and changes for each are described below:

- CA: Venting efforts originally expected to be accomplished under this subelement were shifted to the new subelement (-CI) with a commensurate reduction of resources. Subcontractor cost was increased to account for a scope increase on aerodynamic database development.
- CB: A reduction in scope was required in order to support the work requested for the new subelement –07.
- CG: Remaining resource estimates from subelement –CH have been transferred to this subelement, as well as an increase in the estimate for travel cost to support additional testing. The WBS number was also corrected per Project Office direction of 11/13/09.
- CH: This subelement has been closed per Project Office direction of 12/21/2009 and the remaining resources reallocated to subelement –CG.
- CI: Added in order to support the Upper Stage element venting analyses and test functions which includes travel to an off-site location.
- 07: Added to provide multi-disciplined Aerosciences support for vehicles unrelated to the Constellation or Space Shuttle programs. Initially, efforts will focus on the Commercial Orbital Transportation Services (COTS) Space X Falcon 9 vehicle.

Revision 13;
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, Ares I (subelements CA, CB, CD)
- First Stage (subelements CG and CH)
- Vehicle Integration, Ares V (subelement AA)

In addition, the Shuttle program is affected by subelement 02.

Revision 12;
The purpose of this revision is to close one subelement (AF) and add two new subelements (AA and AB) to divide the subelement AF work on the Ares V between Vehicle Integration and Core Stage elements; increase labor hours and decrease the subcontract cost estimate to adjust the staffing plan and accommodate an increase in scope of work for database management on Subelement CA; increase relocation on Subelements CG and CH; and increase travel for technical interchange support on Subelement CH. Additionally, the Schedule and Performance Plan have been revised to reflect the changes in task activities.

Revision 11;
The purpose of this revision is to increase the scope of work and adjust the resources accordingly. In addition, an adjustment to resources since the original Contract Year (CY) 4 estimate is necessary to reflect additional recruitment costs. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect any changes in task activities.

The following subelements are affected and changes for each are described below:

- CA: Resources were added to support an off-site wind tunnel test. The duration of the test has been extended to three (3) weeks, rather than two (2), with a resulting increase in travel costs.
- CD: Channel Islands Acoustics has been added as a consulting subcontractor for aeroacoustic analyses and defining environments. Travel resources have also been added for attendance at three (3) Technical Interchange Meetings.
- CG: Increased the estimate for relocation cost.
- CH: Increased the estimate for relocation cost.

Revision 10;
The purpose of this revision is to extend this task into Contract Year (CY) 4 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period 27 September 2008 through 2 October 2009. Work on subelement R1 has been completed and will be closed. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect any changes in task activities for the new period of performance.

This revision affects the following APO elements:

- Vehicle Integration, Ares I (subelements CA, CB, and CD)
- First Stage (subelements CG and CH)
- Vehicle Integration, Ares V (subelement AF)

In addition, the Shuttle project is affected by subelement 02.

Subelement CE will remain open, but has no activity currently scheduled during CY4.

Subelement AF was corrected from Revision 9 to comply with the naming convention for the Ares V vehicle. It was previously identified as subelement CF.

Revision 9;
The purpose of this revision to increase the scope of work and to adjust resources accordingly. Three (3) new subelements, along with the corresponding labor hours, have been added. Subelement -CF is for support of the Ares V cargo launch vehicle development and design trade studies utilizing a multi-disciplined approach (WBS # 206518.01.01.08). Subelements -CG and -CH are to perform Ares I First Stage Booster integration activities and coordination with other Aerosciences sub-disciplines (an even division of resources between WBS #'s 136905.08.01.02 and 136905.08.01.09).

Other resource adjustments were required to (1) remove some of the estimated travel in subelement -CD from the current contract year resulting from schedule slippage of planned test programs, (2) reduce the labor hours in subelement -CB that was not backfilled upon personnel termination, (3) add relocation and recruiting expense estimates (ODC) in subelements -CG and -CH, (4) reallocate some labor hours and subcontractor costs from subelements -CA, -CB, and -CD to assist the multi-discipline requirements in subelement -CF, and (5) add recruiting cost estimate (ODC) in subelement -CF.

Accompanying this are updates to the Schedule, Performance Plan, and Risk Assessment to reflect these changes.

Revision 8;
The purpose of this revision is to make resource adjustments based on various changes since the original Contract Year 3 estimate was prepared. In addition, the Team Lead has changed from Louis Landry to William Crosby.

Changes to the resource estimates were necessary to (1) increase the labor hours in subelement -CB resulting from a scope increase to provide additional capability in computational fluid dynamics, (2) increase the travel budget for additional requirements and longer duration stays for off-site support in subelements -CB and -CD, (3) increase the ISSI subcontractor cost in subelement -CA to adjust for a rate correction, (4) reallocate some of the subcontractor costs from subelement -CB to -CE, and (5) add relocation expenses (ODC) to subelement -CD that were not previously accounted for.

Accompanying this are updates to the Schedule, Performance Plan, and Risk Assessment to reflect these changes.

Revision 7;
The purpose of revision 07 is 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 any changes in task activities for the new period of performance.

Work on Ares V Vehicle Integrated Performance Analysis (subelement –CC) has been completed and will not carry over into the new CY.

Revision 6;
The purpose of this revision is to correctly apportion resources for the remainder of the Fiscal Year. Work was added to subelement –CA to support the venting analysis efforts for the Ares I Integrated Upper Stage. An increase in travel cost was also realized in subelement –CA resulting from an extended test at a remote site. Deletion of labor hours and subcontractor cost were made to subelement –CD as the available requisitions have not been filled.

Revision 5;
The purpose of this revision is to re-title subelement –CE to “Launch-Induced Pad Environments of the Ares I” and to redefine the objectives and scope. Planned labor hours have been reduced, but subcon-

tractor cost was added to this subelement. Restructuring of priorities has also resulted in a transfer of labor hours from subelement –CB to subelement –CE.

Some subelement –CA labor hours have been substituted with subcontractor cost as the former teammate Miltec is now a specialty contractor on this contract. In addition, a portion of the labor hours in subelement –CA were reassigned to subelement –CD to reflect increased effort on that work.

Adjustment of labor hours to subcontractor cost in subelement -CA also resulted from Miltec's change in status.

Accompanying this are updates to the Schedule, Performance Plan, and Risk Assessment to reflect these changes for this period of performance.

Revision 04;
The purpose of this revision is to add subelements –CD "Aero-Acoustic Analysis for ARES I" and –CE "Prediction of Launch-Induced Thermal and Pressure Loads due to Launch of the ARES I Vehicle from Kennedy Space Center Launch Complex 39", as well as to adjust the estimate to more closely reflect the actual rate of resource useage. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect these changes for this period of performance.
The following subelements have these WBS numbers:

Subelement –02: Aerothermodynamics Support for Space Shuttle
WBS # 136905.02.04.08

Subelement –R1: Aerodynamics Support for Space Shuttle
WBS # 197009.10.01.01.11

Subelement –CA: Aerodynamic Analyses for ARES I
WBS # 136905.02.04.06.01

Subelement –CB: Aerothermodynamic Analysis for ARES I
WBS # 136905.02.04.06.02

Subelement –CC: ARES V Vehicle Integrated Performance Analysis
WBS # 136905.08.05.02.04.08

Subelement –CD: Aero-Acoustics Analysis for ARES I
WBS # 136905.02.04.08.06

Subelement –CE: Prediction of Launch-Induced Thermal and Pressure Loads due to Launch of the ARES I Vehicle from Kennedy Space Center Launch Complex 39
WBS # 292360.09.20.07.01

Revision 03;
The purpose of this revision is to extend this task into Contract Year 2 of the NNM05AB50C ESTS contract. This revision defines and estimates work for the period 30 September 2006 through 28 September 2007. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.

The following subelements have been closed:
Subelement -R0 Vehicle Unsteady Environments Support for Lift-off Debris.
Subelement -03 Launch Vehicle Aerodynamic Analysis and Tests.
Subelement -04 Space Shuttle Aerothermodynamic Analysis.
Subelement -05 CLV Aerothermodynamic Analysis.
Subelement -06 ARES V Vehicle Integrated Performance Analysis.

The following subelements have been added:
Subelement -CA Aerodynamic Analysis for ARES I.
Subelement -CB Aerothermodynamic Analysis for ARES I.
Subelement -CC ARES V Vehicle Integrated Performance Analysis.

Revision 02;
This revision adds subelement -06 "ARES V Vehicle Integrated Performance Analysis". This subelement will provide the plume environments analysis for the trade study. The resources for subtask -R0 have been removed after 1 July 2006, as this subtask as been transferred to the Propulsion Directorate. Relocation estimates have been added to subelement -03 and -05 to cover these unexpected costs. The TOP, Schedule and Milestones have been updated to reflect this change.

Revision 01;
This revision adds scope of work to subelement -05. This support will include modeling of radiation transport loads from launch vehicle propulsive plumes and aerothermodynamic computional fluid dynamics (CFD) analysis. This support will also perform software upgrades and/or replacement with entirely new software tools. Additionally, the schedule and milestones have been updated to reflect this change.

This Task Order (TO) replaces TO 22-030301 due to the NASA/MSFC reorganization and the subsequent realignment of the NNM05AB50C ESTS contract. The subelements have been replaced as follows:

New		Old
32-030301-R0		22-030301-R0
32-030301-R1		22-030301-R1
32-030301-02	replaces	22-030301-02
32-030301-03		22-030301-03
32-030301-04		22-030301-04
32-030301-05		22-030301-05

This TO defines and estimates work for the period 1 April 2006 through 29 September 2006. Funding for this TO is provided per MSFC PR number unavailable. Additionally, the Schedule, Performance Plan, and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.

1.0 Task Order Description / Objectives:

Perform aerodynamic, aeroacoustic, and aerothermodynamic analyses in support of Integration, Aero, and Thermal Panels. Provide expert empirical aerodynamic analyses and support the miscellaneous space launch vehicle trade studies and provide evaluation of wind tunnel, computational fluid dynamics (CFD), and engineering code predictions. Perform aerodynamic, aeroacoustic, and plume heating environments analysis for other space launch vehicles and review the implementation of these environments by analysts.

Subelement -07 Miscellaneous Vehicle Studies

The objective of this subelement is to provide Aerosciences support for studies, trades, and preliminary design activities of selected vehicles. These tasks require expert historical knowledge of launch vehicle aerodynamics, aerothermodynamics, plume environments, and aeroacoustics. These tasks require coordination of these disciplines into vehicle-level design studies, trades, and preliminary design assessments.

The following activities shall comprise these tasks and support:

a. Provide engineering method or empirical aerodynamic predictions and assessments.
b. Support wind tunnel testing, data reduction, and aerodynamic database preparation.

c. Provide aerothermodynamic and rocket exhaust plume heating analyses using engineering methods, CFD, and/or empirical relationships.
d. Provide aeroacoustic environment predictions using empirical methods.
e. Provide vehicle base heating assessments and predictions using empirical methods.

Subelement -08 Aerosciences Support for Launch Vehicle Acoustics Insight

The objective of this subelement is to provide Aerosciences support for Kennedy Space Center Evolved Expendable Launch Vehicle (EELV) and Commercial Orbital Transportation Services (COTS) in the area of vehicle acoustics analyses, estimation, and prediction. This task requires knowledge of launch vehicle aeroacoustics, aeroacoustics test techniques and procedures, aeroacoustics data analysis and related methodologies, historical vehicle aero acoustics environment characteristics, and empirical, analytical or computational prediction/comparative methods and tools. This task requires prediction, coordination and evaluation of launch vehicle acoustic environments into vehicle-level sound pressure levels, vibro-acoustic design loads, trades, and preliminary design assessments, and/or evaluation and assessment of contractor-provided acoustic environments and related vehicle and component acoustics qualification and acceptance testing.

The following activities shall comprise these tasks and support:

a. Provide engineering method or empirical aeroacoustic environment predictions and assessments.
b. Provide access to and collection of existing acoustics wind tunnel test data, and related aeroacoustic environments from other vehicles and programs.
c. Provide aero acoustic environment estimations using empirical methodologies to scale existing acoustic data sets for EELV and/or COTS vehicle configurations.
d. Provide insight assessment of contractor-provided aero acoustic environments.
e. Coordinate and serve as a point of contact for the aeroacoustics discipline with the KSC engineering branches responsible for EELV and COTS vehicle insight.

Subelement –XA Flame Trench Launch Loads

The objective of this subelement is to predict the launch-induced environments (thermal and pressure) for a class of launch vehicles. The new environment data will be used for the design of the Main Flame Deflector (MFD) and flame trench. In addition, the data will also be used to update impact pressures and heat flux environments for the KSC-NE-8764 databook.

The following activities shall comprise these tasks and support:

a) Implement the improved PLume IMPingement (PLIMP) code to provide adequate environment data over prescribed body points.
b) Estimate pressures, temperatures, and heat rates on the MFD, side deflectors, and the side walls of the flame trench.
c) Evaluate any proposed modifications to the MFD and flame trench geometry and incorporate proposed changes in geometry into the model, where appropriate, to obtain updated results.
d) Provide an analysis report at the completion of the task.

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

This work includes providing aerodynamic, aerothermodynamic, aeroacoustic, computational fluid dynamic (CFD), debris transport, and unsteady flow analysis, test support, insight and review support for the EV33 Aerosciences Branch for other space launch vehicles that are not Constellation program related.

Subelement -07 Miscellaneous Vehicle Studies

The technical analyses and evaluation associated with this subelement include empirical environment estimation, engineering level code utilization, and incorporation of engineering, CFD, and wind tunnel data in the development of vehicle preliminary design environments, characteristics, and associated products. This subelement further requires understanding and utilization of historical launch vehicle aerosciences data to anchor and further verify current predictions and associated analytical methods. This subelement also requires coordination of various aerosciences assessments, environments, and characteristics provided by other personnel into dedicated vehicle trade studies, assessments, and preliminary design activities.

Subelement -08 Aerosciences Support for Launch Vehicle Acoustics Insight

The technical analyses and evaluation associated with this subelement includes empirical environment estimation, engineering level code utilization, and incorporation of engineering, CFD, and wind tunnel data in the development of estimated aero acoustic environments, characteristics, and associated vibro-acoustic loads. This subelement further requires understanding and utilization of historical launch vehicle aero acoustics flight and wind tunnel data to anchor and further verify current predictions, or assess EELV and/or COTS contractor-provided environments. This subelement also requires coordination of acoustics discipline issues between other branch personnel and KSC engineering branch personnel responsible for EELV and COTS insight functions.

Subelement –XA Flame Trench Launch Loads

The technical analyses and evaluation associated with this subelement include empirical environment estimation, engineering level code utilization, and incorporation of engineering, CFD, Standard Plume Flowfield (SPF), and Plume Impingement Program (PLIMP) in the development launch loads. This subelement also requires understanding and utilization of historical launch vehicle aerothermodynamic data to anchor and further verify current predictions and associated analytical methods.

3.0 Discussion of Skills Required

Subelement -07 Miscellaneous Vehicle Studies

An experience base in Aerosciences environments and characteristics, wind tunnel testing, empirical estimation, and development of flight design Aerosciences databases is required. Familiarity with historical launch vehicle characteristics and environments in Aerosciences disciplines is also required.

Subelement -08 Aerosciences Support for Launch Vehicle Acoustics Insight

An experience base in historic flight vehicle acoustic environments and characteristics, acoustic wind tunnel testing, acoustics test data reduction and analysis, empirical estimation, MATLAB expertise, and development and/or assessment of acoustic environments is also required.

Subelement –XA Flame Trench Launch Loads
An experience base in aerodynamic heating, plume environments, and PLIMP for aeroheating, empirical estimation, and development of flame deflector and flame trench design is required. Familiarity with historical launch vehicle aerothermodynamics and development is also required.

4.0 Special Tools Required

MATLAB, Sinda/FLUENT, CHCHVENT, APAS, CBAERO, CART3D, VAEPP, PLIMP, MINIVER, STATE, LOCI, LOCI-CHEM, and other CFD solvers.

5.0 Participating Subcontractors

Subcontractor	Subelement(s)	Type of Support
(b)(4)	-07, -XA	Aerothermodynamics, CFD

6.0 Milestones and Deliverables

Monthly Activity Reports will be required. Other deliverables will be technical reports tied to program analyses and reviews.

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

Subelement -07 has associated travel for two Technical Interchange Meetings (TIM) to discuss results of the findings, observations, and recommendations of the planned analyses, and is included within the subcontract estimate.

Subelement -08 has associated travel for three TIMs to discuss results of the findings, observations, and recommendations of the planned analyses.

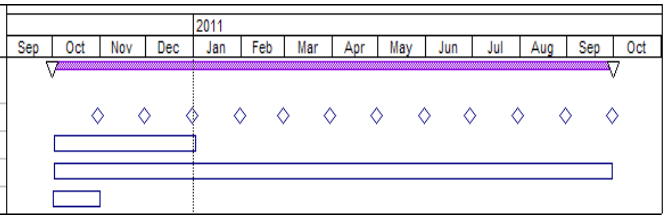
8.0 Work Shelf

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
32-030301	**00**	**Aerodynamics and Aerothermodynamics Analyses & Reviews**
32-030301	00	Monthly Activity Reports
32-030301	07	Miscellaneous Vehicle Studies
32-030301	08	Aerosciences Support for Launch Vehicle Acoustics Insight
32-030301	XA	Flame Trench Launch Loads



ESTS Contract Task Order Request Performance Plan

Task Order Title: Aerodynamic and Aerothermodynamic Analysis and Reviews

Task Order Number: 32-030301 Revision: 19

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X 65% =
		Justification
Perform aerodynamic and aerothermodynamics analyses in support of Space Shuttle Integration Aero and Thermal Panels. Provide expert empirical aerodynamic analyses and support space flight vehicle trade studies and evaluation of space flight vehicle wind tunnel,computational fluid dynamics (CFD), and engineering code predictions. Perform aerodynamic and plume heating environments analysis for the Space Shuttle and other space flight vehicles and review the implementation of these environments by analysts.		
	Weighting Schedule %	**Schedule Score**
Schedule Objectives (Milestones)	10% *(min 10%)*	X 10% =
		Justification
Monthly Activity Reports will be required. Other deliverables will be technical reports tied to program analyses and reviews as agreed to with the program.		
	Weighting Cost%	**Cost Score**
Cost (actual vs. negotiated)	25% *(min.25%)*	X 25% =
		Justification
	Weighting Total %	**Total Score**
	100.00%	

ESTS Contract Task Order Request Performance Plan

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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: Aerodynamic and Aerothermodynamic Analysis and Reviews

Task Order Number: 32-030301 Revision: 19

Comments:

Marshall Space Flight Center
Engineering, Science & Technical Services

JACOBS
ESTS Group

Risk Assessment

Contract Number: *NNM05AB50C*
TO Title: *Aerodynamic and Aerothermodynamic Analysis and Reviews*
TO Number: *32-030301* **Revision:** *19*

Period of Performance: *10/2/2010* to *9/30/2011*

MSFC Initiator: *Mark D'agostino*

(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.

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