

Task Order Plan (TOP)

Contract Number: NNM05AB50C
TO Title: EM40-Composites Manufacturing Support
TO Number: 34-040005 **Revision:** 14

Period of Performance: 10/02/2010 to 7/31/2011

MSFC Initiator: Thomas Delay

(b)(4)

Emergency: No

Revision 14: The purpose of this revision is to add scope and funds to two new subelements (50 and 55) and to add scope and funds to the ST(External Tank) subelement. The new subelements will be for work activities for Advanced Composites Technologies(-50) and Cryotank(-55). Additional funding for the ST subelement will be for subcontractor support for External Tank stringer investigation.

(b)(4)

The Performance Plan and Risk Assessment have not been revised since they are not affected.

Revision 13: 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 March 31, 2011.

Sub-elements 02 , 32, 35 and 60 have been closed in this revision. Added additional sub-element ST (External Tank). This sub-element has additional scope and schedule added to the task order. Sub-element 99 will remain open but does not have any funding or scope. Updated Section 5.0 to reflect that no subcontractor labor will be needed for this task. Updated Section 7.0 to reflect that no travel or ODC is necessary for this task.

Additionally, the Schedule, Performance Plan and Risk Assessment have been revised to reflect changes in task activities for the new period of performance.

Revision 12: The purpose of this revision is to add scope and funds to subelements -02 and -99 to investigate composite repair processes and create a Despatch oven computer interfaced control system to increase shuttle processing efficiency and technology. Additionally, composite joint and fastening systems will be investigated.

Subelements CA, CC, CE, CO, CW, CY and CZ have been administratively closed in an activity separate from this revision to reflect changes in scope for Ares work. The work corresponding to these subelements covered by this task is being continued under the new task order 34-000001 subelement CI. The schedule has been revised to reflect the closed subelements and the costs for the Ares subelements have been updated administratively.

The Performance Plan and Risk Assessment have not been revised since they are not affected.

Revision 11: 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: Upper Stage (subelement CA, CC, CO, CW, CY, CZ)

Revision 10: The purpose of this revision is to more accurately reflect the effort required during this period of performance. The total task order estimate decreased from (b)(4) a decrease of (b)(4). The specific changes by subelement are detailed below. The Schedule, Performance Plan and Risk Assessment have not been revised since there are no expected changes in task activities for this period of performance.

Subelement 02 – Procurement of Composite Layup Production Equipment:

- Materials estimate was decreased by (b)(4) due to freezer procurement not anticipated being completed by the end of the fiscal year.

Subelement 99 – Short Term Support:

- Section 2.0 includes a new statement that describes infrastructure support activities for Building 4707.
- Labor estimate was reduced by (b)(4) hours (b)(4) to more accurately reflect the effort required during this period of performance.

Subelement CA – CLV Integrated Manufacturing and Assembly:

(WBS: 136905.08.05.12.01.08)

- Section 2.0 includes a new statement that describes infrastructure support activities for Building 4707.
- Travel estimate was reduced by (b)(4) because less travel to conferences and vendors was required than expected.
- Labor estimate was reduced by (b)(4) hours to more accurately reflect the effort required during this period of performance. A total labor increase of (b)(4) was due to a shift from (b)(4) hours.

Subelement CW – Common Bulkhead Manufacturing Demonstration Article:

(WBS: 136905.08.05.12.02.08.11)

- Section 2.0 includes a new statement that describes infrastructure support activities for Building 4707.
- Labor estimate was reduced by (b)(4) hours (b)(4) to more accurately reflect the effort required during this period of performance.

Subelement CY – MDA Honeycomb Core and Adhesive Development:

(WBS: 136905.08.05.12.02.08.09)

- Section 2.0 includes a new statement that describes infrastructure support activities for Building 4707.
- Travel estimate was reduced by (b)(4) because less travel to conferences and vendors was required than expected.
- Labor estimate was reduced by (b)(4) hours (b)(4) to more accurately reflect the effort required during this period of performance.

Subelement CZ – MDA Profile Map and Machining Development:

(WBS: 136905.08.05.12.02.08.10)

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

Revision 09: The purpose of this revision is to close the CLV LOX and LH2 Tank and Structural Test Articles sub-element CB and replace this effort with three subelements that more accurately describe the effort. The new sub-elements are CW (Common Bulkhead Manufacturing Demonstration Article), CY (MDA Honeycomb Core and Adhesive Development) and CZ (MDA Profile Map and Machining Development). The labor cost estimates associated with this division will be proportionally divided up to meet each new subelement work load but there is not any additional labor included with this revision. The specific changes by subelement are detailed below. The total task order estimate

(b)(4) The Schedule, Performance Plan and Risk Assessment have not been revised since there are no expected changes in task activities for this period of performance.

Subelement 02 – Procurement of Composite Layup Production Equipment:

- Materials estimate was increased by (b)(4) to cover the cost of purchasing a new freezer, test fixturing and instrumentation.

Subelement CB – CLV LOX and LH2 Tank and Structural Test Articles:

(WBS: 136905.08.05.12.02.08)

- Labor estimate was decreased by (b)(4) hours (b)(4) to reflect this subelement closing and the work moving to subelements CW, CY and CZ.
- ODC estimate was reduced by (b)(4) because this effort will now be covered by subelement CY.
- Subcontractor estimate was reduced by (b)(4) to reflect this subelement closing and the work moving to subelements CW, CY and CZ.
- Travel estimate was reduced by (b)(4) because this effort will now be covered by subelement CY.
- Materials estimate for the CB sub-element has been increased by (b)(4) for the cost of laser perforation of honeycomb core.
- The total impact to this subelement is a decrease of (b)(4)

Subelement CW – Common Bulkhead Manufacturing Demonstration Article:

(WBS: 136905.08.05.12.02.08.11)

- Labor estimate of (b)(4) hours (b)(4) was added to reflect expected work moving from subelement CB.
- Subcontractor estimate of (b)(4) was added to reflect expected work moving from subelement CB.

Subelement CY – MDA Honeycomb Core and Adhesive Development:

(WBS: 136905.08.05.12.02.08.09)

- Labor estimate of (b)(4) hours (b)(4) was added to reflect expected work moving from subelement CB.
- ODC estimate was increased by (b)(4) because this effort was moved from subelement CB.
- Subcontract estimate of (b)(4) was added to reflect expected work moving from subelement CB.
- Travel estimate of (b)(4) was added to reflect expected traveling necessary and was previously covered by subelement CB.

Subelement CZ – MDA Profile Map and Machining Development:

(WBS: 136905.08.05.12.02.08.10)

- Labor estimate of (b)(4) hours (b)(4) was added to reflect expected work moving from subelement CB.
- Subcontract estimate of (b)(4) was added to reflect expected work moving from subelement CB.

Revision 08: 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: First Stage (subelement CE), Upper Stage (subelement CA, CB, CC)

REVISION 07:

The purpose of this revision is to more accurately reflect the effort required during this period of performance. The total task order estimate (b)(4) (b)(4) The specific changes by subelement are detailed below. The Schedule, Performance Plan and Risk Assessment have not been revised since there are no expected changes in task activities for this period of performance.

Subelement CA – CLV Integrated Manufacturing and Assembly:

(WBS: 136905.08.05.12.01.08)

- Labor estimate was reduced by (b)(4) to more accurately reflect the effort required during this period of performance.
- Materials estimate was increased by (b)(4) to cover pre-preg and film adhesive purchases..
- ODC estimate was reduced by (b)(4) because relocation expenses of new employees was not required as expected.,
- Travel estimate was reduced by (b)(4) because less travel to conferences and vendors was required than expected.
- The total impact to this subelement is an increase of (b)(4)

Subelement CB – CLV LOX and LH2 Tank and Structural Test Articles:

(WBS: 136905.08.05.12.02.08)

- Labor estimates was increased by (b)(4) to more accurately reflect the effort required during this period of performance.
- Materials estimate was increased by (b)(4) to cover the purchase of more honeycomb core and film adhesives than originally estimated.
- ODC estimate was reduced by (b)(4) because relocation expenses of new employees was not required as expected.
- Travel estimate was reduced by (b)(4) because less travel to conferences and vendors was required than expected during this reporting period.
- The total impact to this subelement is an increase of (b)(4)

Revision 06 removes the NESC engineering and technician support from the task order by closing sub element -65. A funding cut has forced this change. Additional materials funding has been added to purchase adhesives and honeycomb for the common bulkhead work. Labor hours were adjusted in the (b)(4) category to reflect a subcontractor being added in each case instead of an ESTS team member.

Sub-element 32 – Solid Rocket Booster Nonmetals

(b)(4)

(b)(4)

(b)(4)

Sub-element 65 – NESC Support (Closed)

040006. This functionally groups the (b)(4) with a (b)(4)
(b)(4)

Revision 02 is being written to reduce the scope of this task order, because personnel were hired later than estimated. In addition to this, some travel and materials and supplies estimate has been removed. With work on the systems tunnel beginning, subelement –CB will be used to track this work. This will include procurement of production equipment, namely FiberSim software and a laser projection system, to assure quality of manufacturing. The procurement efforts will begin immediately, but the invoicing will not occur until next year.

Revision 01 is being written to reflect an expansion in the scope of the EM40-Composites Manufacturing Support task. The principal objectives are the further development of the common bulkhead. This revision adds (b)(4)
(b)(4) and it will be phased into the task in mid-June 2007. The financial estimates have been revised to include relocation expenses and to reduce the estimate for materials and for travel.

1.0 Task Order Description & Objectives

The Jacobs-ESTS Group Nonmetals Engineering Team will provide Composites Manufacturing Support for the MSFC EM40-Nonmetals Engineering Branch. This activity includes leadership and fabrication of composite demonstration and proof-of-concept test articles and materials properties test coupons in Buildings 4612 and 4707.

Specific projects to be supported are listed in separate subelements below:

Subelement 02	Procurement of Composite Layup Production Equipment(Closed)
Subelement 32	Solid Rocket Booster Nonmetals(Closed)
Subelement 35	Reusable Solid Rocket Motor(Closed)
Subelement 50	Advanced Composite Technologies (ACT)
Subelement 55	Cryotank
Subelement 60	Radiation Shielding NRA(Closed)
Subelement 65	NESC Support (closed)
Subelement 99	Short Term Support
Subelement CA	CLV Integrated Manufacturing and Assembly (WBS: 136905.08.05.12.01.08) (Closed)
Subelement CB	CLV LOX and LH2 Tank and Structural Test Articles (WBS: 136905.08.05.12.02.08)(closed)
Subelement CC	CLV Cryogenic Insulation (WBS: 136905.08.05.12.07.08) (Closed)
Subelement CE	1 st Stage RSRMV (WBS: 136905.08.01.11) (Closed)
Subelement CO	Structural Development Test Article (SDTA) (WBS: 136905.08.05.12.03.08) (Closed)
Subelement CW	Common Bulkhead Manufacturing Demonstration Article (CBMDA) (WBS: 136905.08.05.12.02.08.11) (Closed)
Subelement CY	MDA Honeycomb Core and Adhesive Development (WBS: 136905.08.05.12.02.08.09) (Closed)
Subelement CZ	MDA Profile Map and Machining Development (WBS:

136905.08.05.12.02.08.10) (Closed)
Subelement EA Orion Support (closed)
Subelement ST External Tank

Additional subelements will be added to this task order (TO) as new projects requiring Nonmetals Engineering Team support are identified.

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

The Jacobs ESTS Group will perform all operations required by the EM40-Composites Manufacturing Team. Specific activities will include:

- Provide technical leadership during the fabrication of composite demonstration and structural proof of concept test articles.
- Assist with composite material/process specification development.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.
- Develop adhesive bonding techniques for composites and sandwich construction.

Specific projects to be supported and the technical approach for each project are described below:

Subelement 02 – Procurement of Composite Layup Production Equipment(Closed)

- Identify and procure a large outdoor freezer that will be used to support composite materials storage.
- Develop a oven control system that utilizes the computer interface and data acquisition system.
- Investigate composite joint technologies for cryogenic and non-cryogenic service.
- Investigate composite fastening systems that are used in industry. Built in place versus applied after layup.

Subelement 50 – Advanced Composites Technologies(ACT)

- Fabricate Composite panels.
- Prepare test samples and fixturing.
- Bonding services.

Subelement 55 – Cryotank

- Fabricate Composite panels.
- Provide proper documentation and engineering direction.
- Prepare test samples.

Subelement 60 – Radiation Shielding NRA(Closed)

- Fabricate composite panels.
- Prepare test samples and test fixtures.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.

Subelement 65 – NESC Support (closed)

- Fabricate composite panels.
- Prepare test samples and test fixtures.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.

Subelement 99 – Short Term Support

- Provide support for any task that requires less than (b) hours of effort and that has no specific deliverable documentation associated with it.
- Support Infrastructure activities for Building 4707.

Subelement CA – CLV Integrated Manufacturing and Assembly (WBS: 136905.08.05.12.01.08) (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.
- Develop adhesive bonding techniques for composites and sandwich construction.
- Identify and procure composite layup support software compatible with the laser projection system.
- Support Infrastructure activities for Building 4707.

Subelement CB – CLV LOX and LH2 Tank and Structural Test Articles (closed) (WBS: 136905.08.05.12.02.08) (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.
- Develop adhesive bonding techniques for composites and sandwich construction.
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Subelement CC – CLV Cryogenic Insulation (WBS: 136905.08.05.12.07.08) (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Develop thermal protection system material/process specifications.
- Implement thermal protection system process improvements.

Subelement CE – 1st Stage RSRMV (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Develop thermal protection system material/process specifications.
- Implement thermal protection system process improvements.

Subelement CO – Structural Development Test Article (Closed)

- Coordinate machining activities.
- Coordinate bonding activities.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.

Subelement CW – Common Bulkhead Manufacturing Demonstration Article (CBMDA) (WBS: 136905.08.05.12.02.08.11) (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.
- Support Infrastructure activities for Building 4707.

Subelement CY – MDA Honeycomb Core and Adhesive Development (WBS: 136905.08.05.12.02.08.09) (Closed)

- Prepare test samples and test fixtures.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.
- Develop adhesive bonding techniques for composites and sandwich construction.
- Support Infrastructure activities for Building 4707.

Subelement CZ – MDA Profile Map and Machining Development (WBS: 136905.08.05.12.02.08.10) (Closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Fabricate composite demonstration and structural proof of concept test articles.
- Implement composite manufacturing process improvements.
- Establish proper form, fit, function and relevant details for composite tooling/design.

Subelement EA – Orion Launch Abort System Support (closed)

- Prepare test samples and test fixtures.
- Coordinate machining activities.
- Provide purchasing services.
- Develop thermal protection system material/process specifications.
- Implement thermal protection system process improvements.

Subelement ST – External Tank (WBS: 524238)

- Fabricate composite test articles.
- Develop composite material/process specifications.
- Implement composite manufacturing process improvements.

- Bonding composites and sandwich constructions.
- Provide engineering support to the ET program for flight.
- Provide white light scanning services as required.

3.0 Discussion of Skills Required

Personnel supporting this task must have experience in design and fabrication of composite and nonmetallic materials. Selected personnel supporting the task must be experienced in manual and automatic composite lay-up techniques, machining, design of composite components.

4.0 Special Tools Required

Personal protective equipment (PPE) appropriate to the performance of the various operations (machining, hand- and automatic-composite laminate lay-up, thermal protection system application, etc.) accomplished by team personnel will be required. FiberSim software and a laser projection system for composite lay-up will be needed to ensure high quality panel and component production. Pro-Engineer CAD software training will be required for at least two of the crew.

5.0 Participating Subcontractors

(b)(4)

6.0 Milestones & Deliverables

Provide reports documenting results of development programs in accordance with project requirements. Provide weekly updates via e-mail or in a scheduled meeting to the composites manufacturing team. Provide formal monthly activity reports. Provide periodic updates of task activities to EM management. Task schedule slips due to uncontrollable circumstances (examples: reprioritization of fabrication projects by customer; etc.) will not be factored negatively in assessing schedule objectives. A majority of the work performed is real time support and is negotiated with the requesting project at the time of receipt.

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

No travel, material or ODC funding is required.

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									
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
34-040005	00	EM40-Composites Manufacturing Support										
34-040005	50	Advanced Composites Technologies										
34-040005	55	Cryotank										
34-040005	99	Short Term Support										
34-040005	ST	External Tank										

ESTS Contract Task Order Request Performance Plan

Task Order Title: [EM40-Composites Manufacturing Support](#)

Task Order Number: [34-040005](#) Revision: 14

Category	Weighting Technical %	End of Period Technical Score
Technical Objectives	65%	X <u>65%</u> = Justification
<p>Provide engineering and technical support to the EM40 (Nonmetals Engineering Branch) Composites Manufacturing Team.</p> <ul style="list-style-type: none"> -Provide technical leadership during the fabrication of composite demonstration and structural proof of concept test articles. -Assist with composite material/process specification development. -Help implement composite manufacturing process improvements. -Help establish proper form, fit, function and relevant details for composite tooling/design. -Help develop adhesive bonding techniques for composites and sandwich construction. 		
Schedule Objectives (Milestones)	Weighting Schedule % <u>10%</u> (min 10%)	Schedule Score X <u>10%</u> = Justification
<ul style="list-style-type: none"> -Monthly Activities Reports -Weekly updates to the Composites Manufacturing Team. 		
<u>Cost (actual vs. negotiated)</u>	Weighting Cost% <u>25%</u> (min.25%)	Cost Score X <u>25%</u> = Justification

ESTS Contract Task Order Request Performance Plan

Task Order Title: [EM40-Composites Manufacturing Support](#)

Task Order Number: [34-040005](#) Revision: 14

Weighting	Total Score
Total %	
100.00%	

Technical, Schedule, and Cost Grading Scale

Score	Description
9.0-10.0	Exceeded TO Performance Plan objectives resulting in major benefit(s)
8.0-8.9	Exceeded TO Performance Plan objectives resulting in modest benefit(s)
7.0-7.9	Met TO Performance Plan objectives
3.0-6.9	Did not meet all TO Performance Plan objectives resulting in minimal impact or requiring additional agency funds
0.0-2.9	Did not meet TO Performance Plan objectives resulting in substantial impact and/or requiring additional agency funds

ESTS Contract Task Order Request Performance Plan

Task Order Number: [EM40-Composites Manufacturing Support](#)

Task Order Number: [34-040005](#) Revision: [14](#)

Comments:

Risk Assessment

Contract Number: NNM05AB50C
TO Title: EM40-Composites Manufacturing Support
TO Number: 34-040005 **Revision:** 14

Period of Performance: 10/02/2010 to 07/31/2011

MSFC Initiator: Thomas Delay

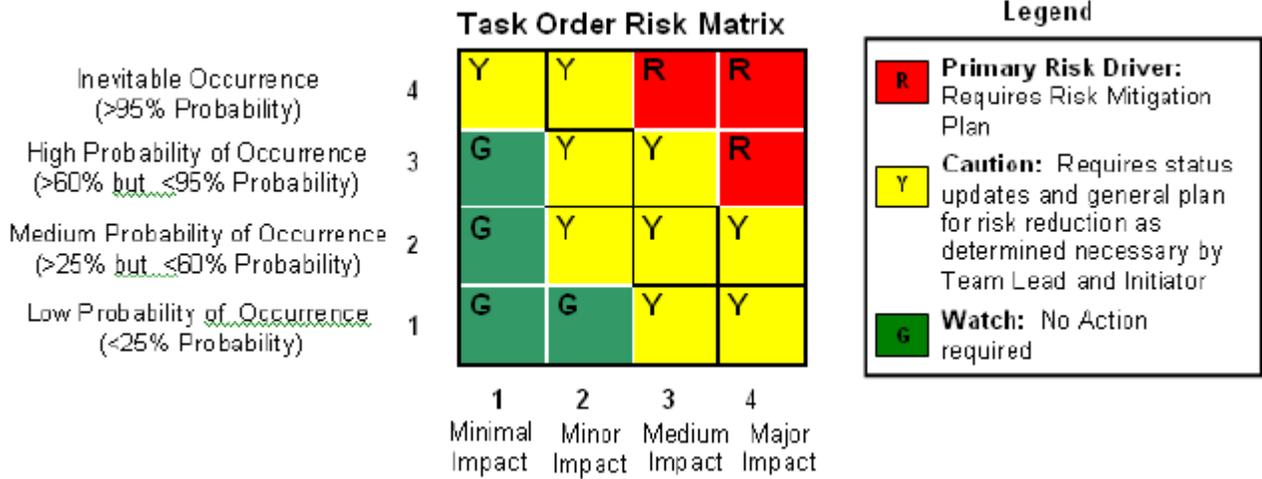
(b)(4)

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	Probabili-ty (1-4)	Im-pact (1-4)	Risk Description
Risk C1	Cost	2	1	There is a risk that the Subtask cost estimate will increase due to unanticipated overtime, material and ODC charges
Risk C2	Cost	4	2	There is a risk that materials evaluation requests will be changed after purchase orders are issued—leading to purchase commitments for undesirable materials and cancellation fees.
Risk T1	Technical	4	2	There is a risk that materials evaluation requests might be changed after purchase orders are issued—leading to a potential that data would be unavailable.
Risk S1	Schedule	4	3	There is a risk that materials evaluation requests might be changed after purchase orders are issued—leading to a potential that data would be unavailable at critical times.

*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 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.

Risks No.: C2, T1, S1		
Risk Description: There is a risk that materials evaluation requests will be changed after purchase orders are issued—leading to purchase commitments for undesirable materials and cancellation fees and a potential that data would be unavailable at critical times.		
Mitigation Step No.	Planned Completion Date	Mitigation Step Description
1	None—ongoing	Current weekly meeting will serve as an appropriate place to discuss any risks.
2		
3		