IG-97-018

FINAL REPORT

RAPID ACTION

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SURVEY OF X-33 TASK AGREEMENTS

March 28, 1997

National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

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Reply to Attn of: W

March 28, 1997

TO: R/Associate Administrator for Aeronautics
MSFC-XXO1/RLV Programs Manager
MSFC-XXO1/X-33 Program Manager

FROM: W/Acting Assistant Inspector General for Auditing

SUBJECT: Final Rapid Action Report
Survey of X-33 Task Agreements
Assignment Number A-MA-96-009
Report Number IG-97-018

The NASA Office of Inspector General (OIG) has completed a survey to evaluate the effectiveness of NASA's procedures for monitoring progress on X-33 task agreements and communicating with the industry and government partners associated with the X-33 project. We found that the X-33 industry partner needs to develop and implement systems for monitoring and tracking cost, schedule, and technical performance.

We issued a draft report on January 30, 1997, and an exit conference was conducted on February 13, 1997. A revised draft report, reflecting the results of the exit conference, was issued on February 18, 1997. Your written response, dated March 12, 1997, is summarized in this report and is included in its entirety as Appendix A.

The corrective actions taken or planned are considered responsive to the report recommendations. We consider recommendation 1 closed. Recommendation 2, however, remains open. On March 25, 1997, X-33 Program Office officials advised us that LMSW must rebaseline the Integrated Master Schedule to include changes to vehicle design, milestones, and budgets. This rebaselining is expected to be completed in May 1997. Since activity related to recommendation 2 is not complete, we are leaving the recommendation open. Further, please include us in the concurrence cycle for closing recommendation 2.

The OIG staff members associated with this audit express their appreciation to the NASA and contractor personnel for their courtesy, assistance, and cooperation. If you have any questions or need additional information, please call me at 202-358-1232 or Ned Echerd, Audit Director, at 205-544-0068.

Robert J. Wesolowski

Enclosure

cc:
JM/D. Green
MSFC-BE01/D. Walker

INTRODUCTION

BACKGROUND

The RLV Program is a partnership between NASA and private industry. The program's goal is to produce leadership in low cost space transportation by developing new technologies and operating ideas that will radically reduce the cost of space access. The X-33 Project is one of several efforts being performed as part of the RLV Program.

Phase I of the X-33 Project was a design concept competition which resulted in NASA selecting the Lockheed-Martin vehicle design. Phase II will advance technology development and research and demonstrate the key design and operational aspects of a single-stage-to-orbit vehicle. Phase II results will support government and private sector decisions by fiscal year (FY) 2000 to commercialize an operational next-generation reusable launch system.

Phase II of the X-33 Project is being performed under Cooperative Agreement NCC8-115 which NASA and Lockheed-Martin Skunk Works (LMSW) signed on July 2, 1996. The cooperative agreement is valued at $1.123 billion. NASA is providing $912 million and LMSW's contribution is $211 million. The X-33 Project includes 19 partners - 5 contractors led by LMSW and 14 government organizations led by NASA.

The government partners, performing as "subcontractors" to respective industry partners, are responsible for numerous activities. Over 250 task agreements identify work that will be performed at government installations for the industry partners. For FY 1996 through FY 1999, the estimated value of government work is $107 million. Support contractors will accomplish about $90 million of this work.

OBJECTIVES, SCOPE, AND METHODOLOGY

The overall survey objective is to evaluate the effectiveness of NASA's procedures for monitoring X-33 task agreements and communicating with all cooperative agreement partners. Specific objectives include determining whether NASA has established:

- Adequate processes to monitor the technical and programmatic status of task agreements.
- Sufficient procedures to monitor the cost, staffing, and schedule performance on individual task agreements.
- Effective communication channels between NASA Headquarters, the Program Office, Field Centers, and industry partners.

SCOPE AND METHODOLOGY

For purposes of this rapid action report, we limited the scope of our survey to reviewing the effectiveness of procedures established by LMSW and Marshall Space Flight Center (MSFC) to monitor the status of X-33 task agreements. We did not review the monitoring capability at other NASA Centers or at Department of Defense installations. We reviewed selected MSFC task agreements to determine the effectiveness of established controls. In addition, we interviewed MSFC and LMSW officials and reviewed supporting documentation at MSFC and at LMSW's Palmdale, CA plant. We focused on LMSW's capability to monitor task agreements.

MANAGEMENT CONTROLS REVIEWED

We reviewed management controls related to procedures and processes established by NASA and LMSW to monitor the status of cost, schedule, and technical performance on X-33 task agreements. Monitoring procedures were specifically reviewed to determine whether:

- Assigned responsibility for monitoring task agreements was appropriate.
- Procedures provided adequate visibility of task agreements.
- Available data on cost and schedule status of task agreements appeared reasonable.

- Frequency of status reporting and distribution of reports was appropriate.

Except for the issues addressed in this report, our review to date did not identify weaknesses in established controls.

SURVEY FIELD WORK

The survey work related to the observations in this report was conducted from September to November 1996, at MSFC and Palmdale, CA. The survey was performed in accordance with generally accepted government auditing standards.

OBSERVATIONS AND RECOMMENDATIONS

OVERALL EVALUATION

We have not completed our overall evaluation of the effectiveness of NASA's procedures for monitoring the status of cost, schedule, and technical performance on X-33 task agreements. However, our survey efforts to date identified a matter which requires immediate management attention. This issue concerns the need to develop and implement sufficient information systems for tracking cost, schedule, and technical performance on the X-33 Project. This matter is discussed below.

MONITORING SYSTEMS HAVE NOT BEEN FULLY IMPLEMENTED

LMSW is responsible for developing and implementing appropriate information systems for monitoring the cost, schedule, and technical performance of the X-33 Project. As of January 1997, however, LMSW had only achieved limited ability to track and report cost, schedule, and technical performance for the overall project and individual task agreements. We recognize that the X-33 cooperative agreement has only been in existence for about six months. Nevertheless, sufficient systems and methods for tracking cost, schedule, and technical performance are needed to ensure efficient and cost effective management of the X-33 Project.

Cooperative agreement NCC8-115 states that LMSW is responsible for:

- "Program cost reporting...for all X-33 Phase II tasks. As appropriate, resources will be allocated and monitored; progress tracked; and status reported to industry team and MSFC program office."

- "Program schedule performance reporting...for all X-33 Phase II tasks. As appropriate, resources will be allocated and monitored; progress tracked; and status reported to industry team and MSFC program office."

- "Integration, allocation, and management of system and subsystem performance budgets across the entire program team. A technical performance measurement approach will be used to define and track performance parameters. Variances will be documented...."

MONITORING COST PERFORMANCE

LMSW's system for monitoring cost performance on the X-33 Project is known as "COSTRACK." LMSW considered COSTRACK operational as of November 1996. We determined, however, that implementation and effectiveness of COSTRACK has been adversely impacted by a number of problems, such as:

- Input from government and industry partners is not always timely.
- Inconsistent month end cutoff dates.
- Inability of some industry partners to report actual hours expended by support contractors.
- A 2 to 3-month lag between budgeted and actual cost data for some partners.
- No automated capability to allocate indirect costs for civil servants.
- Not separately identifying and reporting the actual cost of work performed by government partners on individual task agreements.

As a result of these problems, LMSW plans to make changes to the COSTRACK system.

MONITORING SCHEDULE PERFORMANCE

MSW plans to develop and implement an "Integrated Master Schedule" (IMS) for monitoring the status of X-33 events and milestones. When completed, the IMS will interface with various data bases and identify a "critical path" for the project. LMSW also plans to prepare and issue operating procedures for the IMS. As of January 1997, however, this guidance was only in draft form and had not been finalized. LMSW initially planned to complete the IMS by September 1996, but this completion date has been revised repeatedly. The current estimated completion date is February 28, 1997.

LMSW officials stated they did not know the actual status of work being performed by the government partners because the partners agreed to use an "exception type" reporting system. They also indicated schedule status reporting has essentially been done verbally because the IMS system was not fully operational.

MONITORING TECHNICAL PERFORMANCE

The LMSW Technical Performance Management System (TPMS) will assist project managers by identifying and tracking critical system performance characteristics. It will enable managers to identify problem areas in system design and supportability which may require changes in subsystem requirements, design concept, budget, and schedule. The TPMS system is intended to be used in conjunction with risk management, requirements analysis and allocation, design, cost, schedule, and life-cycle cost assessments.

According to LMSW, a system engineering management plan will be developed to provide specific guidance for operating the TPMS. On January 8, 1997, LMSW stated that the milestone for completing this guidance and implementing TPMS is January 31, 1997.

RECOMMENDATION 1

The Director, Space Transportation Division, and X-33 Project Manager should review LMSW's COSTRACK system to ensure it provides complete and accurate cost information and any needed improvements are completed as soon as possible.

SUMMARY OF MANAGEMENT'S RESPONSE

Concur. The initial challenges in establishing COSTRACK centered around the differences between industry and government operating procedures and the need to provide as much consistency and standardization as possible. Team level reporting lagged due to inconsistent reporting periods, accounting differences, and slow development of the electronic information system. The COSTRACK reporting system has undergone reviews and adjustments have been made. COSTRACK is now providing complete and accurate cost information to RLV and X-33 managers. The system will continue to be monitored over the life of the program to ensure compliance.

EVALUATION OF MANAGEMENT'S RESPONSE

Actions taken or planned by NASA are responsive to the recommendation.

RECOMMENDATION 2

The Director, Space Transportation Division, RLV Programs Manager and X-33 Project Manager should initiate appropriate actions to ensure LMSW's information systems for monitoring schedule and technical performance are fully completed and implemented in a timely manner.

SUMMARY OF MANAGEMENT'S RESPONSE

Concur. Performance measurement systems are in place throughout the NASA and Industry team. Team level accountability resides with the Integrated Product Team (IPT) leaders at LMSW. Individual teammates report their progress and status their activity through technical leads culminating with the IPT leader. IPT leaders review and status their performance weekly to the program office. Schedule issues have been effectively raised and dealt with utilizing internal company scheduling tools consolidated in Palmdale, CA. Technical performance measures are in place and online. Staff has been added as scheduled to track these parameters and flag trends and threshold crossings to management. The X-33 system for monitoring schedule, Integrated Master Schedule, will be in place by February month-end.

EVALUATION OF MANAGEMENT'S RESPONSE

Actions taken or planned are responsive to the intent of the recommendation. However, subsequent to receiving the management response, we received a LMSW status report on the IMS, dated March 22, 1997. This report provides the current status of IMS and identifies what additional work is required to complete the system. The IMS database currently reflects program scope and status as of December 1996, although there have been many changes to the X-33 vehicle design, Team Statement of Work and NASA task agreements processed through the X-33 Configuration Change Board. LMSW is rebaselining the IMS and X-33 Program budgets to incorporate these changes. LMSW also is hiring additional staff who will be dedicated to updating the IMS. LMSW expects to complete the IMS in May 1997.

MAJOR CONTRIBUTORS TO THIS AUDIT

MARSHALL SPACE FLIGHT CENTER	Ned Echerd, Audit Director Jim Linville, Auditor-in-Charge

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National Aeronautics and
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Headquarters
Washington, DC 20546-0001

MAR 12 1997

Reply to Attn of: R

TO: W/Acting Assistant Inspector General for Auditing

FROM: R/Deputy Associate Administrator for Aeronautics
and Space Transportation Technology
(Space Transportation Technology)

SUBJECT: OIG Draft Rapid Action Report on the Survey of X-33
Task Agreements, Assignment Number A-MA-96-009

Enclosed are my detailed comments to the subject report.

I concur with the two recommendations in the report. The corrective actions associated with recommendations 1 and 2 have been essentially completed, therefore, I suggest these recommendations be closed upon issuance of the final report.

If you have any questions or need additional information concerning my comments, please call me at 358-4579.

Gary E. Payton

Enclosure

cc:
R/Dr. Whitehead
RB/Mr. Fuller

RESPONSE TO OIG DRAFT RAPID ACTION REPORT ON SURVEY OF X-33 TASK AGREEMENTS, ASSIGNMENT NO. A-MA-96-009

COMMENTS:

Recommendation 1: Concur. Lockheed Martin Skunk Works's (LMSW) competitive proposal for X-33 Phase II contained an automated system for monitoring cost performance of all industry team members as well as government centers and installations. Known as COSTRACK, this system provides for the reporting of total work force utilization in terms of hours, total cost incurred in terms of dollars, and the resultant plan (or budgeted dollars) vs. actual dollars costed to date. Reporting frequency is weekly for all industry team members and every two weeks for government centers and installations. A monthly report from all partners is also required.

The initial challenges centered around the differences between industry and government's operating procedures and the need to provide as much consistency and standardization as possible. Budgets for all teammates were established by month-end August 1996. Internal systems have been utilized since that time to track and status individual performance. The team level reporting lagged as inconsistent reporting periods (i.e., cut-off dates), accounting differences (NASA program accounting versus industry accounting practices), and the slow development of the electronic information system were dealt with. The following challenges are discussed further:

- Government centers/installation's month end cutoff dates were not the same. This was not unexpected and very early on all partners identified their cutoff dates in order to determine when reporting could be expected from all participants.

- All partners were asked to identify whether they could identify actual hours expended by support contractors. Since most support contractors were already in place when the X-33 Phase II was awarded, the terms and conditions of the existing contracts with support contractors dictated whether it was possible to track actual hours expended. For example, not all support contractors were under a cost type contract which requires "533" reporting. Consequently, the result was mixed; some partners could capture this data and some could not. This situation led to the corrective action of reporting cost incurred by the support contractor as a better measure of performance vs. reporting the hours utilized. This corrective action was implemented end of month November 1996 report.

- The difference between "obligations" and "cost" when applied to government activities was clearly understood by the Government partner. It was recognized that projecting the plan for costing was more meaningful than projecting an obligation plan. Consequently the corrective action taken at end of month November 1996 report accommodated the two-to-three month lag between actual cost data by time phasing the budget and projecting a cost plan vs. an obligation plan.

- Program Management Support (PMS) represents a "head tax" that each project is liable for to their own institution. Allocation methods and percentages vary between centers/installations but amounts are clearly known as shown on each Task Agreement and negotiated with industry prior to award of X-33 Phase II. The PMS requirements are evaluated during the fiscal year.

- The COSTRACK system requires reporting the actual cost of work performed by government partners on individual Task Agreements consistent with the Work Breakdown Structure (WBS) that is in place for X-33 Phase II. This necessitates reporting at times more than one Task Agreement within the WBS roll-up level established. No data (total) is lost with this approach and it is reasonable in terms of efficiency to continue reporting in this manner.

- Timely input from government and industry partners is key to the effective statusing of the X-33 Phase II activity. To improve in this area, specific management attention is focused through the use of weekly telecons to all center points of contact to identify any potential reporting difficulties, as well as weekly management reviews to assess improvements.

- Weekly program review meetings are held with management and Integrated Product Teams (IPT) leaders which deal directly with cost and schedule performance. Initially, we were tracking only 62% of the team costs incurred within a two week window but by January the reporting moved to 98% for the same two week period.

LMSW's COSTRACK reporting system has undergone reviews and adjustments have been made with the November 1996 end of month report. LMSW's COSTRACK System is providing complete and accurate cost information to the satisfaction of the RLV Program and X-33 Project Managers. The system will continue to be monitored over the life of the program to ensure compliance.

Since corrective actions have been taken and will continue to be monitored, we consider this recommendation closed upon issuance of the final report.

Recommendation 2: Concur. Performance measurement systems are in place throughout the NASA and Industry Team and have been since August 1996. The philosophy of performance measurement is to streamline the controls and systems at the team level to highlight areas of concern that management needs to focus on. Once issues of cost, schedule, or technical performance have been raised, individual teammates, as participating members of the team program office, are responsible for statusing the nature of the problem and providing a resolution for that problem.

Team level accountability resides with the IPT's. The IPT leaders are responsible for their overall performance. Cost, schedule, and technical performance is collected by teammates and summarized by IPT. Individual teammates report their progress and status their activity through their technical leads culminating with the IPT leader. The IPT leaders review and status their performance weekly to the program office. This approach enables the program to collect the data in one fashion (via teammates) and validate it with another (IPT Structure).

The team that has been formed for the X-33 Phase II Program is structured across company boundaries. All participants have invested and have a stake in the success of our Phase II program. Accordingly, responsibility and accountability for performance are with the partner's organizations. The Team Program Office, composed of IPT leadership as well as company/NASA leadership, is represented at every site where Phase II work is being completed. Executing and reporting responsibilities are at an appropriate level to ensure that adequate attention is being paid to all areas of concern and to take full economic advantage of existing infrastructure reporting capabilities.

In addition, schedule issues have been effectively raised and dealt with utilizing internal company scheduling tools consolidated in Palmdale, California. This system has enabled the IPT's to status their performance and to raise issues with the program office. We are continuing to seek improvements in both cost and schedule reporting to further enhance our team management tools without imposing additional program and reporting requirements on the team.

The Technical Performance Measures are in place and on-line. Staff has been added as scheduled to track these parameters and flag trends and threshold crossings to management. The X-33 systems for monitoring schedule and technical performance are in place and will continue to be enhanced. The integrated master schedule (IMS) will be in place by February month-end. We believe this will satisfy the recommendation.

Since the necessary corrective actions have been taken, we consider this recommendation closed upon issuance of the final report.