IG-97-019

AUDIT REPORT

REUSABLE LAUNCH VEHICLE PROGRAM

March 27, 1997

National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: W

March 27, 1997

TO: G/General Counsel
R/Director, Space Transportation Division

FROM: W/Acting Assistant Inspector General for Auditing

SUBJECT: Final Audit Report
Reusable Launch Vehicle Program
Assignment Number A-MA-96-001
Report Number IG-97-019

The NASA Office of Inspector General (OIG) has completed an audit of the Reusable Launch Vehicle (RLV) Program. The audit showed that RLV program and procurement planning was consistent with program goals and objectives. However, we found that NASA must continue its efforts to obtain Congressional approval of a waiver of indemnification for its private sector RLV partners. Also, NASA should continue its vigilance in addressing environmental issues and improve its record keeping to substantiate adherence to the Office of Management and Budget program criteria.

Your written response, dated March 14, 1997, is summarized in this report and is included in its entirety as Appendix A. We consider your comments responsive to the report recommendations. Consequently, recommendations 1, 2 and 3 are considered closed.

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 Neddie Echerd, Audit Director at 205-544-0068, or me at 202-358-1232.

Robert J. Wesolowski

Robert J. Wesolowski

Enclosure

cc:
JM/D. Green
MSFC/BE01/D.Walker
MSFC/XX01/R. Bachtel

INTRODUCTION

The Reusable Launch Vehicle (RLV) program is a partnership between NASA and private industry with a goal to develop new technologies and operating concepts that will radically reduce the cost of access to space. As part of the White House's 1994 National Space Transportation Policy, the program is intended to accelerate the continuing commercialization of the next generation of vehicles for the national launch industry.

The program is using an integrated, fast-track approach for reducing the technical and business risks in developing economical, operational, reusable launch vehicles. With an integrated ground and flight test program, including experimental flight vehicles, the RLV program will establish the feasibility of developing a system that can dramatically reduce the cost of putting payloads into orbit.

The technologies required to produce a single-stage-to-orbit (SSTO) RLV are being demonstrated in four distinct areas. These include a ground-based Core Technology Program and three experimental test vehicles, the Delta Clipper Experimental Advanced (DC-XA), X-34, and X-33. The program office at Marshall Space Flight Center (MSFC) manages daily program operations. Project managers have been co-located at industry sites.

The program is divided into three phases. Phase I was a fifteen-month effort to prepare the concept definition and preliminary design of the experimental X-33. It also included the DC-XA and X-34 programs to demonstrate rapid prototyping of advanced space launch technology. Phase II includes development and testing of the X-33 and X-34, and a complimentary ground test program. NASA expects to complete Phase II by the year 2000. Phase III will include design, manufacture and RLV system operation with industry as the system owner/operator, and the government as a customer.

OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

The audit objectives were limited to answering the following questions:

- Was procurement planning coordinated and effective?
- Is NASA effectively evaluating cost and schedule achievement?

SCOPE AND METHODOLOGY

To meet our audit objectives, we conducted interviews with key NASA employees and examined relevant documents. Specifically, we:

- Reviewed documents to obtain an understanding of the program's history.
- Investigated the procurement processes that NASA used for Phase I and Phase II cooperative agreements with commercial firms.
- Gathered data concerning the Office of Management and Budget (OMB) decision criteria required for program advancement.
- Reviewed MSFC payroll records and applicable program personnel listings.
- Evaluated regulations and policies concerning environmental requirements.

MANAGEMENT CONTROLS REVIEWED

We reviewed NASA's organizational structure, cooperative agreement language and the guidelines that provide the framework for the RLV program oversight. Also, we reviewed significant management controls related to program goals and objectives.

AUDIT FIELD WORK

Audit field work was conducted from January through November 1996 at NASA Headquarters and MSFC. The audit was performed in accordance with generally accepted government auditing standards.

OBSERVATIONS AND RECOMMENDATIONS

OVERALL EVALUATION

Our review showed that RLV program and procurement planning was consistent with program goals and objectives. However, issues concerning third party liability claims and environmental impact remain unresolved. These unresolved issues pose a potential risk to achieving program cost and schedule expectations. We also determined that accurate information to substantiate adherence to OMB Phase II Programmatic Criteria was unavailable. The criteria provide the basis for go/no go program decisions. As a result, while management appears to meet the intent of the OMB guidelines, written records to substantiate their claims are inadequate.

Additionally, we are aware of problems with NASA's capacity to monitor cost, schedule and technical achievement. This issue is being addressed in a separate OIG audit.

THIRD PARTY LIABILITY

NASA has used waivers of liability for its aerospace activities to provide indemnification authority for previous test flights. These waivers are available under Section 308 of the National Aeronautics and Space Act (42 U.S.C. §2458 (b)). The waivers are available to users of NASA spacecraft and cover aerospace activities resulting from contract actions. For the X-33, however, the waivers are not available because: (1) NASA's industry partner will be the owner of the X-33; and (2) NASA is using a cooperative agreement, not a contract, for Phase II of the X-33.

Indemnification is required before the first test flight of X-33, scheduled to begin in the spring of 1999. The cost of insurance, however, may be prohibitive or unavailable due to the inherent risks with an experimental program. The industry partners are reluctant to undertake space flight activities unless the liability risks can be mitigated.

NASA has addressed liability relief concerns by proposing an amendment to Section 308 of the Space Act. Management officials expressed no concerns about the amendment's passage. They said it was not controversial, has Congressional support, and Congress has passed similar legislation in the past to address liability issues in the Commercial Space Launch Act (49 U.S.C. Subtitle IX, ch.701, §§70101-70119).

NASA also included language in the cooperative agreement, NCC8-115, acknowledging the potential liability to third parties. If the Section 308 amendment is enacted, NASA will agree to process the partner's application for indemnification against claims of third parties. The indemnification would cover claims for death, bodily injury, or loss of or damage to property resulting from flight testing of the X-33 vehicle.

NASA has been proactive with its proposed amendment to Section 308. The Agency also has been sensitive to industry liability concerns by including language to address the issue in the X-33 cooperative agreement. Liability issues, however, will remain unresolved until Congress enacts legislation or industry accepts responsibility for any third party liability.

If the proposed amendment fails, the industry partners are aware that they may be required, through insurance or otherwise, to accept responsibility. If this occurs, the partners can include the cost of insurance in their financial contribution, or take other measures to provide for financial protection against third party liability. This could alter the funding available to perform planned program tasks. It could also cause schedule delays due to renewed negotiations necessary to incorporate redefined tasks.

RECOMMENDATION 1

The Director, Space Transportation Division, and the NASA General Counsel (Code G) should continue to aggressively pursue resolution of third-party liability issues to ensure indemnification requirements are met before the planned X-33 test flights in the first quarter of 1999.

Management's Response

Management concurred with the recommendation.

Evaluation of Management's Response

Management's comments are responsive to the recommendation. This recommendation is closed.

ENVIRONMENTAL IMPACT

NASA has a responsibility to carry out the applicable provisions of the National Environmental Policy Act (NEPA), while pursuing its mission. The RLV program has actively embraced this duty by including an environmental focus in program planning. An environmental assessment was used to support the program decision to continue Phase II of X-33. Currently, the Final Environmental

Impact Statement (EIS) for the X-33 project is being prepared and is scheduled for release in September 1997.

Not surprisingly, significant environmental concerns have been raised because of the high risk nature of the X-33, an experimental flight test program. These concerns revolve around the potential risk of overflight to the human population and the environment. Potential environmental impact issues include systems reliability, debris impact consequences, sonic booms and the effects on cultural resources .

To date, the environmental analyses performed have not identified any issues that would preclude program continuation. NASA has and continues to review environmental effects of RLV technologies and flight operation sites. Alternate flight test operations, flight test operations facilities, flight test corridors, and propulsion systems for X-33 have been evaluated to identify and scope the magnitude of relevant environmental issues.

Further analyses will address environmental issues associated with the fabrication, assembly, testing and preparation of the flight operations and landing sites associated with the X-33. NASA will lead this effort in preparation of the EIS. Cooperating agencies include the U.S. Department of Defense, the Bureau of Land Management and the Federal Aviation Administration.

To help ensure that all issues will be explored, NASA has solicited comments from state and local governments. Also, NASA has held public meetings and issued formal requests for written comments to obtain input and coordination with all interested and affected parties. In addition, the NASA Office of Inspector General has made the RLV program office aware of environmental issues brought to its attention.

NASA's brisk and active application of NEPA is decisive in the pursuit of RLV program goals. Completion of the EIS by September 1997, is critical to the planned X-33 test flights. Any problems encountered could negatively impact the ambitious program schedules.

RECOMMENDATION 2

The Director, Space Transportation Division, should continue to vigorously pursue current and emerging environmental issues to ensure: (1) completion of the EIS by September 1997; and (2) RLV and X-33 program objectives and schedules can be met with minimal environmental impact.

Management's Response

Management concurred with the recommendation.

Evaluation of Management's Response

Management's comments are responsive to the recommendation. This recommendation is closed.

PROGRAM OFFICE SIZE

Accurate, reliable information to substantiate that the MSFC program office is being maintained in accordance with OMB Phase II Programmatic Criteria is unavailable. To achieve significant cost reductions, the OMB, the Office of Space Transportation Policy, and NASA developed programmatic standards to use as the groundwork for demonstrating a "new way of doing business." The criteria addressed the need for streamlined management methods to oversee RLV program development and demonstration efforts. It formally acknowledged that significant reductions in development and operations costs require a lean management plan.

According to Phase II Programmatic Criteria, "the use of small and efficient project offices is critical to demonstrating low cost development capabilities, streamlined acquisition strategies, minimal government oversight, and other cultural changes required to meet the cost reduction goals of the RLV technology program." This will be shown by maintaining the RLV program management office, including the X-33, X-34, DC-XA, and dedicated technology management offices, at a level no larger than twenty people. The criteria further specified that the personnel would be divided, with eight at NASA Headquarters (HQ) and twelve at MSFC.

According to standards established by the Comptroller General, program management has a responsibility to adopt an organization, methods, and procedures to ensure that resource use is consistent with laws, regulations, and policies. They are also tasked to obtain and maintain reliable resource data. More specifically, the RLV program has an agreement with the NASA Administrator to report program progress toward meeting the decision criteria set forth for the RLV program, Phases II and III, to OMB. The criterion stipulates that the MSFC RLV program management office be maintained at a level no larger than twelve people.

Our review of RLV program office organization documents revealed inconsistencies in data that NASA would use to demonstrate compliance with the OMB criteria. For example:

- The number of positions shown on organization charts varied from ten to seventeen.

- Payroll records showed ten RLV management positions; however, key personnel were not listed.

- Phone listings showed eight RLV management positions, but two employees not included as RLV management charged 100 percent of their time in fiscal year 1996, to a labor code reserved for RLV project managers.

Because the program office is small and management could identify, on an individual basis, the reasons for the data discrepancies, adequate record keeping was not considered a priority. While the RLV program appears to meet the intent of the OMB guidelines to maintain a small program office, written records to confirm the number of people maintained in the MSFC office are inadequate.

Pertinent information is required for management control of resources, to facilitate operations control and decision making abilities. The data must be sufficient to maintain its relevance and value to management. Incomplete and inaccurate documentation impedes management's ability to efficiently track the information. Accurate accounting for program personnel is required to confirm that OMB guidelines are being followed.

RECOMMENDATION 3

The Director, Space Transportation Divison, should ensure appropriate records are available to demonstrate compliance with OMB requirements.

Management's Response

Concur. To assist in complying with OMB guidelines, RLV project management officials at MSFC now utilize a monthly report that provides the capability to monitor actual labor charges to the program. This will ensure only appropriate personnel charge their time and attendance to RLV project codes.

Evaluation of Management's Response

Management's action is responsive to the recommendation. This recommendation is closed.

MAJOR CONTRIBUTORS TO THIS AUDIT

MARSHALL SPACE FLIGHT CENTER	Ned Echerd, Audit Director Teresa Danne, Auditor-in-Charge

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House Subcommittee on Space and Aeronautics

National Aeronautics and
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Reply to Attn of: R

MAR 14 1997

TO: W/Acting Assistant Inspector General for Auditing
THRU: G/General Counsel

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

SUBJECT: Draft Audit Report
Reusable Launch Vehicle Program
Assignment No. A-MA-96-001

I have reviewed the subject report and concur with the report's recommendations. The following comments are related to Recommendation 3:

> To assist in complying with OMB guidelines, RLV project management officials at MSFC now utilize a monthly report that provides the capability to monitor actual labor charges to the program. This will ensure only appropriate personnel charge their time and attendance to RLV project codes.

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

Gary E. Payton

Gary E. Payton

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

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