

GAO

Report to the Administrator, National  
Aeronautics and Space Administration

August 1990

# SPACE PROGRAM SAFETY

## Funding for NASA's Safety Organizations Should Be Centralized



National Security and  
International Affairs Division

B-239537

August 16, 1990

The Honorable Richard H. Truly  
Administrator, National Aeronautics  
and Space Administration

Dear Admiral Truly:

We have completed our review of the National Aeronautics and Space Administration's (NASA) safety-related programs. We reviewed the programs to determine whether NASA had established an independent organization with direct authority for these programs throughout the agency, as recommended by the Presidential Commission on the Space Shuttle Challenger Accident.<sup>1</sup>

## Background

In the aftermath of the space shuttle Challenger accident, the President appointed a commission to review the circumstances surrounding the accident, establish the probable cause or causes, and develop recommendations for corrective action. The Commission's report criticized NASA for its "silent safety program."

The Commission concluded that NASA did not have an independent and effective safety organization. The Chief Engineer at NASA headquarters had overall responsibility for safety, reliability, and quality assurance, but his ability to manage the program was restricted by organizational structure and limited staffing. Safety activities at field centers were subordinate to the projects and activities they were intended to oversee. For example, at Marshall Space Flight Center, the Director of Reliability and Quality Assurance reported to the Director of Science and Engineering, who was responsible for overseeing the development of space shuttle hardware.

According to the Commission, this arrangement resulted in the safety organization's lack of necessary independence from the hardware producer. This lack of independence in turn reduced the safety organization's capability to serve as a watchdog to ensure that sound engineering judgment was exercised in using hardware and in analyzing hardware problems. According to the Commission, an effectively functioning

<sup>1</sup>Report of the Presidential Commission on the Space Shuttle Challenger Accident, (Washington, DC: June 6, 1986), p. 199.

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safety, reliability, and quality assurance organization could have taken action to prevent the Challenger accident.

Among other things, the Commission recommended that NASA establish a safety, reliability, and quality assurance office that would (1) be headed by an Associate Administrator, who would report directly to the NASA Administrator; (2) have direct authority for safety, reliability, and quality assurance throughout the agency; and (3) be independent of other NASA functional and program responsibilities.

In July 1986, NASA responded to the Commission's recommendations by creating the Office of Safety, Reliability, Maintainability, and Quality Assurance (SRM&QA).<sup>2</sup> In addition, it reorganized safety activities at its field centers and provided them with increased resources. The SRM&QA organization is responsible for providing independent oversight, review, assessment, and approval of all NASA's safety-related activities.

According to SRM&QA documents, NASA plans to spend over \$500 million in fiscal year 1990 for SRM&QA activities. Most of this amount is to be spent on prime contractors' efforts to ensure the quality and safety of products they are developing for NASA.

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## Results in Brief

In response to the recommendations of the Presidential Commission on the Space Shuttle Challenger Accident, NASA established the Office of SRM&QA to provide independent oversight of all safety-related activities. This office is headed by an Associate Administrator and reports directly to the NASA Administrator. Field center safety organizations report to center directors but have access, as needed, to the Associate Administrator for SRM&QA.

We found that, while this organizational structure appeared adequate, field center safety organizations were not entirely independent because they obtained most of their funds from activities whose safety-related performance they were responsible for overseeing. The center safety organizations obtained over 90 percent of their fiscal year 1990 budgets—about \$124 million—from the offices whose projects were subject to the center safety organizations' oversight and from the headquarters offices that supervised those projects.

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<sup>2</sup>On May 1, 1990, the name of this office was changed to the "Office of Safety and Mission Quality."

We do not believe that this method of funding enables NASA's safety organizations to maintain the complete independence envisioned by the Presidential Commission. While we found no evidence that such heavy reliance on project offices for funding had compromised the safety programs' effectiveness, the potential for reduced effectiveness exists. Also, NASA officials do not agree on the most appropriate method of budgeting and funding SRM&QA activities. Most of the field centers' officials expressed concern about the effect of current funding processes on the independence of their SRM&QA organizations.

## Current Funding Process Limits Independence

Of the over \$500 million budgeted for safety-related activities, about \$124 million is for the field center safety organizations. These organizations use their funds primarily to pay mission support contractors.<sup>3</sup> However, field center safety organizations must rely on three separate sources for funding: (1) the headquarters SRM&QA office, (2) center project offices, and (3) the headquarters offices that supervise the projects.

The process for funding NASA's field center safety organizations limits their independence because they receive most of their funds from offices whose projects they oversee. Center safety organizations also receive funds from the headquarters offices through a multiple program support process.<sup>4</sup> Consequently, center SRM&QA activities could be underfunded, and the flexibility of center safety oversight could be restricted. While not all NASA officials agree, most center officials expressed concern that the current funding process could compromise independence or result in an inadequately funded SRM&QA program.

Further, NASA does not have one standard process to budget for SRM&QA activities. At the Goddard Space Flight Center, for example, programs provide some funds directly but also are taxed a percentage of their budgets to support generic SRM&QA activities at the center. The percentage is based on the number of civil service employees assigned to the project.

On the other hand, the Marshall Space Flight Center's SRM&QA officials and project representatives negotiate the amount of center project funds

<sup>3</sup>Mission support contractors provide critical surveillance of design, manufacturing, and testing activities to assess compliance with policy, requirements, and controls. They also analyze and track problems and their corrective actions.

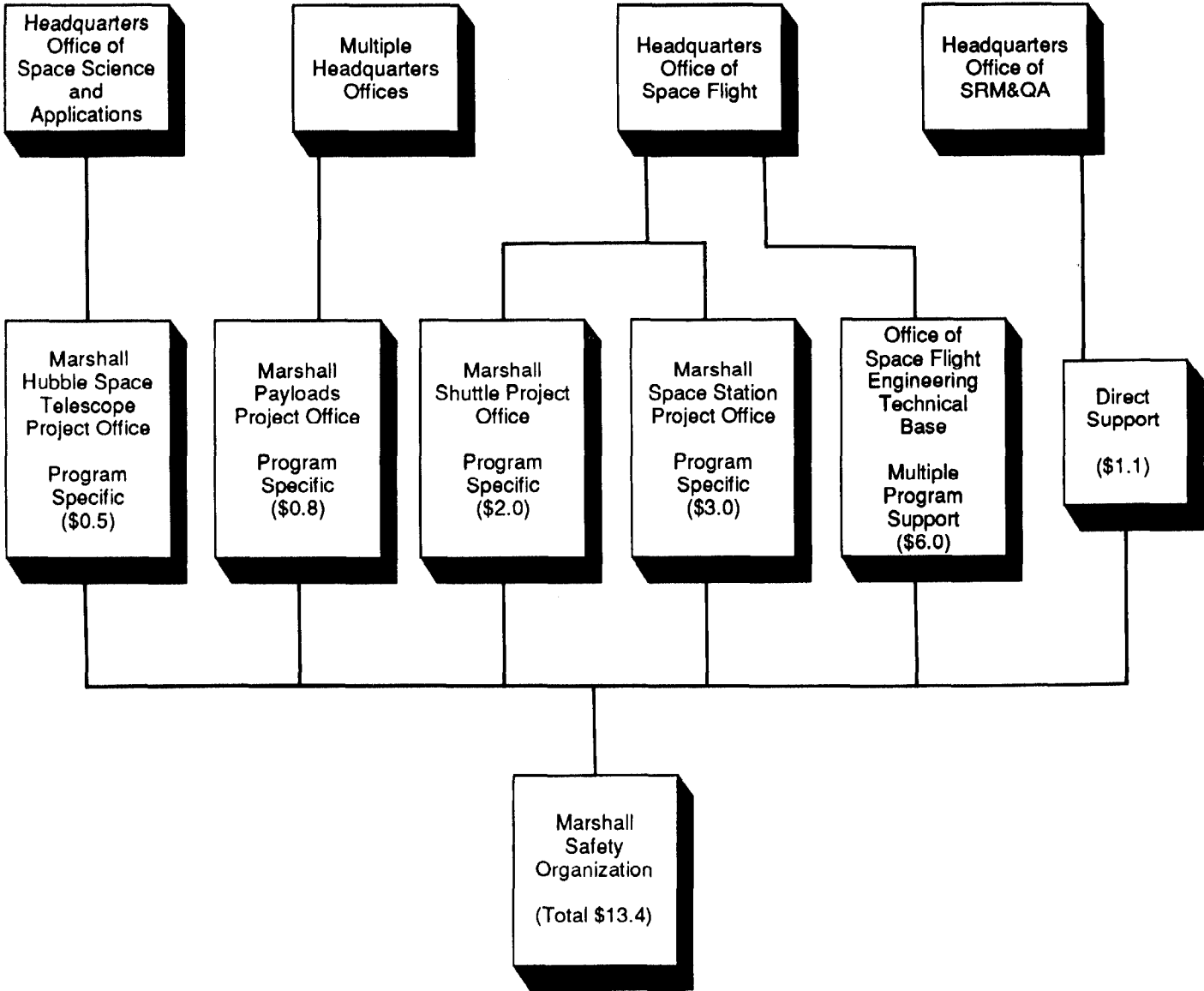
<sup>4</sup>As defined in this report, "multiple program support" refers to all funds provided to the centers by headquarters offices to finance common projects. These funds are classified as "engineering and technical base funds," "multiple program support funds," and "benefits assessments funds."

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to support Marshall's safety organization. The Marshall safety organization also obtains multiple program support funds from the headquarters office of Space Flight's engineering and technical base budget. In fiscal year 1990, for example, the headquarters Office of SRM&QA provided a relatively small amount—\$1.1 million—to Marshall Space Flight Center and earmarked it for specific tasks rather than for support of Marshall's general SRM&QA mission. About 92 percent, or \$12.3 million (\$13.4 million minus \$1.1 million), of Marshall's fiscal year 1990 SRM&QA funds came from both the project offices whose projects the center SRM&QA office was to oversee and the headquarters offices that supervised those projects. Figure 1 illustrates the funding sources for the Marshall Space Flight Center's SRM&QA activities in fiscal year 1990.

**Figure 1: Marshall Space Flight Center SRM&QA Funding Sources (Fiscal Year 1990)**

Dollars in millions



**Implications of the Current Funding Process**

We did not identify any instances in which the Office of SRM&QA's effectiveness was reduced because of a lack of independent funding. However, the potential for reduced effectiveness exists.

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The absence of a single, independent funding source could result in the underfunding of the center safety oversight function. Center SRM&QA activities must compete for funding with research and development activities, and most of the funding is controlled by managers who are responsible for this research and development. Officials at Marshall Space Flight Center noted, for example, that the keen competition for project office funds can result in a resistance to adequately funding center safety functions. According to Stennis Space Center officials, obtaining funding from a variety of project offices is more difficult than obtaining funding from a single source.

The lack of centralized, independent funding may also restrict the flexibility of center safety managers. Officials at Johnson Space Center told us, for example, that they cannot use funds provided for a specific project or program to perform work on another project or program. As a result, they might be unable to respond promptly to changes in circumstances and priorities. These officials said that the Space Station Project Office had significantly underfunded SRM&QA activities and subsequently denied the request for additional funding. Consequently, Johnson officials used multiple program support funds from the Office of Space Flight to supplement funding for what they termed a "minimal SRM&QA program" for Johnson's Space Station Freedom work package. These officials indicated that the only reason they had been able to use multiple program support funds in this manner was that they had some discretionary control over them. However, according to these officials, their ability to continue using these funds is being impaired because the funds are frequently earmarked for specific uses.

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### Most NASA Safety Managers Believe That Centralized SRM&QA Funding Would Ensure Independence

Not all NASA officials agreed on the need for a centralized SRM&QA budget, even though it would ensure independent funding in meeting oversight responsibilities. However, according to the Director of Safety, Reliability, and Quality Assurance at the Johnson Space Center, in discussions at a recent SRM&QA headquarters conference, all the centers except Goddard favored a centralized source of funding for their SRM&QA organizations.

In March 1989, the Director of the Marshall Space Flight Center recommended that the agency's total SRM&QA budget be provided through the Office of SRM&QA. The Director pointed out that, while ongoing center SRM&QA programs were funded by the headquarters Office of Space

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Flight and programs receiving SRM&QA support, the center needed additional SRM&QA funding. According to the Director, a separate centralized budget would provide a better focus for NASA's SRM&QA efforts.

The Director of Safety, Reliability, and Quality Assurance at the Johnson Space Center addressed the need for an independent funding source in a July 1989 memorandum to the Associate Administrator for SRM&QA. He pointed out that "he who controls the funds also determines the content of the activity." He recommended that the Office of SRM&QA fully budget all funds needed by the center safety organizations. According to this official, reliance on program funding represents the same funding arrangement that existed prior to the Challenger accident.

In an October 5, 1989, memorandum to the Associate Administrator for SRM&QA, the Director of Safety, Reliability, and Quality Assurance at the Kennedy Space Center expressed concern that the independent evaluation provided by safety organizations is jeopardized when critical funding is not appropriated. In this official's opinion, the headquarters SRM&QA's support for field center funding is crucial to the success of the center's safety programs. He recommended that NASA establish a process by which the safety resource requirements could be funded. The Kennedy official added that this process should include safeguards against the deletion of funds without the approval of the headquarters SRM&QA organization.

On the other hand, SRM&QA managers at the Goddard Space Flight Center told us that they do not believe that their independence is limited because they are funded by project and program offices. These officials said that they had not encountered any funding problems. They believe that project managers have primary responsibility for safety and that the use of project funds for safety oversight is consistent with that responsibility.

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## Conclusions

NASA has implemented the Presidential Commission's recommendation to establish separate organizations to oversee SRM&QA activities. However, because the field center safety organizations are funded primarily by the project offices whose projects they oversee and by headquarters offices that supervise those projects, they do not have the complete independence envisioned by the Presidential Commission. Although we did not identify any situations in which the existing funding process had compromised safety programs' effectiveness, the potential for reduced effectiveness exists, and the safety organizations' oversight functions



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could be compromised. In addition, the safety organizations could be underfunded and their flexibility impaired because they rely on this funding mechanism.

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## Recommendation

We recommend that the NASA Administrator modify the processes and procedures for formulating the SRM&QA budget to ensure that SRM&QA activities are funded independently of the programs and activities they are responsible for overseeing. We further recommend that the SRM&QA budget be established within the Office of SRM&QA.

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## Agency Comments and Our Evaluation

In commenting on a draft of this report, NASA acknowledged that since the creation of the Office of SRM&QA, a vigorous debate has ensued on the merits of centralized funding. However, NASA has chosen not to centralize funding within the Office of the Associate Administrator for SRM&QA because it could (1) lead to a lessening of the safety and mission quality responsibilities of the program managers by encouraging them to defer decisions to the Office of SRM&QA; (2) generally diminish the interaction between field center SRM&QA organizations and program offices and affect program managers, efforts to ensure that the highest priorities are addressed in the budgeting process; and (3) require a significant increase in the SRM&QA staff to properly administer the function. (NASA's comments are reprinted in app. I).

We agree that project managers should be responsible for SRM&QA and that most of the funds for SRM&QA activities are properly controlled by the project managers and provided to their prime contractors to carry out their SRM&QA responsibilities. However, the SRM&QA organization is to provide independent oversight, reviews, and assessments of how well project managers carry out their SRM&QA responsibilities. Therefore, we continue to believe that, to ensure independence, funding for these activities should be controlled by the Associate Administrator for SRM&QA and not the project managers.

We also agree that field center SRM&QA organizations should be active participants in the budgetary process and that interaction between those organizations and project offices should continue. However, in our view, trade-offs between project requirements and SRM&QA oversight requirements ought to be made at the highest levels of the organization, rather than at project office levels.

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Finally, while some increase in staff to administer centralized funding might be necessary to ensure independent oversight, we question why a sizable increase would be necessary. Field center safety organization budgets are relatively small—totaling about \$124 million of NASA's \$12.3 billion fiscal year 1990 research and development budget—and consequently should not require a large number of personnel to administer them. Also, consolidation should offer some offsetting efficiencies both in the headquarters offices and project offices where the budgets are currently administered and in field center SRM&QA organizations where personnel now participate in multiple budget reviews each year.

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## Scope and Methodology

We examined the report of the Presidential Commission on the Space Shuttle Challenger Accident, internal NASA documents, and studies related to SRM&QA organization and budgeting issues. We obtained safety information on all nine space centers from NASA's SRM&QA headquarters office. In addition, we visited Marshall Space Flight Center, Johnson Space Center, and Goddard Space Flight Center to review records and interview officials to obtain their perspectives on the need for independent funding. We conducted our review from October 1989 to May 1990 in accordance with generally accepted government auditing standards.

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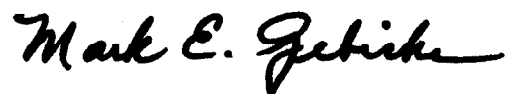
As you know, the head of a federal agency is required by 31 U.S.C. 720 to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations no later than 60 days after the date of this report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this report.

This report is also being sent to the Chairs of the Subcommittee on VA, HUD, and Independent Agencies of the House and Senate Appropriations Committee; the Subcommittee on Science, Technology and Space of the Senate Committee on Commerce, Science, and Transportation; the House Committee on Science, Space, and Technology; and the Director of the Office of Management and Budget. Copies will also be made available to others upon request.

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Please contact me on (202) 275-5140 if you or your staff have questions concerning this report. Major contributors to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "Mark E. Gebicke". The signature is written in a cursive style with a long, sweeping underline.

Mark E. Gebicke  
Director, NASA Issues

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# Comments From the National Aeronautics and Space Administration



National Aeronautics and  
Space Administration

Washington, D.C.  
20546

Office of the Administrator

JUN 28 1990

Mr. Frank C. Conahan  
Assistant Comptroller General  
U.S. General Accounting Office  
Washington, DC 20548

Dear Mr. Conahan:

We are gratified by the General Accounting Office's assessment of the NASA Office of Safety and Mission Quality (SMQ) and the finding that the function is working well and in accordance with the recommendations of the Rogers Commission. The one issue identified was funding, i.e., central funding of all SMQ activities through the Associate Administrator for SMQ versus the current policy of funding the majority of SMQ activities through the program offices.

Since the creation of SMQ, a vigorous debate has ensued on the merits of all funding being controlled by the Associate Administrator for SMQ. We have chosen not to centralize funding within the Office of the Associate Administrator for the following reasons:

1. Historically, NASA has been run as a matrix organization. The project managers bear responsibilities for all aspects of the projects that they supervise, including SMQ. It is their responsibility to distribute the funds available to them in a manner that ensures the best result possible for their projects. They are held accountable for all aspects of the project performance, including SMQ. Thus, through direct allocation of funds from project to SMQ tasks, they assure that their project will receive the support required. Transferring the total responsibility for SMQ funding to the Associate Administrator for SMQ could lead to a lessening of the safety and mission quality responsibilities of the program managers by encouraging them to defer all decisions in this area to the Office of SMQ. The role of the Associate Administrator for SMQ is to provide independent oversight, review, assessment, approval, policy development and enforcement.
2. The current arrangement requires active participation by each field center SMQ organization in the budgetary process. They must vigorously defend their requirements and champion their needs to both program management and management of the

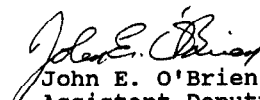
Office of SMQ. Since resources are always limited, we believe this is a very healthy process that assures the highest priorities are always addressed. In his current role, the Associate Administrator for SMQ does have constant access to the NASA Administrator and acts as an advocate for SMQ funding priorities. We agree that the provisions for funding this function in NASA can influence the rigor of SMQ, and we also agree that SMQ is currently performing effectively.

Under this structure, the SMQ function has been appropriately carried out, and, as stated within the GAO report, there is "no evidence that such heavy reliance on project offices for funding had compromised safety program effectiveness . . . ." During our continuing management reviews, we will address the funding issues and make any changes necessary to maintain the current level of SMQ discipline.

3. Concentration of total funding requirements in SMQ would require a significant increase in staff to properly administer this function.

We compliment your professional staff, and we want to thank you again for your impartial and objective review of this function within NASA. An outside perspective is always welcome as we seek to continually improve our performance.

Sincerely,

  
John E. O'Brien  
Assistant Deputy Administrator

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# Major Contributors to This Report

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