

IG-01-017

**AUDIT
REPORT**

**SPACE SHUTTLE PROGRAM MANAGEMENT
SAFETY OBSERVATIONS**

March 23, 2001



National Aeronautics and
Space Administration

OFFICE OF INSPECTOR GENERAL

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Acronyms

COTR	Contracting Officer's Technical Representative
FY	Fiscal Year
GAO	General Accounting Office
HEDS	Human Exploration and Development of Space
IRIS	Incident Reporting Information System
NPG	NASA Procedures and Guidelines
NSTS	NASA Space Transportation System
OIG	Office of Inspector General
S&MA	Safety and Mission Assurance
SFOC	Space Flight Operations Contract
SR&QA	Safety, Reliability, and Quality Assurance
SSP	Space Shuttle Program
TMR	Technical Management Representative
USA	United Space Alliance

W

March 23, 2001

TO: A/Administrator

FROM: W/Inspector General

SUBJECT: INFORMATION: Space Shuttle Program Management Safety Observations
Report Number IG-01-017

The NASA Office of Inspector General (OIG) is performing an audit of the United Space Alliance's (USA's) safety procedures under NASA's Space Flight Operations Contract (SFOC).¹ As part of the audit, we reviewed the oversight of USA's safety procedures for the Space Shuttle Program at the Lyndon B. Johnson Space Center (Johnson). We found that the Johnson Safety, Reliability, and Quality Assurance Office (Johnson Safety Office) is not providing the required support to the Manager, Space Shuttle Program Safety and Mission Assurance (Space Shuttle Program Safety Manager), for oversight of USA's safety activities. We also found that NASA's contractor surveillance plans do not address all SFOC requirements for safety; USA did not update its Management Plan to reflect organizational and personnel changes to the SFOC, including changes in key safety personnel from NASA and USA; and USA's reporting to NASA of close calls² and mishaps needs improvement. As a result, NASA does not have adequate management

¹ NASA awarded the SFOC to USA of Houston, Texas, on September 26, 1996. USA is a joint venture of The Boeing Company and Lockheed-Martin to conduct the SFOC and is the prime contractor for NASA's Space Shuttle Program. USA performs work for SFOC under contract number NAS9-20000. The total contract cost plus fee is estimated at \$8.6 billion. The contract is a cost-plus-award-fee/incentive fee/performance fee type contract and has a period-of-performance of October 1, 1996, through September 30, 2002. The contract includes two, 2-year option periods, which potentially extend the period-of-performance through September 30, 2006.

² NASA Procedures and Guidelines (NPG) 8621.1, "NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping," June 2, 2000, defines a close call as a situation or occurrence with no injury, no damage or only minor damage (less than \$1,000), but has the potential to cause any type mishap, or any injury, damage, or negative mission impact. (A close call is not considered a mishap, but the mishap reporting, investigation, and recordkeeping and recurrence control guidelines will be followed).

controls in place to ensure (1) effective oversight of USA's safety operations under the SFOC, (2) better control over \$13 million³ in annual Space Shuttle Program funds provided to the Johnson Safety Office, and (3) that adequate corrective actions are taken on all safety mishaps and close calls. We have addressed safety involving NASA contractors in two prior audit reports.⁴ A synopsis of each report is in Appendix B of the attached report.

Background

The SFOC and the SFOC Contracting Officer impose many safety requirements on USA and NASA. The NASA Space Transportation System (NSTS) 07700⁵ requires that the Johnson Safety office support the Space Shuttle Program Safety Manager. Also, the Contracting Officer requires each Technical Management Representative (TMR)⁶ to develop a surveillance plan that includes providing input to the Space Shuttle Program Safety Manager regarding safety issues in each of the TMR's delegated areas of responsibility. In addition, the SFOC requires USA to establish and maintain a Management Plan that includes current procedures for management of USA's safety program under SFOC. Finally, the Agency requires that all NASA reportable mishaps and close calls (including those incurred by contractors) be recorded and submitted electronically to the Agencywide reporting system.⁷ Prompt management attention to these areas is particularly important to the continued success of the Space Shuttle Program as it prepares to increase the number of flights in the next year.⁸

³ Johnson Space Shuttle Program management provided us this funding amount. The Johnson Space Shuttle Program Business Management Office could not provide us documentation to support the amount. This funding flows down to the Johnson Safety Office, Shuttle Division from the various Space Shuttle Program components (Orbiter, External Tank, Space Shuttle Main Engine). From a total of \$16 million, \$3 million was for the Johnson Institutional Safety Office. The Johnson Safety Space Shuttle Division consists of 22 civil servants and 120 contractor support staff.

⁴The two reports that address safety issues with NASA contractors are Report No. IG-00-035, "Contract Safety Requirements at Kennedy Space Center and Marshall Space Flight Center," June 5, 2000, and IG-00-28, "Safety Concerns with Kennedy Space Center's Payload Ground Operations," March 30, 2000.

⁵ SFOC Section J-1-A, paragraph 1 imposes the NSTS 07700 series of documents, "Space Shuttle Program Requirements and Description." The latest revision of NSTS 07700, Revision G, was dated December 17, 1997.

⁶ The Contracting Officer delegates management of each major component of the Space Shuttle Program to the TMR's. The major components are (1) Space Shuttle Program Systems Integration, (2) Safety and Mission Assurance, (3) Space Shuttle Program Management Integration, (4) Avionics and Software, (5) Flight Crew Operations, (6) Mission Operations, (7) Space Shuttle Vehicle Engineering, (8) Space Station Office, (9) Solid Rocket Booster Project, (10) Logistic Operations, and (11) Shuttle Process Integration.

⁷ The Incident Reporting Information System (IRIS) is NASA's Agencywide automated system for tracking mishap and injury information. The IRIS enables the real-time reporting of mishaps and injuries and facilitates detailed mishap investigation and follow-up documentation. The IRIS provides a valuable tool for reporting mishap information to NASA management and outside sources and is the Agency's primary system for accumulating data on employee injuries and lost time rates.

⁸ From October 2000 through September 2001, NASA has planned nine Space Shuttle flights to assemble the International Space Station. From 1996 through 2000, NASA averaged five flights per year.

Management Response and OIG Evaluation

While management did not agree with all of the findings, Johnson concurred with the recommendations and has planned or taken responsive corrective actions. Johnson will establish procedures to clarify the responsibilities of the Johnson Safety Office to ensure that it provides the necessary support to the Space Shuttle Program Safety Manager. Johnson also plans to update the various SFOC surveillance plans to adequately address safety, revise the SFOC Management Plan to reflect current operations, and ensure that the Agency's automated mishap tracking system accurately reflects current USA mishap and close call information.

Details on the status of the recommendations are in the report's recommendation section.

[original signed by]

Roberta L. Gross

Enclosure

Final Report on Audit of Space Shuttle Program Management Safety Observations

FINAL REPORT
AUDIT OF SPACE SHUTTLE PROGRAM MANAGEMENT
SAFETY OBSERVATIONS

W

March 23, 2001

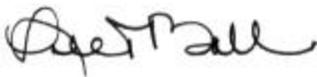
TO: M/Associate Administrator for Space Flight
AA/Acting Director, Lyndon B. Johnson Space Center

FROM: W/Assistant Inspector General for Auditing

SUBJECT: Final Report on Audit of Space Shuttle Program Management Safety
Observations
Assignment Number A0004100
Report Number IG-01-017

The subject final report is provided for your information and use. Please refer to the Executive Summary for the overall audit results. Our evaluation of your response is incorporated into the body of the report. The corrective action completed on recommendation 3 was responsive, and the recommendation is considered closed for reporting purposes. The corrective actions planned for recommendations 1 and 2, and 4 through 10 were responsive. Please notify us when action has been completed on those recommendations, including the extent of testing performed to ensure corrective actions are effective.

If you have questions concerning the report, please contact Mr. Kevin J. Carson, Program Director, Safety and Technology Audits, at (301) 286-0498, or Mr. Karl Allen, Audit Program Manager, at (202) 358-2595. We appreciate the courtesies extended to the audit staff. The final report distribution is in Appendix G.



(for) Russell A. Rau

Enclosure

cc:

AA/Director, John F. Kennedy Space Center

B/Acting Chief Financial Officer

B/Comptroller

BF/Director, Financial Management Division

G/General Counsel

H/Associate Administrator for Procurement

JM/Director, Management Assessment Division

L/Acting Associate Administrator for Legislative Affairs

Q/Associate Administrator for Safety and Mission Assurance

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NASA Office of Inspector General

IG-01-017
A0004100

March 23, 2001

Space Shuttle Program Management Safety Observations

Executive Summary

Background. For this portion of the audit, we reviewed the oversight of USA's safety procedures for the Space Shuttle Program at Johnson. During our audit, we identified several weaknesses in the overall management control of Space Shuttle Program safety that need management's attention.

Objectives. Our overall audit objective is to evaluate USA safety procedures for NASA's SFOC. The specific objective related to this report was to determine whether NASA is performing effective oversight of USA's safety program.

Appendix A contains further details on the audit objectives, scope, and methodology. Subsequent reports will address the audit's remaining objectives as detailed in Appendix A.

Results of Audit. Since the SFOC was awarded, NASA has flown a total of 22 successful Space Shuttle flights. Despite this success rate, NASA's oversight of USA's safety operations under the SFOC needs improvement. Specifically:

- The Johnson Safety Office is not providing the required support to the Space Shuttle Program Safety Manager, for oversight of USA's safety activities. As a result, Space Shuttle Program Management did not have the necessary management controls in place to ensure (1) better control over \$13 million in Space Shuttle Program funds provided to the Johnson Safety Office and (2) effective safety oversight of key components of the Space Shuttle Program which are part of USA's work under SFOC (Finding A).
- NASA's contractor surveillance plans do not address all SFOC requirements for safety thus hindering NASA's monitoring of USA's safety operations (Finding B).
- USA did not update its Management Plan commensurate with the changes to the SFOC, resulting in a less effective management tool for monitoring USA's management and performance under the SFOC (Finding C).

- USA's reporting to NASA of close calls and mishaps needs improvement. Until improvements are made, NASA's system for reporting and tracking mishap information is not as effective as possible in tracking and monitoring mishaps and their corrective actions (Finding D).

Recommendations. NASA should ensure that the Space Shuttle Program Safety Manager receives the necessary support from the Johnson Safety Office. In addition, NASA should ensure that (1) surveillance plans address all contract requirements for safety, (2) USA's SFOC Management Plan is kept current, and (3) USA promptly and accurately reports all required close call and mishap information to NASA's reporting system.

Management's Response. Management concurred with each recommendation and has taken or planned corrective actions that we consider responsive. The complete text of the response is in Appendix F.

Introduction

Under the SFOC, USA is responsible for the day-to-day operation and management of the U.S. Space Shuttle fleet; thus USA's work affects the safety of NASA's astronauts, the Space Shuttle orbiters, and other space hardware, personnel, and equipment. Johnson is responsible for managing the SFOC and the Space Shuttle Program. The NASA SFOC management team consists of the Contracting Officer, a Contracting Officer's Technical Representative (COTR), 4 Assistant Contracting Officers, and 11 TMR's. The Johnson Space Shuttle Program management team includes a Manager, Assistant Manager, and Manager for Safety and Mission Assurance.

USA's specific responsibilities under the SFOC include Space Shuttle modification, testing, checkout, and launch and landing activities at the John F. Kennedy Space Center (Kennedy) and flight operations at Johnson. Johnson is responsible for managing the SFOC and the Space Shuttle Program. The Space Shuttle Program management team is integrated into the SFOC management team in that the Assistant Manager is the SFOC COTR, and the Manager Safety and Mission Assurance is the SFOC TMR for Safety and Mission Assurance (S&MA). The SFOC Statement of Work, paragraph 1.3, specifies the safety and mission assurance requirements for the contract. Appendix C of this report lists Agency safety and quality requirements that have been incorporated, by reference, into the SFOC.

Findings and Recommendations

Finding A. Matrixed Support for Safety Oversight

The Johnson Safety Office did not provide the required support to the Space Shuttle Program Safety Manager for oversight of USA's safety activities. This occurred because Johnson did not clearly define the roles, responsibilities, and lines of authority for the Space Shuttle Program Safety Manager and the Johnson Safety Office regarding Space Shuttle Program safety. As a result, Space Shuttle Program Management did not have the necessary management controls in place to ensure (1) better control over \$13 million in Space Shuttle Program funds provided to the Johnson Safety Office and (2) effective safety oversight of key components⁹ of the Space Shuttle Program which are part of USA's work under the SFOC.

NASA Policy on Space Shuttle Program Safety Responsibilities

Johnson has several policies that address Space Shuttle Program safety. NSTS 07700, Volume 1, paragraph 3.4.1.3, "Space Shuttle Program Requirements," designates the Space Shuttle Program Safety Manager as being responsible for "managing Space Shuttle S&MA implementation and for oversight of all S&MA activities in support of the Space Shuttle Program." The key responsibility of the Space Shuttle Program Safety Manager is to:

Ensure establishment of contractor S&MA processes to assure that the Space Shuttle and its related support systems are designed, constructed, qualified, and operated satisfactorily to perform their intended purposes.

Johnson Procedures and Guidelines 1107.1A, "The Johnson Organization," assigns safety responsibility to the Johnson Safety Office by stating:

The SR&QA [Safety, Reliability, and Quality Assurance] Space Shuttle Division ensures Shuttle flights are accomplished safely with high mission assurance. The Division Chief represents SR&QA on the Space Shuttle Program Manager's staff. This representation includes all elements of SR&QA throughout the Agency that support the Space Shuttle Program.

NSTS 07700, Volume 1, paragraph 3.4.2.14, "Safety, Reliability, and Quality Assurance," requires that the Johnson Safety office support the Space Shuttle Program Safety Manager. This paragraph states:

This function performed by the Johnson SR&QA [Safety, Reliability, and Quality Assurance] Office includes the matrixed support effort and resources necessary to support the Manager, Space Shuttle Program S&MA and assure

⁹ The Space Shuttle Program consists of several components; each component is managed by a separate TMR. The components are Systems Integration, Management Integration, Avionics and Software, Flight Crew Operations, Mission Operations, and Orbiter Vehicle Engineering (at Johnson); Solid Rocket Booster Project (at George C. Marshall Space Flight Center); and Logistic Operations and Shuttle Process Integration (at John F. Kennedy Space Center).

the implementation of requirements applicable to the safety, reliability, and quality assurance aspects of the Space Shuttle Program.

In a December 3, 1998, delegation letter, the SFOC Contracting Officer also directed the Johnson Safety Office to provide the support required by NSTS 07700, Volume 1, paragraph 3.4.2.14.¹⁰ The delegation letter lists the support required from the Johnson Safety Office including surveillance and evaluation of contractor and associated subcontractor activities associated with safety and real-time insight into activities at selected subcontractors. The key areas of support that the SFOC Contracting Officer delegated to the Johnson Safety Office are listed in Appendix E of this report. The Contracting Officer provided similar delegations to the NASA Center S&MA offices at Kennedy and the George S. Marshall Space Flight Center (Marshall).

Johnson Procedures and Guidelines 1107.1A assigns the responsibility for independent review of Space Shuttle Program safety to the Human Exploration and Development of Space (HEDS) Independent Assurance Office. The HEDS Independent Assurance Office is responsible for providing “credible, objective, and nonadvocacy reports regarding the integrity of the HEDS Enterprise¹¹ and program processes.” According to the Johnson guidelines, the office “assesses whether the HEDS Enterprise is achieving its safety and mission objectives with an acceptable level-of-risk.”

The officials and organizations responsible for Space Shuttle Program Safety at Johnson and the associated lines of authority are shown in Appendix D of this report. The appendix also contains the specific responsibilities for each official or organization as documented in Johnson Procedures and Guidelines 1107.1A, “The Johnson Organization,” and NSTS 07700.

Johnson Safety Office Support for the Space Shuttle Program

The Johnson Safety Office did not provide the matrixed personnel support¹² to the Space Shuttle Program Safety Manager as required by NSTS 07700 and as detailed in the Contracting Officer’s Letter of Delegation. The Space Shuttle Program Safety Manager told us that the Johnson Safety Office provided him only with input for the SFOC award fee and that office had not provided any of the required support detailed in the delegation letter. The Johnson Safety Office did not accept the delegation until August 16, 2000, or about 2 years

¹⁰ The delegation for support was by a Letter of Contract Administration Delegation, NASA Form 1430A.

¹¹ NASA has established the five Strategic Enterprises to function as primary business areas for implementing NASA's mission and serving its customers. Each Enterprise has a unique set of strategic goals, objectives, and implementation strategies that address the requirements of the Agency's primary customers. NASA's five Strategic Enterprises are (1) Space Science, (2) Earth Science, (3) HEDS, (4) Aerospace Technology, and (5) Biological and Physical Research.

¹² The Johnson Safety Office is required to provide support to the Space Shuttle Program Safety Manager. The Director of the Johnson Safety Office is responsible for managing all the staff, both civil servants and contractor personnel, to perform this task.

after the initial delegation.¹³ The other Center Safety offices (Kennedy and Marshall) accepted the delegation shortly after receiving the December 1998 delegation letter. The Chief of the Space Shuttle Division of the Johnson Safety Office told us that his office did not respond to nor provide the support detailed in the delegation letter because his office must remain independent of the Space Shuttle Program. He further explained that his office responds to the Space Shuttle Program Safety Manager only in his capacity as the SFOC TMR for S&MA, and as such, provided only information pertaining to the SFOC award fee evaluation. As a result, the Space Shuttle Program Safety Manager was not provided the resources necessary to adequately provide oversight of all S&MA activities in support of the Space Shuttle Program as described in NSTS 07700.

Space Shuttle Program Safety Responsibilities

The lack of matrixed personnel support from the Johnson Safety office occurred primarily because Johnson did not clearly define the roles, responsibilities, and lines of authority for the Space Shuttle Program Safety Manager and the Johnson Safety Office regarding Space Shuttle Program safety. As detailed in Appendix D of this report, Johnson's organizational structure and description of responsibilities for safety of the Space Shuttle Program overlap, conflict with SFOC requirements, and are unclear as follows:

- The job descriptions and responsibilities of the Space Shuttle Program Safety Manager and the Chief, Johnson Safety Office Space Shuttle Division, are nearly identical with each official reporting to a different manager. This overlap in responsibilities conflicts with the SFOC and NSTS 07700, which requires the Chief, Johnson Safety Office Space Shuttle Division, to provide matrixed personnel support to the Space Shuttle Program Safety Manager in fulfilling requirements applicable to the safety, reliability, and quality assurance aspects of the Space Shuttle Program. The Johnson Safety Office Space Shuttle Division did not provide that matrixed personnel support.
- The HEDS Independent Assurance Office¹⁴ and the Johnson Safety Office Space Shuttle Division are both providing independent assessments of the safety of the Space Shuttle Program. This overlap conflicts with (1) Johnson Procedures and Guidelines 1107.1A, which requires only the HEDS Independent Assurance Office to provide independent assessments of the Space Shuttle Program's safety, and with (2) NSTS 07700, which requires the Chief, Johnson Safety Office Space Shuttle Division, to provide matrixed personnel support to the Space Shuttle Program Safety Manager.

¹³ Acceptance of delegation is documented by NASA Form 1431, "Letter of Acceptance of Contract Administration Delegation," that the Director of the Johnson Safety Office signed on August 16, 2000.

¹⁴ The HEDS Independent Assurance Office, although physically located at Johnson, reports to the Associate Administrator for S&MA at NASA Headquarters.

- The Johnson organizational structure is unclear in that there appears to be an additional organization responsible for Space Shuttle Program safety when, in fact, the organization does not exist. The Space Shuttle Safety, Reliability, and Quality Assurance Office (shown on the Johnson organization chart as responsible to the Space Shuttle Program Office) is the same organization as the Johnson Safety Office Space Shuttle Division. Johnson Procedures and Guidelines 1107.1A does not cite the Space Shuttle Safety, Reliability, and Quality Assurance Office.

These duplicate responsibilities have resulted in disagreement among Space Shuttle Program and S&MA managers about who is ultimately responsible for (1) the safety of the Space Shuttle Program, (2) support for the Space Shuttle Program Safety Manager, and (3) independent assessment of Space Shuttle Program safety. Management should clarify the current organizational structure by defining which office is responsible for the respective areas to avoid any duplication of effort and to ensure optimal Space Shuttle Program safety management.

Control Over Space Shuttle Program Safety

As a result of the confusion and disagreement over Space Shuttle Program safety responsibilities, the Space Shuttle Program Manager (1) did not have adequate control over \$13 million in Space Shuttle Program funds provided to the Johnson Safety Office and (2) had less effective oversight of key safety components of the Space Shuttle Program performed by USA.

- **Use of Space Shuttle Program Funds.** The Johnson Safety Office Space Shuttle Division receives annual funding of about \$13 million from the Space Shuttle Program for providing matrixed personnel support for safety oversight. The Chief Johnson Safety Office Space Shuttle Division provided us work instructions as evidence of the functions that the Division performs. However, the Division did not provide the specific support to the Space Shuttle Program Safety Manager as described in the SFOC Contracting Officer's December 3, 1998, delegation letter. Thus, the Space Shuttle Program Manager did not have adequate control over the funding since it was not used as intended nor was it directly controlled by his organization.
- **Oversight of Safety of Key Components of the Space Shuttle Program.** Because the Space Shuttle Program Safety Manager did not receive the required support from the Johnson Safety Office, the Agency has no assurance of oversight of the safety status of key components of the Space Shuttle Program. Key components include Shuttle integration, orbiter, flight software, extra vehicular activity and flight crew

equipment, flight operations, flight crew preparation and crew/vehicle integration, and the safe operations on and around critical NASA hardware at USA's subcontractor facilities in southern California.¹⁵

More clearly defined roles and responsibilities regarding the safety of the Space Shuttle Program would promote safer Space Shuttle operations and better control of \$13 million in Space Shuttle Program funds. Johnson management should clarify those roles and responsibilities to ensure they define which office has responsibility for the (1) safety of the Space Shuttle Program; (2) support for the Space Shuttle Program Safety Manager; and (3) independent assessment of Space Shuttle Program safety.

Recommendations, Management's Response, and Evaluation of Management's Response

The Director, Lyndon B. Johnson Space Center, should:

- 1. Clarify the Space Shuttle Program/SFOC organizational structure, NSTS 07700, and Johnson Procedures and Guidelines 1107.1A by defining the roles, responsibilities, and lines of authority for (1) safety of the Space Shuttle Program; (2) support for the Space Shuttle Program Safety Manager; and (3) independent assessment of Space Shuttle Program safety.**
- 2. Provide the Space Shuttle Program Safety Manager the support required by the SFOC and NSTS 07700.**

Management's Response. Concur. Regarding recommendation 1, Johnson plans to revise the appropriate documentation to clarify the roles and responsibilities for support for the Space Shuttle Program Safety Manager and independent assessment of Space Shuttle Program safety. In response to recommendation 2, Johnson plans to prepare annual operating agreements that will delineate the products and tasks to be completed by the Johnson Safety Office. The complete text of management's response is in Appendix F.

Evaluation of Management's Response. Management's planned actions are responsive to the recommendations. The recommendations are resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

¹⁵ Operations consist of Space Shuttle orbiter sustaining engineering and maintenance at Boeing's Reusable Space System's (a major subcontractor of USA) Palmdale, and Huntington Beach, California, facilities.

Finding B. NASA Surveillance of USA

NASA's surveillance plans for USA do not adequately address all contract requirements for safety. Surveillance plans are incomplete because Johnson does not have a system for review and approval of the plans. As a result, NASA management, including the SFOC Contracting Officer, COTR, TMR's, and Space Shuttle Program managers, have less effective means of monitoring USA operations to assure that SFOC safety objectives are being met.

SFOC Requirements for Contractor Surveillance

Section A of the SFOC states that one of NASA's roles with regard to the contract is to "perform surveillance, audits, and technical insight of contractor activities." SFOC Section G.9 allows the Contracting Officer to appoint TMR's to assist with surveillance. Under this authority, the Contracting Officer appointed a total of 11 TMR's and assigned specific contract responsibilities to each through a formal delegation letter. The delegation letter requires each TMR to:

Establish and provide to the COTR and Contracting Officer, a surveillance plan that will ensure receipt of the quantity and kinds of supplies or services required by the Statement of Work of the contract. The surveillance plan shall include, but not be limited to, identification of how the contractor will be evaluated against the metrics identified in attachment J-1-B of the contract.

The Contracting Officer, COTR, and the TMR for S&MA required each TMR to provide input to the TMR for S&MA regarding safety issues in each of the TMR's delegated areas. That input was to be documented in each TMR's respective surveillance plan. The surveillance plan for the TMR for S&MA states:

All TMRs are responsible for Safety and Product Assurance for their specific areas of responsibility. Specific SMA [Safety and Mission Assurance] insight is provided by the institutional SMA [Safety and Mission Assurance] organizations through direct participation in these functional areas, and the various surveillance methodologies are documented within the various TMR SFOC surveillance plans. Insight activity results are provided to both the functional area TMR and the SMA [Safety and Mission Assurance] TMR.

NASA SFOC Surveillance Plans

Most of the surveillance plans that we examined contain detailed procedures for assessing the quality of the supplies and services provided under the SFOC. However, the surveillance plans do not sufficiently address safety to ensure adequate oversight of USA's safety operations.

- The surveillance plan for the TMR for S&MA is incomplete and does not fully address the TMR's delegated responsibilities. The plan basically reiterates the performance standards,

metrics, and data requirements that were already addressed in the SFOC's Statement of Work. The surveillance plan does not describe specific surveillance methodologies used by the TMR for S&MA to ensure that the contractor implements the requirements of SFOC Statement of Work, paragraph 1.3, "Safety, Mission Assurance and Product Assurance." The surveillance plan does describe how the other TMR's were to address safety in their respective surveillance plans.

- The contractor surveillance plans for 8 of the 10 other TMR's do not describe specific surveillance methodologies to ensure safe operations within the TMR's areas of responsibility¹⁶ as documented in the TMR for S&MA's surveillance plan. In addition, none of the plans required or described any type of input to, or coordination with, the TMR for S&MA as required by the Contracting Officer, COTR, and the TMR for S&MA. Furthermore, five of the surveillance plans did not address safety.
- The Contracting Officer did not delegate a key contract requirement for safety--risk management-- to a TMR which resulted in the area not being covered by a surveillance plan for nearly 4 years after contract award. Risk management is key to safe Space Shuttle Program operations because, as stated in the SFOC, paragraph 1.1.1.4, risk management requires the contractor to report all anomalies that represent safety, mission success, and major program schedule milestone risks to the Government.

Although most of the surveillance plans adequately addressed quality, the plans should better address specific safety surveillance procedures for all contract areas including risk management and procedures for coordinating with the TMR for S&MA.

Contracting Officer Review and Approval of Surveillance Plans

The contractor surveillance plans did not adequately address all contract requirements for safety because the SFOC Contracting Officer did not establish a process for review and approval of the plans. The former SFOC Contracting Officer, who required each TMR to prepare and submit a surveillance plan, never reviewed the plans for adequacy. The current Contracting Officer told us that he relies on the fact that the Space Shuttle launches and lands successfully, which assures him of the contractor's safe and adequate performance. The Contracting Officer has not received contract surveillance training and stated that he expected the COTR to keep him informed on the technical aspects of the SFOC such as the adequacy of surveillance plans. The TMR for S&MA told us that he was certain the original surveillance plans addressed safety, but they were revised, and he had not reviewed the revised plans. We found no evidence of review and approval of any of the current surveillance plans by the Contracting Officer, COTR, or TMR for S&MA.

¹⁶ The specific areas of responsibility were cargo integration, flight crew operations, orbiter logistics, management integration, flight software, vehicle engineering, International Space Station, and Shuttle process integration.

Surveillance Plans as Management Tools

Without detailed surveillance plans for the safety operations of all key elements of the SFOC, Johnson management, Space Shuttle Program Managers, the COTR, and the Contracting Officer lack a valuable management tool to assess and measure the surveillance NASA performs on USA's safety operations and to ensure accountability for that surveillance. To ensure that USA is operating safely, detailed surveillance plans should specify a surveillance strategy; list the specific surveillance activities to be performed (inspections, audits, etc.); and identify how USA will be evaluated against the metrics specified in the SFOC.

Johnson management has begun a process for evaluating and improving the plans. Johnson should complete this process and ensure that each key element of the SFOC is covered by a detailed surveillance plan.

Recommendations, Management's Response, and Evaluation of Management's Response

The Director, Lyndon B. Johnson Space Center, should:

- 3. Direct the SFOC Contracting Officer to ensure that a TMR and an accompanying surveillance plan cover all key elements of the SFOC Statement of Work, including risk management.**

Management's Response. Concur. On July 12, 2000, the SFOC Contracting Officer revised the delegation for the TMR for S&MA to include responsibilities for risk management. The complete text of the response is in Appendix F.

Evaluation of Management's Response. The actions taken by management are responsive to the recommendation. We consider the actions sufficient to disposition the recommendation, which will be closed for reporting purposes.

- 4. Update each SFOC TMR's contractor surveillance plan to specifically describe the methods, monitoring requirements, and insight mechanisms necessary to ensure safe operations and the receipt of the quantity and types of supplies or services required by the Statement of Work.**
- 5. Coordinate the safety aspects of each SFOC contractor surveillance plan with the TMR for S&MA.**

Management's Response. Concur. Regarding recommendation 4, the COTR and SFOC Contracting Officer performed a detailed audit of the TMR surveillance plans. The audit

included the definition of activities and processes used to ensure safety of products and services. Each TMR is implementing surveillance plan updates in response to the audit.

For recommendation 5, the SFOC COTR and Contracting Officer required the TMR's to coordinate their revised surveillance plans with the TMR for S&MA (see Appendix F).

Evaluation of Management's Response. Management's planned actions are responsive to the recommendations. The recommendations are resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

Finding C. USA Management Plan

USA has not performed the required update of its SFOC Management Plan to reflect current operations. The plan is not current because neither the COTR nor TMR for S&MA notified the Contracting Officer or took action to ensure that USA would update the plan. As a result, NASA lacks a key management tool for monitoring and measuring USA's safety, management, and performance under the SFOC contract.

Contract Requirements for a Management Plan

SFOC paragraph 1.1, "Program and Business Management," states that "The contractor shall provide and maintain program management systems . . . , for the planning, organization, control, and reporting of all activities required by this contract."

Paragraph 1.1.1.1 of the SFOC requires USA to provide and maintain a management plan. USA's Management Plan, which was approved by the SFOC COTR, states:

The MP [management plan] represents the most current baseline on management approaches, organization, roles and responsibilities, interfaces, etc. It provides a control document that governs the contractor's management of SFOC For these reasons, this MP [management plan] should be considered a living document that will require periodic update.

Chapter 9 of USA's Management Plan is dedicated to system safety and mission assurance. The chapter addresses NASA and USA goals and objectives, organizational structure, and major processes relating to the safety of the Space Shuttle Program. In addition, specific safety activities are covered throughout the Management Plan.

Updating the USA Management Plan

USA has not updated its Management Plan as required. Although the SFOC has had more than 500 modifications since its inception, the current Management Plan contains out-of-date or inaccurate key information such as the names of subcontractors and key management personnel, including safety personnel from NASA and USA. As a result, the SFOC objective of having a program management system for planning, organizing, controlling, and reporting all SFOC safety activities has not been fully achieved.

The SFOC COTR and the USA Vice President for Safety, Quality, and Mission Assurance told us that the original intent of the Management Plan was to provide a documented management approach for the SFOC but that the plan had outlived its usefulness. The USA Vice President also stated that USA uses the plan only as a directory to various supporting plans within the company. He added that USA delivered a revised Management Plan to NASA in February 1998, but because of higher priorities, NASA had neither reviewed the plan nor

published it. The SFOC has had more than 500 changes with the first significant change¹⁷ to the contract occurring less than a month after contract award. Yet, the Management Plan that was in effect during the time of our audit was the original baseline plan dated November 22, 1996.

Management Plan Review Procedures

Neither the Space Shuttle Program nor SFOC management had established procedures to ensure that USA's Management Plan was kept current. The SFOC COTR did not notify the Contracting Officer to take action to ensure that USA's SFOC Management Plan had been updated as required by the contract. The Contracting Officer's delegation letters to the COTR and TMR for S&MA required both individuals to monitor contractor performance and to immediately report all problems to the Contracting Officer. As discussed earlier, the SFOC COTR and the Space Shuttle Program Safety Manager were aware that USA's Management Plan was not current. However, neither worked with the Contracting Officer to take corrective action.

Management Plan Use

Without a current management plan, NASA lacks a valuable tool for monitoring and measuring USA's management of SFOC safety. In addition, the SFOC COTR describes the Management Plan in his SFOC surveillance plan as a management tool for "work review and performance monitoring surveillance." A current Management Plan would help improve NASA's surveillance of USA's SFOC safety and better assist NASA in assessing management effectiveness, which is an evaluation factor in the SFOC award fee plan.

Recommendations, Management's Response, and Evaluation of Management's Response

The Director, Lyndon B. Johnson Space Center, should direct the SFOC Contracting Officer to:

- 6. Notify USA to update the current SFOC Management Plan to reflect current operations in the Space Shuttle Program and in USA's SFOC management approach.**
- 7. Establish procedures to ensure that USA's SFOC Management Plan is kept current in accordance with paragraph 1.1.1.1 of the SFOC.**

Management's Response. Concur. Regarding recommendation 6, Johnson management received a proposed revision to the SFOC Management Plan on October 11, 2000. Johnson

¹⁷ Modification number 4, dated December 16, 1996, directed the contractor to perform soil borings and chemical analyses at the NASA Industrial Plant in Downey, California.

determined that the plan needed modification, and the contractor is modifying it for Johnson's review and approval. In relation to recommendation 7, Johnson will require that the Management Plan be updated on an annual basis as well as within 45 days of the transition of any additional contracts into the SFOC. The complete text of the response is in Appendix F.

Evaluation of Management's Response. Management's planned actions are responsive to the recommendations. The recommendations are resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

Finding D. USA Mishap Reporting

The classification and reporting of USA's close calls and mishaps¹⁸ can be improved at Kennedy and Johnson. Specifically, USA (1) either did not report or promptly report all close calls and mishaps into the IRIS and (2) reported incomplete or out-of-date data into the IRIS. This occurred because Johnson uses systems other than the IRIS to record and track close calls and mishaps. In addition, neither the Kennedy nor Johnson S&MA offices reviewed USA's mishap reporting on a regular basis to ensure that all information is current and complete. Consequently, NASA's mishap information system is not as effective as possible in tracking and monitoring mishaps and their corrective actions.

NASA Mishap Reporting Guidelines

The IRIS is NASA's Agencywide automated system for tracking mishap and injury information. The IRIS enables the real-time reporting of mishaps and injuries and facilitates detailed mishap investigation and follow-up documentation. The IRIS provides a valuable tool for reporting mishap information to NASA management and outside sources and is the Agency's primary system for accumulating data on employee injuries and lost time rates.

NPG 8621.1, "NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping," June 2, 2000, provides specific, Agencywide procedures regarding mishaps.¹⁹ The NPG states that when a mishap occurs, each NASA Center's S&MA officials shall, "ensure all NASA reportable mishaps and close calls . . . are recorded and submitted electronically to the IRIS." The NPG also states that, "by close of business the next workday, the Center safety office will submit a follow-up electronic NASA Form 1627-A²⁰ initial report using the IRIS."

Analysis of Mishaps at Johnson and Kennedy

We reviewed the documentation supporting USA's reported mishaps that occurred at Johnson and Kennedy from October 1997 through June 2000. The documentation for 104 of the 177 mishaps that we examined showed that USA recorded the mishaps promptly and thoroughly

¹⁸ NPG 8621.1 defines a close call as a situation or occurrence with no injury, no damage or only minor damage (less than \$1,000), but possesses the potential to cause any type mishap, or any injury, damage, or negative mission impact. (A close call is not considered a mishap, but the mishap reporting, investigation, and recordkeeping and recurrence control guidelines will be followed).

¹⁹ SFOC Attachment J-11 (a) references NASA Handbook 1700.1 (volume 1), "NASA Basic Safety Manual." On January 24, 2000, NPG 8715.3, "NASA Safety Manual," replaced NASA Handbook 1700.1. Paragraph 1.3 of the NASA Safety Manual states that requisite safety program principles include the "Investigation of all hazardous conditions, close calls, environmental incidents, and mishaps, without retribution to the employees, and the prompt publication of lessons-learned as part of accident prevention and a continuous improvement effort." Procedures for mishap and close call reporting are in NPG 8621.1.

²⁰ NASA Centers use NASA Form 1627-A, "NASA Initial Safety Incident Report," to report mishap and close call information to the IRIS.

and identified appropriate follow-up actions. Although USA has a detailed, well-documented system for reporting and followup on mishaps at both Kennedy and Johnson, further improvements can be made. Details on areas requiring improvement follow:

Johnson Close Call and Mishap Reporting

Close Call Reporting. The IRIS contained no evidence of USA input directly or through Johnson, on USA close calls at Johnson. Employees at Johnson report close calls to management who, in turn, input the data into the Center's Close Calls Database (not the IRIS). Johnson safety officials stated that this process is a way for employees to file complaints or concerns noted across the Center and that not all reported information falls under the NPG 8621.1 definition of a close call. Because the close calls are not maintained in the IRIS, there is no way of determining whether USA is reporting its close calls. For example, during calendar years 1998 and 1999, Johnson employees reported 1,755 close calls. However, because this information is maintained in a separate database and contains no unique identifiers, there is no way of determining how many of the close calls are related to USA. The close calls were generally employee slips, trips, and falls and other injuries; electrical hazards; and fire hazards that had the potential for serious injury or property damage as illustrated below:

- A coil in an air conditioning unit became loose and overheated resulting in a burning smell and smoke (April 1998).
- A lawnmower severed a natural gas line (July 1998).
- An electrical arc created by a faulty light fixture emitted sparks that landed near personnel after discoloring the ceiling (December 1998).

Although Johnson's Close Call Database showed that management implemented corrective action for each close call, Johnson did not report the close calls into the IRIS. Johnson should ensure that applicable close call information is promptly reported into the IRIS.

Mishap Reporting. Of a total of 54 USA mishaps at Johnson in fiscal year (FY) 1998, 33 (61 percent) were still reported as being open. These mishaps have been open from 21 to 32 months; therefore, we question whether the information in Johnson's Close Calls Database was current or whether corrective actions had been or were being taken to resolve the mishaps. In addition, from October 1, 1997, through June 2000, 67 (46 percent) of 146 USA-reported mishaps did not have corrective actions recorded in Johnson's mishap reporting system (Frequently Retrieved Executive Data System). Although most of the 146 mishaps were injury/illness related and may not have required corrective actions, Johnson was unable to provide us any documentation on corrective actions.

The USA mishap information in Johnson's reporting system was not always current because Johnson safety officials do not review USA mishap reporting on a regular basis to ensure that all

information is current, complete, and input into IRIS. Periodic reviews by the Johnson Safety Office of mishap information compiled and reported by USA would ensure that the information reported in IRIS is current, accurate, and reliable for management use.

Johnson Uses System other than IRIS. USA did not input its Johnson mishaps and close calls into the IRIS primarily because Johnson did not use the IRIS on a daily basis to record and track mishaps and close calls. Rather, Johnson inputs mishap and close call information for the Center, including USA, into its own reporting system, the Frequently Retrieved Executive Data information system. Johnson uploads the data in that system to the IRIS only once a month. Johnson safety officials told us that the IRIS was not effective for their needs because it did not allow for tracking of mishaps and close calls by responsible directorate. The safety officials also informed us that the NASA Headquarters Office of S&MA provided Johnson with oral approval to deviate from NPG 8621.1 requirements by primarily using the Frequently Retrieved Executive Data information system in place of the IRIS. NASA Headquarters S&MA officials told us that they allowed Johnson to use its own system with the expectation that Johnson would provide a mechanism for updating the IRIS with all required information on a real-time basis. Johnson management told the NASA Headquarters Office of S&MA that work is under way to implement a feeder system but that it was not yet developed. Johnson should ensure that it reports USA mishap and close call information into IRIS on a daily basis in accordance with NPG 8621.1 and that it keeps current all information regarding corrective actions and closeout.

Kennedy Mishap Reporting

Kennedy did not use the IRIS to report all USA-related mishaps. USA uses an internal "flash report" for the initial reporting of mishaps.²¹ The USA Safety office reviews the flash reports to determine whether the event is a reportable mishap (to IRIS) and who within USA is responsible for the investigation and implementation of corrective actions. Through our review of a judgmental selection of 31 flash reports²² for the period October 1997 through June 2000, we determined that 6 (19 percent) of 31 sampled mishaps related to USA were not reported in IRIS. The six mishaps included, for example, an incident in March 1999 during which a 50-80 pound regulator slipped while being removed from a panel in the Vehicle Assembly Building at Kennedy and injured a technician. In an April 1999 incident, two technicians dropped a heat shield while relocating it in the Orbiter Processing Facility at Kennedy. Despite completed USA flash reports for both of these incidents, USA did not report them into the IRIS. Similarly, the other four incidents were documented in flash reports but not reported to the IRIS. The USA mishaps documented in the flash reports were not always recorded in the IRIS because there is no requirement for Kennedy safety officials to review USA mishap reporting on a regular basis to ensure that all information is current, complete, and recorded in the IRIS.

²¹ The purpose of flash reports is to communicate timely and factual information on incidents of significant interest or of a sensitive nature to USA program and senior-level management.

²² The sample consisted only of flash reports that, according to the USA safety office, were serious enough that they should have been reported to the IRIS.

Periodic reviews by the Kennedy Safety Office of mishap information compiled and reported by USA would ensure that the information reported in IRIS is current, accurate, and reliable.

Importance of Accurate IRIS Information

As NASA's Agencywide automated system for tracking mishap and injury data, the IRIS must contain current, accurate, and reliable information. Work-related mishap data are entered into IRIS for review by the Centers to assure that similar mishaps are not occurring and to determine lost work time rates to compare the NASA Centers' rates to the national average. Inconsistent and untimely reporting of SFOC mishaps may adversely affect NASA's ability to (1) develop safety metrics; (2) record and report mishap information to external organizations, such as the Occupational Safety and Health Administration; (3) evaluate the contractor's performance in fulfilling safety responsibilities; (4) establish a baseline of data for use in analyzing trends; and (5) develop corrective actions, lessons learned, and mishap prevention programs. Management should ensure that USA is effectively recording mishap data in the IRIS.

Recommendations, Management's Response, and Evaluation of Management's Response

The Director, Lyndon B. Johnson Space Center, should:

- 8. Report promptly all Johnson mishaps and close call information into IRIS.**
- 9. Direct the SFOC Contracting Officer to ensure that all USA mishap information, including close calls, is promptly reported into IRIS on a daily basis as required by NPG 8621.1 and that all information regarding corrective actions and mishap closeout is kept current in IRIS.**
- 10. Direct the SFOC Contracting Officer to ensure that NASA safety officials review USA's mishap reporting on a periodic basis to ensure that all information is current and complete and properly input into the IRIS.**

Management's Response. Concur. Johnson management will work with the NASA Headquarters' Office of S&MA to ensure that a process is in place to facilitate the prompt reporting of mishaps and close calls. If it is determined that IRIS is not the appropriate reporting tool as a result of technical considerations, Johnson will propose an alternative approach. Regarding recommendation 9, Johnson stated that in conjunction with developing a process to facilitate prompt reporting to NASA Headquarters, NASA Center S&MA offices will work with the Space Shuttle Program Safety Manager to ensure the timely and accurate reporting of USA mishap and close call information. In response to recommendation 10, Johnson stated that senior management currently reviews and analyzes mishap data through various forums such as the Executive Safety Committee and Incident Error Review Boards.

Johnson will include the review of mishap data as a specific focus in its 2001 TMR surveillance plan audits. The complete text of management's response is in Appendix F.

Evaluation of Management's Response. Management's planned actions are responsive to the recommendations. The recommendations are resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

Appendix A. Objectives, Scope, and Methodology

Objectives

The overall audit objective is to evaluate the USA safety procedures for NASA's SFOC. The specific objective related to this report was to determine whether NASA is performing effective oversight of USA's safety program.

The remaining objectives, which will be discussed in a separate report, are to determine whether:

- safety responsibilities between USA and NASA are clearly defined and
- hazardous materials used in contract performance are properly controlled.

Scope and Methodology

To accomplish our objectives we:

- Held discussions with NASA SFOC management including the Contracting Officer, Assistant Contracting Officers, COTR, and TMR's; Johnson Space Shuttle Program staff including the Assistant Program Manager and the Space Shuttle Program Safety Manager; Johnson Safety Office staff; and USA Safety, Quality and Mission Assurance staff at USA's Headquarters in Houston, Texas, and at Kennedy.
- Reviewed the documents listed in Appendix C and the SFOC TMR Delegation Letters; SFOC TMR Surveillance Plans; Johnson Procedures and Guidelines 1107.1A, "The JSC [Johnson] Organization"; NPG 8621.1, "NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping"; USA/Kennedy Internal Ground Operations Safety reports; Safety and Mission Assurance Functional Policy and Procedure E-02-01, "Mishap Reporting and Investigation," dated September 25, 1998; and SFOC Program Directive 006B, SFOC "Flash Reports," dated October 11, 1996.
- Reviewed documentation on USA mishaps that occurred at Kennedy and Johnson. Specifically, we queried the NASA IRIS during May and June 2000 to identify and review USA mishaps occurring at Kennedy from October 1, 1997, through June 2000. We also reviewed mishap reports from October 1, 1997, through June, 2000, for those USA mishaps occurring at Johnson. We selected and reviewed a judgmental sample of USA's internal flash reports for its mishaps occurring at Kennedy in FY 1998 through FY 2000 and traced those reports through the IRIS.

Management Controls Reviewed

We reviewed Johnson's overall management organizational structure for the Space Shuttle Program and SFOC safety program to ensure that USA was performing all contractually specified safety requirements. As a guideline, we followed the General Accounting Office's, "Standards for Internal Control in the Federal Government," November 1999, which states:

A positive control environment is the foundation for all other standards
[A] factor affecting the environment is the agency's organizational structure. It provides management's framework for planning, directing, and controlling operations to achieve agency objectives. A good internal control environment requires that the agency's organizational structure clearly defines key areas of authority and responsibility and establishes appropriate lines of reporting.

We found a weakness in Johnson's management control structure related to NASA oversight of USA's safety operations under the SFOC. This weakness is discussed in detail in the findings and recommendations section of the report.

Audit Field Work

We conducted field work from June through November 2000 at NASA Headquarters, Johnson, Kennedy, and at USA Headquarters in Houston, Texas. We performed the audit in accordance with generally accepted government auditing standards.

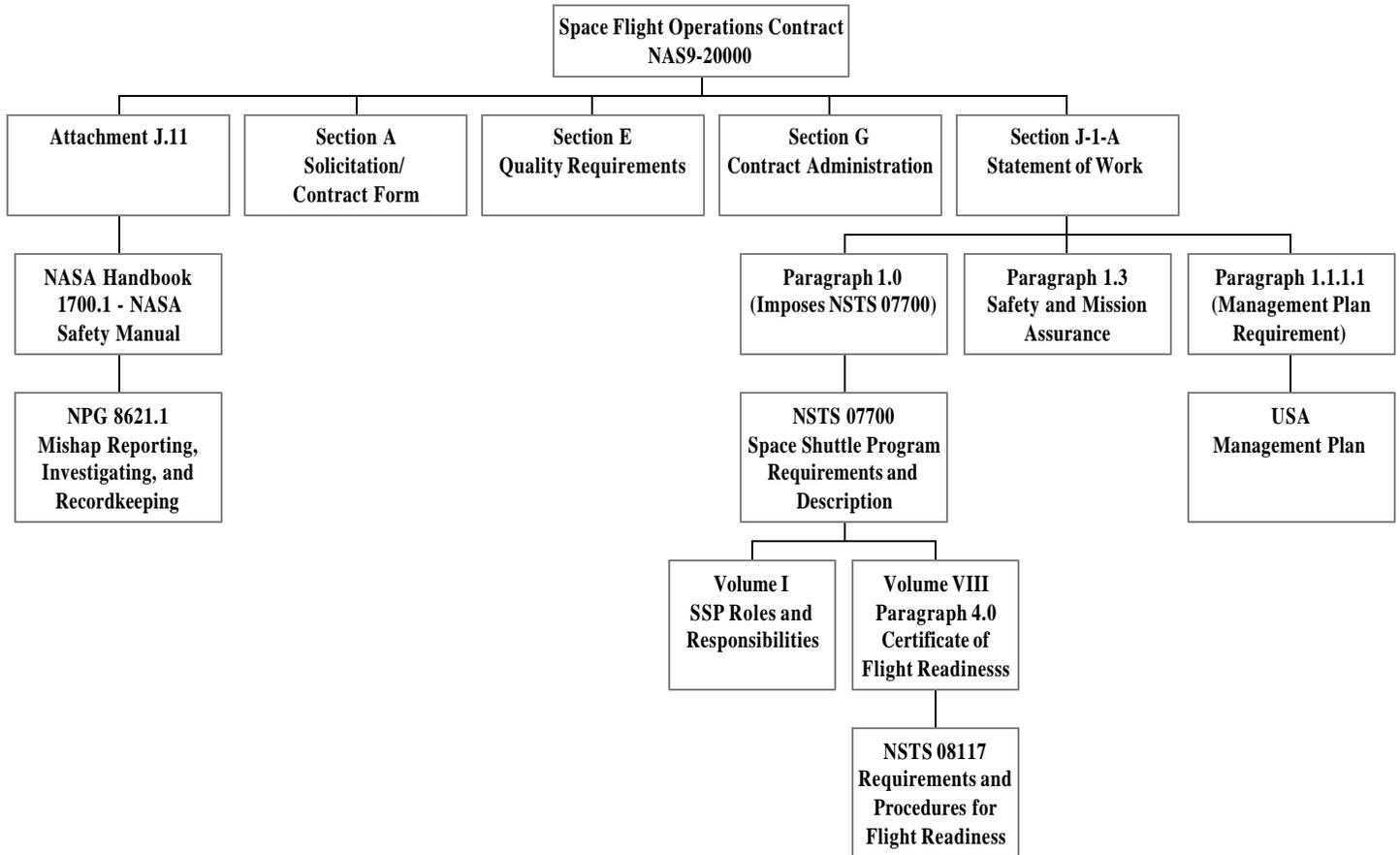
Appendix B. Summary of Prior Audit Coverage

“Contract Safety Requirements at Kennedy Space Center and Marshall Space Flight Center,” Report Number IG-00-035, June 5, 2000. The NASA Administrator stated in a January 19, 1999, message that safety is the Agency’s highest core value. On February 26, 1999, the Administrator emphasized the need for NASA contractors to be supportive of and accountable for safety. The overall objective of the audit was to evaluate the safety procedures of NASA contractors. We found that NASA was not applying existing basic safety provisions such as required contract safety clauses, contractor safety plans at contract award and Center safety office involvement in the procurement process to 15 out of 25 contracts that we reviewed at Kennedy and the George C. Marshall Space Flight Center. As a result, NASA contractors including some involved in hazardous operations may not be supporting the same safety goals as NASA. We recommended that management identify all open contracts that either involve potentially hazardous operations or exceed \$1 million and determine whether those contracts have the required safety clauses and contractor safety plans. Management concurred with our recommendations and implemented corrective actions to ensure that all applicable contracts contained the required safety documentation.

“Safety Concerns with Kennedy Space Center’s Payload Ground Operations,” Report Number IG-00-28, March 30, 2000. In February 1999, the NASA Office of Inspector General was requested by the House of Representatives Committee on Science to address concerns related to the safety functions of Kennedy’s Payload Ground Operations Contract performed by McDonnell Douglas Aerospace, Space and Defense Systems, a subsidiary of The Boeing Company (Boeing). In response to this request, we reviewed the contractor’s operations to determine whether (1) safety responsibilities between Boeing and NASA had been clearly defined; (2) hazardous materials were being used in Kennedy’s processing facilities; and (3) hazardous materials, if used, were properly controlled. The audit identified that ground workers were using potentially hazardous materials in Kennedy processing facilities without exercising proper control and safety precautions. This condition existed because (1) Boeing safety personnel had not performed adequate, contract-required inspections of the facilities; (2) Kennedy and Boeing safety personnel had not reviewed Materials Usage Agreements that authorized the use of noncompliant materials; and (3) Kennedy and Boeing safety personnel did not perform risk analyses to support the materials usage agreements. As a result, NASA lacks assurance that associated risks are adequately identified, documented, reviewed, and mitigated. Improper use of these materials is hazardous to ground workers and increases the risk of damage to Space Shuttle payloads, including International Space Station hardware and equipment. We recommended that management (1) direct the contractor to perform analyses to support the use of all materials that do not meet requirements for flammability and electrostatic discharge, (2) clarify instructions for preparation of Materials Usage Agreements, and (3) increase surveillance of the contractor’s safety office inspection procedures. Management concurred with each recommendation and implemented a number of procedures to control all noncompliant materials.

Appendix C. Agency Safety Requirements Referenced by the SFOC

As part of our audit, we reviewed the following Agency requirements incorporated by reference into the SFOC:

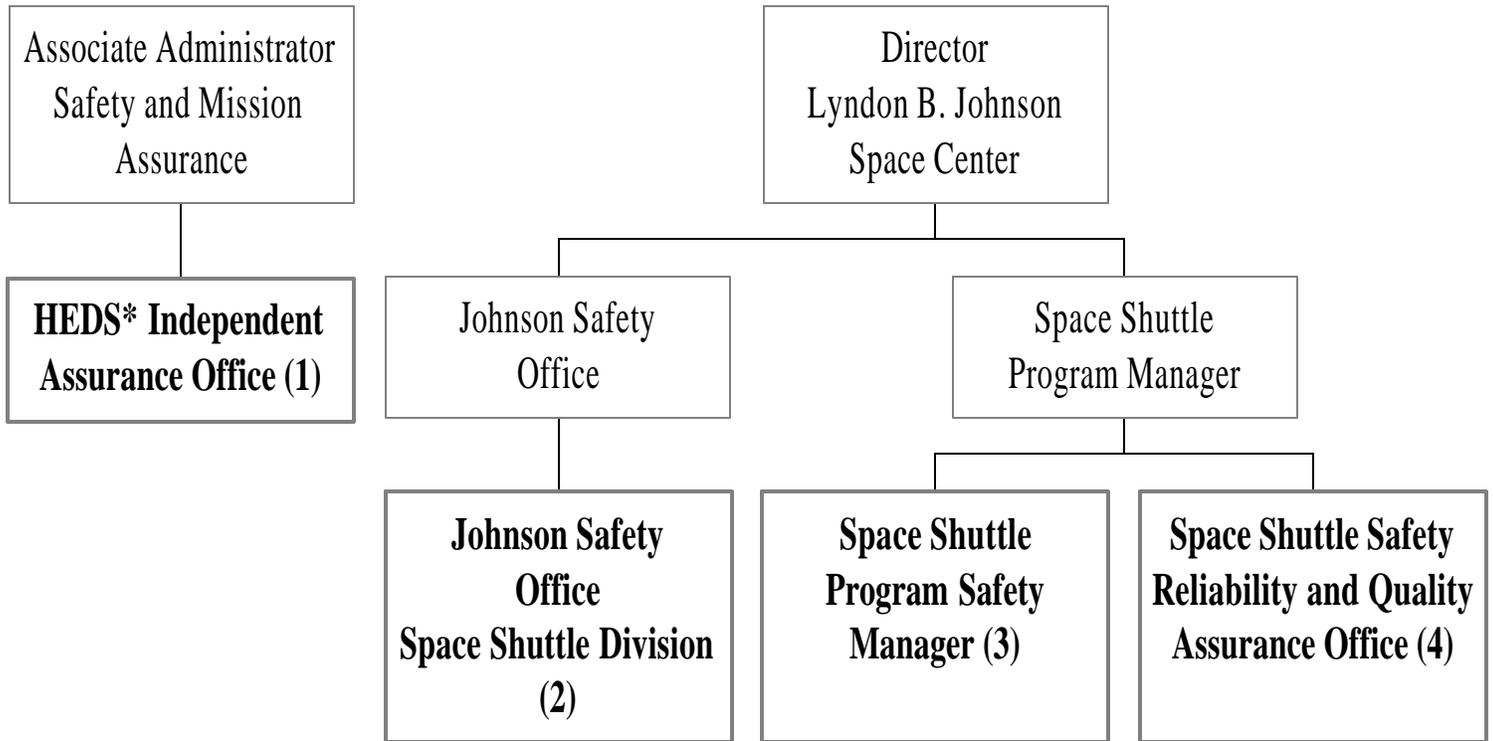


Acronyms

NPG	NASA Procedures and Guidelines
NSTS	NASA Space Transportation System
SSP	Space Shuttle Program
USA	United Space Alliance

Appendix D. Johnson Space Shuttle Program Safety Responsibilities

The Johnson organization chart identifies the officials and organizations responsible for Space Shuttle Program Safety (shown in bold) and the associated lines of authority.



*Human Exploration and Development of Space.

The specific responsibilities follow for each official or organization as documented in Johnson Procedures and Guidelines 1107.1A, "The Johnson Organization," and NSTS 07700 and through auditor observations:

Appendix D

(1) HEDS Independent Assurance Office

<p align="center">Responsibilities in Johnson Procedures and Guidelines 1107.1A, “The Johnson Organization”</p>	<p align="center">Responsibilities in SFOC/NSTS 07700*</p>	<p align="center">Auditor Observation</p>
<p>The Director of the HEDS Independent Assurance Office reports to the NASA Associate Administrator for Safety and Mission Assurance. The Director manages the HEDS Independent Assurance Office and is located at Johnson, the HEDS Enterprise Lead Center. This office consists of functional experts with experience in operations, integration, system engineering, and software independent verification and validation. The Director is also supported by the Chief, Safety, Reliability, and Quality Assurance (SR&QA) Space Shuttle Division (Johnson Safety Office Space Shuttle Division).</p> <p>The HEDS Independent Assurance Office provides its customers with credible, objective, and nonadvocacy reports regarding the integrity of the HEDS Enterprise and program processes. This office focuses on the safety, technical integrity, and operation of the HEDS Enterprise and assesses whether it is achieving its safety and mission objectives with an acceptable level of risk. The HEDS Independent Assessment Office plans, coordinates, integrates, and reports the outcomes of its independent assessments. In general, independent assurance activities are planned to support Space Shuttle flight readiness and major program milestones.</p>	<p>Not Cited.</p>	<p>1. The office’s requirements under Johnson Procedures and Guidelines 1107.1A overlap some of the functions the Johnson Safety Office Space Shuttle Division performs. Specifically, the Chief of the Johnson Safety Office Space Shuttle Division told us that his office is also responsible for independent assessment of Space Shuttle Program safety.</p>

* Space Flight Operations Contract/NASA Space Transportation System

(2) Johnson Safety Office Space Shuttle Division

<p style="text-align: center;">Responsibilities in Johnson Procedures and Guidelines 1107.1A, “The Johnson Organization”</p>	<p style="text-align: center;">Responsibilities in SFOC/NSTS 07700*</p>	<p style="text-align: center;">Auditor Observation</p>
<p>Space Shuttle Division - The SR&QA Space Shuttle Division ensures Shuttle flights are accomplished safely with high mission assurance. The Division Chief represents SR&QA on the Space Shuttle Program Manager's staff. This representation includes all elements of SR&QA throughout the Agency that support the Space Shuttle Program. The Division signs the Certificate of Flight Readiness endorsements, supports program change boards and program milestone reviews, facilitates SR&QA prelaunch assessment reviews, maintains SR&QA program requirements documentation, administers the Space Shuttle Program joint survey program, and supports joint activities of the Space Shuttle Program and the International Space Station Program. The Division also provides safety engineering support to the Payload Safety Review Panel and SR&QA support to the Extravehicular Activity Project for the Space Shuttle and Space Station.</p> <p>The SR&QA Space Shuttle Division manages the West Coast SR&QA Office, which ensures that NASA Johnson prime contractors operate safely on Government property. The Division also provides prime contractor SR&QA oversight, hardware acceptance support, and subcontractor Government source inspection support.</p>	<p>3.4.2.14 Safety Reliability and Quality Assurance (SR&QA)</p> <p>This function includes the matrixed support effort and resources necessary to support the Manager, Space Shuttle Program Safety and Mission Assurance (Space Shuttle Program Safety Manager) and to assure the implementation of requirements applicable to the safety, reliability, and quality assurance aspects of the Space Shuttle Program.</p>	<ol style="list-style-type: none"> 1. The office’s requirements under Johnson Procedures and Guidelines 1107.1A overlap the requirements of the Space Shuttle Program Safety Manager under NSTS 07700 paragraph 3.4.1.3. 2. The office did not provide the matrixed support to the Space Shuttle Program Safety Manager as required by NSTS 07700 paragraph 3.4.2.14. 3. The Division Chief told us that his office performs an independent assessment of the safety of the Space Shuttle Program. This overlaps the requirements of the HEDS Independent Assurance Office under Johnson Procedures and Guidelines 1107.1A.

Appendix D

(3) Space Shuttle Program Safety Manager

Responsibilities in Johnson Procedures and Guidelines 1107.1A, “The Johnson Organization”	Responsibilities in SFOC/NSTS 07700*	Auditor Observation
<p>Not cited.</p>	<p>3.4.1.3 Manager, Space Shuttle Program Safety and Mission Assurance (S&MA)</p> <p>The Manager, Space Shuttle Program Safety and Mission Assurance is responsible for managing the Space Shuttle Safety and Mission Assurance implementation and for oversight of all S&MA activities in support of the Space Shuttle Program. The manager is responsible to:</p> <ul style="list-style-type: none"> a. Represent the Program Manager on S&MA matters at internal and external forums. b. Provide S&MA requirements, tasks, and resource integration for NASA and contractor support. c. Develop program strategies for complying with Agency S&MA policy and procedures while ensuring strategies are responsive to program requirements. d. Evaluate program risks and advise the Program Managers (Technical Management Representatives) on their acceptability. e. Ensure establishment of contractor S&MA processes to assure that the Space Shuttle and its related support systems are designed, constructed, qualified, and operated satisfactorily to perform their intended purposes. 	<p>The manager’s requirements under NSTS 07700 paragraph 3.4.1.3. overlap the requirements of the Johnson Safety Office Space Shuttle Division under Johnson Procedures and Guidelines 1107.1A.</p>

(4) Space Shuttle Safety, Reliability, and Quality Assurance Office

Responsibilities in Johnson Procedures and Guidelines 1107.1A, “The Johnson Organization”	Responsibilities in SFOC/NSTS 07700*	Auditor Observation
Not Cited.	Not Cited.	The purpose of this office is unclear because the office exists in name only.

Appendix E. Key Space Shuttle Program Safety Responsibilities Delegated to the Johnson Safety Office

The SFOC Contracting Officer's Letter of Contract Administration Delegation delegated the following key areas of responsibility to the Johnson Safety Office.

- Shuttle Integration
- Orbiter
- Flight Software
- Extra-Vehicular-Activity and Flight Crew Equipment
- Flight Operations
- Flight Crew Preparation and Crew/Vehicle Integration

The delegated duties included:

- Perform surveillance and evaluation of contractor and associated subcontractor/supplier activities associated with risk management and safety, reliability, maintainability, and quality assurance as defined in the statement of work or program requirements.
- Gain real-time insight into activities at selected subcontractors. If delegation to other organizations is necessary, a strong framework of teamwork and regular communication should be developed and maintained.
- Manage the resources provided to perform the obligations of this delegation.
- Perform oversight of authorized subdelegated activities.
- Provide S&MA evaluation and technical assessment of engineering change requests.
- Evaluate contract deliverable products for compliance and acceptability.
- Resolve S&MA technical issues in conjunction with USA managers as required to fully facilitate USA performance.
- Prepare and maintain a Safety, Reliability, and Quality Assurance surveillance plan. This plan will outline the surveillance activity and information to be provided in support of the S&MA TMR.
- Recommend to the Space Shuttle Program Safety Manager any desired changes in contract scope and/or technical provisions with justification.
- Provide immediate notice of significant program problems or issues to the Space Shuttle Program Safety Manager.
- Provide performance evaluation with substantiated metrics to the Space Shuttle Program Safety Manager.
- Prepare and submit an annual audit schedule to the Space Shuttle Program Safety Manager.

Appendix F. Management's Response

National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
2101 NASA Road 1
Houston, Texas 77058-3696



Reply to Attn of: BD5

MAR 12 2001

TO: NASA Headquarters
Attn: W/Assistant Inspector General for Auditing

FROM: AA/Acting Director

SUBJECT: Management Response to OIG's Draft Audit Report on Space Shuttle
Program Management Safety Observations, Assignment
Number A0004100

We have reviewed the subject draft report, and thank you for the opportunity to provide comments. This response has been prepared in coordination with the Office of Space Flight. While we do not agree with all the findings, and strongly emphasize that flight safety was never impacted by the organizational structure concerns, we do concur with the recommendations. Actions have been taken, or are underway, to strengthen the areas of concern. Each recommendation, and resultant actions, is discussed individually in the enclosure. If you have any questions regarding this response, please contact Ms. Pat Ritterhouse, Audit Liaison Representative, at 281-483-4220.


Roy S. Estess

Enclosure

cc:
MA/R. D. Dittmore
NA/J. H. Casper
HQ/HK/J. E. Horvath
HQ/JM/J. D. Werner
HQ/M/J. H. Rothenberg
HQ/Q/F. D. Gregory

Management Response to OIG's Draft Audit Report on Space Shuttle Program Management Safety Observations, Assignment Number A0004100

Auditor's Findings

"The Johnson Safety Office did not provide the required support to the Space Shuttle Program Safety Manager for oversight of USA's safety activities. This occurred because Johnson did not clearly define the roles, responsibilities, and lines of authority for the Space Shuttle Program Safety Manager and the Johnson Safety Office regarding Space Shuttle Program safety. As a result, Space Shuttle Program Management did not have the necessary management controls in place to ensure (1) better control over \$13 million in Space Shuttle Program funds provided to the Johnson Safety Office and (2) effective safety oversight of key components of the Space Shuttle Program which are part of USA's work under the SFOC."

Recommendations for Corrective Action

The Director, Lyndon B. Johnson Space Center, should:

1. Clarify the Space Shuttle Program/SFOC organizational structure, NSTS 07700, and Johnson Procedures and Guidelines 1107.1A by defining the roles, responsibilities, and lines of authority for (1) safety of the Space Shuttle Program; (2) support for the Space Shuttle Program Safety Manager; and (3) independent assessment of Space Shuttle Program safety.
2. Provide the Space Shuttle Program Safety Manager the support required by the SFOC and NSTS 07700.

JSC Comments

Concur with Recommendation 1. The Space Shuttle Program Manager is responsible for the safety of the Space Shuttle Program (SSP). The SSP Manager, Safety and Mission Assurance (SMA) is responsible for the development of Program policy and requirements for Safety. The Johnson Space Center Safety, Reliability, and Quality Assurance (SRQA) organization will provide support to the SSP Manager - SMA as necessary to implement program requirements and to ensure proper Contractor surveillance. Responsibilities for independent assessment of SSP safety reside with the HQ/Q HEDS Independent Assurance Director, who resides at the Johnson Space Center. Program, Center and HQ/Q documentation will be revised as necessary to clarify these responsibilities by May 1, 2001.

Concur with Recommendation 2. The requirements for support to the SSP Manager - SMA in the execution of Space Flight Operations Contract (SFOC) surveillance have been documented in sub-delegations to the JSC, MSFC, and KSC SRQA organizations. The JSC SRQA Director submitted a Letter of Acceptance of Contract Administration Delegation, dated August 16, 2000, to the SSP Manager - SMA. Specific individual responsibilities have been identified. Annual operating agreements are being prepared and coordinated which will delineate products and tasks to be completed. These plans will be completed by May 1, 2001.

Enclosure

Auditor's Findings

"NASA's surveillance plans for USA do not adequately address all contract requirements for safety. Surveillance plans are incomplete because Johnson does not have a system for review and approval of the plans. As a result, NASA management, including the SFOC Contracting Officer, COTR, TMR's, and Space Shuttle Program managers, have less effective means of monitoring USA operations to assure that SFOC safety objectives are being met."

Recommendations for Corrective Action

The Director, Lyndon B. Johnson Space Center, should:

3. Direct the SFOC Contracting Officer to ensure that a TMR and an accompanying surveillance plan cover all key elements of the SFOC Statement of Work, including risk management.
4. Update each SFOC TMR's contractor surveillance plan to specifically describe the methods, monitoring requirements, and insight mechanisms necessary to ensure safe operations and the receipt of the quantity and types of supplies or services required by the Statement of Work.
5. Coordinate the safety aspects of each SFOC contractor surveillance plan with the TMR for S&MA.

JSC Comments

Concur with Recommendation 3, 4 and 5. The Contracting Officer's Technical Representative (COTR) for the Space Flight Operations Contract (SFOC), accompanied by the Contracting Officer (CO), performed a detailed audit of the SFOC Technical Management Representative (TMR) surveillance plans between June and September 2000. This audit verified the existence and implementation of surveillance plans covering all key elements of the SFOC Statement of Work. The SFOC CO revised the SMA TMR delegation on July 12, 2000, to include responsibilities for Risk Management (SOW 1.1.1.4) and the SMA TMR's surveillance plan covers this element of the SOW. With this action already taken, we consider this Recommendation 3 closed.

For Recommendations 4 and 5, the audit noted in response to Recommendation 3 also included the definition of activities and processes used to ensure safety and quality of products and services. Surveillance plan updates are being implemented by each TMR as required by the findings of the audit. COTR/CO audits of the SFOC surveillance plans will be performed on an annual basis. As a part of these audits, each TMR will be required to coordinate the safety and quality aspect of their plans with the SMA TMR. We consider these actions responsive to the recommendations.

Auditor's Findings

"USA has not performed the required update of its SFOC Management Plan to reflect current operations. The plan is not current because neither the COTR nor TMR for S&MA notified the Contracting Officer or took action to ensure that USA would update

the plan. As a result, NASA lacks a key management tool for monitoring and measuring USA's safety, management, and performance under the SFOC contract."

Recommendations for Corrective Action

The Director, Lyndon B. Johnson Space Center, should direct the SFOC Contracting Officer to:

6. Notify USA to update the current SFOC Management Plan to reflect current operations in the Space Shuttle program and in USA's SFOC management approach.
7. Establish procedures to ensure that USA's SFOC Management Plan is kept current in accordance with paragraph 1.1.1.1 of the SFOC.

JSC Comments

Concur with Recommendations 6 and 7. A proposed revision to the SFOC Management Plan was received on October 11, 2000. NASA's review determined a number of additional modifications needed prior to acceptance, and a rejection notice was given to the contractor on December 6, 2000. The contractor is working these modifications, and the revised product is expected by the end of February 2001. NASA has significant insight tools and opportunities other than the Management Plan to maintain a sufficient knowledge of the contractor's plans and performance, but does believe that the Management Plan should be updated when appropriate to document the characteristics of the contractor's operations. NASA will establish a requirement in the contract deliverable definition to formally require a Management Plan update within 45 days of the transition of additional contracts into SFOC. The DRD will also be modified to require a formal update on an annual basis unless the COTR formally approves a "no annual update required" based on rationale from the contractor that no significant management changes have occurred which warrant a DRD modification. We consider these actions responsive to these recommendations.

Auditor's Findings

"The classification and reporting of USA's close calls and mishaps can be improved at Kennedy and Johnson. Specifically, USA (1) either did not report or promptly report all close calls and mishaps into NASA's Incident Reporting Information System (IRIS) and (2) reported incomplete or out-of-date data into the IRIS. This occurred because Johnson uses systems other than the IRIS to record and track close calls and mishaps. In addition, neither the Kennedy nor Johnson S&MA offices reviewed USA's mishap reporting on a regular basis to ensure that all information is current and complete."

Recommendations for Corrective Action

The Director, Lyndon B. Johnson Space Center, should:

8. Report promptly all Johnson mishaps and close call information into IRIS.
9. Direct the SFOC Contracting Officer to ensure that all USA mishap information, including close calls, is promptly reported into IRIS on a daily basis as required

by NPG 8621.1 and that all information regarding corrective actions and mishap closeout is kept current in IRIS.

10. Direct the SFOC Contracting Officer to ensure that NASA safety officials review USA's mishap reporting on a periodic basis to ensure that NASA safety officials review USA's mishap reporting on a periodic basis to ensure that all information is current and complete and properly input into the IRIS.

JSC Comments

Concur with Recommendation 8. The Johnson Space Center SRQA Office will coordinate with the Headquarter's Office of Safety and Mission Assurance to ensure a robust process is in place to facilitate the prompt reporting of all reportable mishap and close calls as defined in NPG 8621.1. In the event that there are technical considerations as to why IRIS is not an appropriate reporting tool, JSC will propose alternative approaches and submit recommended changes to headquarters requirements. The implementation and updating of information will be completed by May 18, 2001.

Concur with Recommendation 9. The SSP Manager – SMA is responsible for the oversight of SFOC safety reporting in accordance with the SFOC CO delegation. In conjunction with the action described in response to Recommendation 8, the SRQA organizations at KSC, JSC and MSFC will implement the changes necessary to provide support to the Manager – SMA and ensure timely reporting of USA mishap information. All USA mishap and close call data will be updated and accurately reflected in the Agency's automated tracking system by May 18, 2001.

Concur with Recommendation 10. All mishap data is currently reviewed and analyzed by senior management through various forums such as the Executive Safety Committee, Incident Error Review boards, and weekly Senior Staff meetings. In conjunction with the actions in response to Recommendations 5 and 8, the SSP Manager – SMA will be responsible for the oversight of surveillance requirements. This includes the processes implemented by the supporting Center SRQA organization to periodically review and audit mishap reporting to ensure current and complete information is provided. Review of mishap data will be a specific focus for the 2001 surveillance plan audits.

Appendix G. Report Distribution

National Aeronautics and Space Administration (NASA) Headquarters

A/Administrator
AA/Chief of Staff
AI/Associate Deputy Administrator
B/Acting Chief Financial Officer
B/Comptroller
BF/Director, Financial Management Division
G/General Counsel
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HK/Director, Contract Management Division
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J/Associate Administrator for Management Systems
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L/Acting Associate Administrator for Legislative Affairs
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NASA Centers

Director, Ames Research Center
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Director, John H. Glenn Research Center at Lewis Field
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Director, Jet Propulsion Laboratory
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Non-NASA Federal Organizations and Individuals

Assistant to the President for Science and Technology Policy
Deputy Associate Director, Energy and Science Division, Office of Management and Budget
Branch Chief, Science and Space Programs Branch, Energy and Science Division, Office of Management and Budget
Director, Acquisition and Sourcing Management Team, General Accounting Office
Professional Staff Member, Senate Subcommittee on Science, Technology, and Space

Chairman and Ranking Minority Member – Congressional Committees and Subcommittees

Senate Committee on Appropriations

Senate Subcommittee on VA, HUD, and Independent Agencies

Senate Committee on Commerce, Science, and Transportation

Senate Subcommittee on Science, Technology, and Space

Senate Committee on Governmental Affairs

House Committee on Appropriations

House Subcommittee on VA, HUD, and Independent Agencies

House Committee on Government Reform and Oversight

House Subcommittee on Government Management, Information, and Technology

House Subcommittee on National Security, Veterans Affairs, and International Relations

House Committee on Science

House Subcommittee on Space and Aeronautics, Committee on Science

Congressional Member

Honorable Pete Sessions, U.S. House of Representatives

NASA Assistant Inspector General for Auditing Reader Survey

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Report Title: Space Shuttle Program Management Safety Observations

Report Number:

Report Date:

Circle the appropriate rating for the following statements.

	Strongly Disagree	Agree	Neutral	Disagree	Strongly Disagree	N/A
1. The report was clear, readable, and logically organized.	5	4	3	2	1	N/A
2. The report was concise and to the point.	5	4	3	2	1	N/A
3. We effectively communicated the audit objectives, scope, and methodology.	5	4	3	2	1	N/A
4. The report contained sufficient information to support the finding(s) in a balanced and objective manner.	5	4	3	2	1	N/A

Overall, how would you rate the report?

Excellent	Fair
Very Good	Poor
Good	

If you have any additional comments or wish to elaborate on any of the above responses, please write them here. Use additional paper if necessary. _____

How did you use the report? _____

How could we improve our report? _____

How would you identify yourself? (Select one)

Congressional Staff Media
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May we contact you about your comments?

Yes: _____ No: _____
Name: _____
Telephone: _____

Thank you for your cooperation in completing this survey.

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