

W

January 28, 1999

TO: AA/Director, Lyndon B. Johnson Space Center

FROM: W/Assistant Inspector General for Auditing

SUBJECT: Final Report on the Audit of Space Station Corrective Action Plans
(Assignment Number A-HA-98-020)
Report Number IG-99-007

The subject final report is provided for your use and comments. 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 actions taken or planned for recommendations 2 and 3 were responsive. Therefore, we request that you notify us when corrective actions are completed, including the extent of testing performed, to ensure corrective actions are effective. The proposed action on recommendation 1 was not fully responsive. Accordingly, we request that management reconsider its position on recommendation 1 and provide additional comments by February 26, 1999.

If you have questions concerning the report, please contact Mr. Dennis E. Coldren, Program Director, Human Exploration and Development of Space Audits, at (281) 483-0730, or Mr. Bret J. Skalsky, Auditor-in-Charge, at (281) 244-1156. We appreciate the courtesies extended to the audit staff. See Appendix F for the report distribution.

[original signed by]

Russell A. Rau

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IG-99-007

**AUDIT
REPORT**

**SPACE STATION
CORRECTIVE ACTION PLANS**

January 28, 1999



National Aeronautics and
Space Administration

OFFICE OF INSPECTOR GENERAL

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Acronyms

| | |
|------|---------------------------------------|
| DCMC | Defense Contract Management Command |
| PMSR | Performance Measurement System Report |

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NASA Office of Inspector General

IG-99-007

AHA-98-020

January 28, 1999

Space Station Corrective Action Plans

Executive Summary

Background. In January 1995, the Lyndon B. Johnson Space Center (Johnson) signed a \$5.638 billion contract¹ with The Boeing Company (Boeing) for the International Space Station (Space Station). The Space Station contract includes requirements for the design, development, manufacture, integration, test, verification, and delivery to NASA of the U.S. On-Orbit Segment² of the Space Station. In accordance with the terms of the contract, Boeing prepares a monthly Performance Measurement System Report (PMSR), which provides cost and schedule performance data.³ The Space Station Program Office (Program Office) uses the PMSR to help manage the Space Station Program, to assess performance trends, and to provide data on areas that need management attention. Part of the PMSR is the Variance Analysis Report, which Boeing uses to identify problems, monitor progress, record corrective action plans, and report results to management. Appendix B contains the requirements for the Variance Analysis Report.

Objectives. Our objectives were to assess the adequacy of corrective action plans by Boeing and Boeing Development Sites, as identified in the PMSR, for addressing Space Station cost and schedule variances and to assess the Government's oversight of the plans. Appendix A contains additional details on objectives, scope, and methodology.

Results of Audit. Boeing's corrective action plans and Johnson's oversight of the plans need improvement. The Space Station Program has experienced a continued deterioration in cost and schedule performance after a September 1997 adjustment of the contract cost baseline,⁴ but variance analyses and corrective action plans have not been effectively utilized to control the negative variances. Additionally, Johnson did not provide effective oversight of Government surveillance of the Earned Value Management System, including the verification of corrective actions related to cost and schedule variances. As a result, the Space Station Program lacked

¹ As of December 2, 1998, the value of contract NAS15-10000 was \$7.227 billion.

² The U.S. On-Orbit Segment of the Space Station includes several U.S. elements to be deployed.

³ In addition to Boeing Houston, Texas (the prime contractor), the Boeing Development Sites that prepare a PMSR and contribute to the summary PMSR for the Space Station Program are Boeing Canoga Park, California; Boeing Huntington Beach, California; and Boeing Huntsville, Alabama.

⁴ The adjustment of the contract baseline eliminated all cost and schedule variances (see Appendixes C and D).

assurance that negative variances were identified and corrective actions were taken to reduce associated risk (see Finding A). Further, Johnson did not ensure that Boeing took corrective actions on conditions noted since at least March 1997 to properly prepare and submit Variance Analysis Reports. As a result, Variance Analysis Reports may not adequately identify cost and schedule risks (see Finding B).

Other Matters of Interest. Boeing Huntington Beach did not properly classify in its March 1998 PMSR \$64.4 million of the \$76.9 million estimated cost variance (overrun) at contract completion. As a result, Boeing did not prepare corrective action plans to include identifying the risks associated with the \$64.4 million in estimated overruns. In September 1998, we discussed our audit results with Program Office officials. They took prompt corrective action to direct Boeing to properly classify estimated variance at contract completion. Additional details are in Appendix C.

Recommendations. NASA should ensure effective surveillance of the Earned Value Management System and direct Boeing to improve the quality of corrective action plans identified in Variance Analysis Reports.

Management's Response. Management concurred with the recommendations and stated it was taking action to correct the reported weaknesses. Management reported that personnel were in place at Johnson and at Defense Contract Management Command (DCMC), Boeing Huntington Beach, to ensure that reporting requirements are achieved and to provide adequate surveillance of the Earned Value Management System.

Evaluation of Response. Management's planned and completed actions are responsive except for the requirement for DCMC, Boeing Huntington Beach, to provide adequate surveillance of the Earned Value Management System by personnel who have attained the required competencies and have completed the required courses. Specifically, management has not requested that DCMC provide an Earned Value Management System Surveillance Monitor who has attained Level II Certification and has completed courses in Contractor Performance Management Fundamentals and Intermediate Contractor Performance Management. We request that management further review its position on this matter and provide additional comments.

Introduction

The Space Station contract requires Boeing to have an Earned Value Management System,⁵ which produces an assessment of cost and schedule performance. The Earned Value Management System tracks and identifies contract results by work breakdown structure⁶ and identifies program elements (variances) that have either exceeded or failed to meet contractually identified thresholds of performance jointly agreed to by the customer and program management. Using the variances, Boeing prepares and submits a monthly Variance Analysis Report, which identifies the largest cost and schedule variances and which should also identify the cause, effect, and corrective action plans that will be taken. Appendix B contains more details on earned value management, explains the contract requirements with respect to the management system and reports, and explains how Johnson obtains support through a contract administration delegation.⁷

During November 1997, Johnson approved an adjustment that added \$600 million to the Space Station contract baseline. The adjustment eliminated all variances and reset cost and schedule performance efficiency (see Appendix D) to 100 percent. Johnson management acted when contractor initiatives, such as corrective action plans, were not successfully achieved. Consequently, by approving the adjustment, NASA recognized and accepted that the overruns were not recoupable⁸ through management actions. (Johnson's adjustment to the Space Station contract baseline did not include an associated adjustment to the contract value through December 1998. We believe the contract should also have been adjusted because the cost to complete the contract could be substantially higher than the current contract value. A separate audit of this issue is under way.) Our audit efforts related to corrective action plans reportable in the PMSR after the contract baseline adjustment.

⁵ Formerly called a Performance Measurement System.

⁶ A division of functional requirements produced according to the contract statement of work.

⁷ A method by which a contracting activity, such as Johnson, assigns contract administration responsibilities to a contract administration office, such as the Defense Contract Management Command.

⁸ Overruns to date that cannot be eliminated by efficiencies and initiatives (corrective action plans).

Findings and Recommendations

Finding A. Surveillance of Earned Value Management System

Johnson did not ensure that DCMC, its agent at Boeing Huntington Beach, accomplished Government surveillance of the Earned Value Management System, as required by the contract administration delegation and the DCMC surveillance plan. The contracting officer for the Space Station had not identified DCMC nonperformance and nonreporting of these contract administration delegation and surveillance plan requirements. As a result, the Space Station Program has not benefited from the intended early identification of program risks and oversight of corrective actions. Appendix B explains the contract administration delegation and the DCMC surveillance plan requirements.

Contract Administration Delegation Requirement

Johnson's Space Station contract administration delegation requires the DCMC representative, who is the Earned Value Management System Surveillance Monitor (monitor), at Boeing Huntington Beach, to provide overall Earned Value Management System surveillance. Specifically, the monitor should assure system and report effectiveness and should perform Boeing management interviews (see Appendix B).

DCMC Monitor's Training and Certification

The Space Station contract administration delegation states that inadequate skills of DCMC personnel performing NASA work are considered to be evidence of inadequate DCMC support. The DCMC, Boeing Huntington Beach, monitor had not attained the competencies and certifications required by DCMC⁹ and did not ensure that Boeing's corrective action plans were effectively accomplished. Because required training courses have been canceled, the current monitor does not expect to complete the competency and certification requirements until after fiscal year 1999.

⁹ DCMC requires the monitor to have fulfilled the DCMC Training Matrix, achieved Level II Certification in any career field, and completed courses in Contractor Performance Management Fundamentals and Intermediate Contractor Performance Measurement.

Performance Identification

As of August 1998, the Space Station contracting officer had not identified specific actions that the monitor did not perform. Specifically, the contracting officer had not identified that the monitor did not:

- ensure that corrective action plans were successfully accomplished;
- conduct required interviews of Boeing Huntington Beach program managers, functional managers, and cost account managers since October 1997; and
- prepare and submit required surveillance reports.

Surveillance Benefits Affected

Since the monitor did not conduct required interviews, the Space Station Program did not obtain the intended benefit of having the monitor convey NASA program interests to Boeing Huntington Beach program managers, functional managers, and cost account managers. Additionally, Space Station officials did not receive the benefit of those managers' knowledge of program risks through the monitor's surveillance activities.

Recommendations, Management's Response, and Evaluation of Response

- 1. The Director, Lyndon B. Johnson Space Center, should request that DCMC provide adequate surveillance of the Earned Value Management System by personnel who have attained required competencies and have completed required courses.**

Management's Response. Concur. Management stated that actions already taken include Level I Certification of the Earned Value Management System Surveillance Monitor at Boeing Huntington Beach. Level II Certification is planned and an Earned Value Management System course is scheduled for this fiscal year. Management also stated it was confident that the Huntington Beach DCMC has the required competencies and personnel to provide adequate surveillance of the Earned Value Management System. The complete text of management's comments is in Appendix E.

Evaluation of Response. Management's comments are not fully responsive because they do not directly address the recommendation. Management did not state it has requested that DCMC provide personnel who have attained Level II Certification and have completed the required courses. Instead, management based its response on comments received from DCMC regarding the monitor's qualifications. However, Level I Certification does not meet DCMC standards. Also, DCMC did not indicate that the Earned Value Management System course referred to by Johnson management was an adequate substitute for DCMC's required courses. Specifically, DCMC requires that the monitor complete courses in Contractor Performance

Management Fundamentals and Intermediate Contractor Performance Measurement. Therefore, we request that management further review its position on this matter and provide additional comments to specifically address the personnel's qualifications.

- 2. The Director, Lyndon B. Johnson Space Center, should request that DCMC prepare the reports specified in the contract administration delegation and the DCMC surveillance plan.**

Management's Response. Concur. Management indicated that DCMC, Boeing Huntington Beach, has submitted a surveillance plan that complies with the delegation requirements and is submitting all required reports. The DCMC response to the audit findings is included in management's response (see Appendix E).

Evaluation of Response. The actions planned by management and DCMC are responsive to the recommendation.

Finding B. Prior Condition Related to Variance Analysis Reports

As indicated by the June 1998 PMSR, the Program Office and Boeing had not resolved an earlier identified weakness on preparation and submission of the Variance Analysis Report. Officials of the Space Station Business Management Office explained that current priorities have been on cost management rather than reporting quality. As a result, Variance Analysis Reports may not have adequately addressed potential cost and schedule risk to the Space Station Program.

Condition Identified by the Program Office

The Space Station Business Management Office notified Boeing that Variance Analysis Report elements were inadequate and out-of-date and that explanations did not identify recovery plans. This assessment was conveyed in an Area of Weakness report for Award Fee Period 2 (October 1, 1996, through March 31, 1997). The Business Management Office notified Boeing Houston that the Variance Analysis Reports should identify underlying problems, describe the recovery plan, describe the impact to cost or how costs would be mitigated or recovered, and identify when schedule variances would be eliminated. We discussed these issues with officials of the Business Management Office, and they indicated that they saw an improvement in the Variance Analysis Reports following the direction given to Boeing Houston. The officials believed that the number of “poor” Variance Analysis Reports were decreasing as the number of quality Variance Analysis Reports were increasing. The Business Management Office also stated that the area of weakness was still unresolved and that the weakness had been a long-term issue with the Space Station Program. However, officials from the Business Management Office also stated that although reporting quality was important, current priorities have been on cost management, which they defined as actions Boeing has taken to manage its portion of the Space Station Program. Officials also stated that Variance Analysis Reports are a small part of cost management and are a by-product of the cost management system. However, Variance Analysis Reports are essential to effective cost management because they provide the means to identify recovery plans and thereby assure program success.

Condition Continued to Exist

We reviewed Boeing's first 16 of the 45 work breakdown structures requiring Variance Analysis Reports for June 1998 and found that deficiencies still existed. Specifically, Boeing did not:

- prepare two Variance Analysis Reports,
- include major data requirements¹⁰ in the Variance Analysis Reports, and
- update or revise Variance Analysis Report data.

Examples of the deficiencies include:

- No report was prepared for Boeing Huntington Beach's Communications and Tracking, which had a cost variance of \$4.27 million and a schedule variance of \$2.23 million. These variances were identified within the top 10 program reportable variances in the PMSR for cost and schedule (see Appendix B).
- Required data elements were omitted from Boeing Huntington Beach's Guidance Navigation and Control. These variances were also identified within the top 10 program reportable variances in the PMSR for cost and schedule (see Appendix B).
- Report data (cause, impact, and corrective actions) for Boeing Houston's Business Integration had not been updated or revised since February 1998.

DCMC Reported the Need for Better Corrective Action Plans

DCMC downgraded Boeing Huntington Beach's Earned Value Management System rating from marginal to unsatisfactory in the August 1998 Monthly Status Report, which was furnished to the Program Office. This rating was based on Boeing's ineffectiveness in assigning corrective actions to control cost and schedule. DCMC stated that a review of the PMSR Variance Analysis Reports ". . . clearly identifies numerous causes for cost overruns and schedule delays, however corrective action plans are vague, simplistic, wishful, and in many cases unrelated to root causes."

¹⁰ Omitted major data requirements included the expected completion dates for corrective action plans, revised schedule and/or cost estimates based on corrective action plans, means of implementing corrective action plans, results of corrective action plans, and the status of progress on previously reported problems.

Recommendation, Management's Response, and Evaluation of Response

3. The Director, Lyndon B. Johnson Space Center, should direct action to ensure Boeing includes in the PMSR Variance Analysis Reports major data requirements that meet the Space Station contract and contractor's Earned Value Management System criteria. Specifically, those requirements include, but are not limited to:

- **Expected completion dates for corrective action plans.**
- **Revised schedule and/or cost estimates based on corrective action plans.**
- **Means of implementing corrective action plans.**
- **Results of corrective action plans.**
- **Status of progress on previously reported problems.**

Management's Response. Concur. Management stated that the Space Station Business Management Office was assigning a budget analyst to validate the Variance Analysis Reports each month. The analyst will ensure that each report includes the requirements listed in the contract and the contractor's Earned Value Management System criteria. If required data is not contained in the reports, they will be returned to Boeing for correction. Management is still seeking improvements to the Variance Analysis Reports and is working with Boeing and DCMC to ensure that the reports are accurate and effective management tools. Management also stated that it will continue to emphasize the importance of an accurate and complete Variance Analysis Report in the award fee process using the results of the monthly review.

Evaluation of Response. The actions planned by management are responsive to the recommendation.

Appendix A. Objectives, Scope, and Methodology

Objectives

The audit objectives were to assess the adequacy of corrective action plans by Boeing and Boeing Development Sites, as identified in the PMSR, to control Space Station costs and schedule and to assess Johnson's oversight of the plans.

Scope and Methodology

Johnson's Space Station contractor, Boeing, has four locations that furnish PMSRs for their functional contract responsibilities. We visited Boeing Houston, Boeing Huntington Beach, and Boeing Canoga Park. Also, we interviewed NASA, Boeing, DCMC, and Defense Contract Audit Agency personnel. We did not visit Boeing Huntsville because the PMSR did not indicate significant cost and schedule variances for that site.

We relied on the computer-generated data in the PMSR from Boeing to assess the cost, schedule, and at-completion variances identified in Variance Analysis Reports. Our reliance was based on limited testing of PMSR data, prior reviews by NASA Office of Inspector General, DCMC, Defense Contract Audit Agency, and other Government agencies.

As part of the audit, we reviewed the Space Station contract and Federal, NASA, and contractor standards, policies, and procedures to understand Earned Value Management System requirements. We also reviewed Boeing's PMSRs to ensure compliance with those requirements.

Management Controls Reviewed

We reviewed management controls relative to contract administration as described in Federal Acquisition Regulation 42.302, "Contract Administration Functions." Specifically, we reviewed Federal Acquisition Regulation 42.302(a)(57) and the Space Station contract, contract administration delegation, "Note 10: Provide the NASA Procuring Contracting Officer with (b) Earned Value Management System support."

We considered management controls to be adequate except that controls needed to be strengthened to ensure that DCMC provides the intended Earned Value Management System benefits to NASA (see Finding A) and to ensure that Boeing provides meaningful information in the Variance Analysis Reports (see Finding B).

Audit Field Work

We conducted our audit from February through September 1998 in accordance with generally accepted government auditing standards.

Appendix B. Earned Value Management

Earned Value Management

Earned Value Management is a systematic approach to assessing cost and schedule performance. An Earned Value Management System tracks and identifies contract results by work breakdown structure and identifies program elements (variances) that have either exceeded or failed to meet contractually identified thresholds of performance jointly agreed to by the customer and program management. Earned Value Management compares the budgeted cost of work performed to the budgeted cost of work scheduled to quantify schedule variance in dollars. Comparing budgeted cost of work performed to actual cost of work performed quantifies cost variance. Comparing estimated cost at completion with budgeted cost at completion provides an estimate of contract overrun or underrun.

Contract Work Breakdown Structure 1.2.2, “Financial Management”

Space Station contract, Work Breakdown Structure 1.2.2, “Financial Management,” requires Boeing to effect financial control disciplines throughout the program for early identification and resolution of potential threats to program success, provide and maintain an Earned Value Management System to provide an assessment of the integrated cost and schedule performance data, and provide an earned value management plan and reports.

The PMSRs must be reported by prime work breakdown structure and must include a Problem Analysis Report, which is a narrative report that explains known and potential problems. The variances to be reported are the 10 largest cumulative cost variances, the 10 largest cumulative schedule variances, and the 5 largest at-completion variances.

Contract Administration Delegation

The Space Station contracting officer, as authorized by Federal Acquisition Regulation 42.302, “Contract Administration Functions,” delegated contract administration services to the DCMC. Under this delegation, DCMC is authorized to perform administrative functions, act as the contracting officer’s representative, and provide Earned Value Management System support.

DCMC is responsible for assigning an Earned Value Management System Surveillance Monitor. The monitor’s duties are to develop, implement, and maintain a surveillance plan that provides the details for accomplishing the surveillance activities; provide overall Earned Value Management System surveillance on a monthly basis; provide specialized support or program analysis; keep the Program Office advised on the status of the contractor’s management control system and related activities; evaluate all proposed contractor’s management control system changes to ensure continued compliance with approved requirements; perform cost account manager interviews (six per quarter), functional manager interviews (two per year), and program manager interviews (one

Appendix B

per year); report interview results as identified in the surveillance plan; summarize interview results in a surveillance evaluation report to the Program Office; and maintain a report file to include areas reviewed, findings, actions taken and results obtained, and performance reports.

Boeing Variance Analysis Report Data Element Requirements

The NASA-approved Boeing Earned Value Management System requires the Variance Analysis Reports to include the identification of applicable control account (by work breakdown structure); discussion of the nature of the problem and its causes; impact of the problem on cost, schedule, and technical performance of the task; corrective action plan to be implemented, including expected completion dates; revised cost and/or schedule estimates based on the corrective action plan; and signature of persons reviewing and approving the report.

Additional information for management consideration should include the potential impact on other elements, results of the corrective action plan, status of progress on previously reported problems, and the managers responsible for implementation of corrective action plans.

Boeing Huntington Beach uses slightly different data element requirements in its Variance Analysis Report.¹¹ These requirements include the identification of the problem, the manner in which to address incremental and cumulative variances, assessment of impact on current task and program, explanation of how corrective action will be implemented, identification of who will implement the corrective action, and designation of when the corrective action will be completed.

¹¹ The Boeing Huntington Beach Earned Value Management System has characteristics reflecting the preferences of the previous owner of that location.

Appendix C. Classification of Variance at Completion

Classification of Variance at Completion

Boeing Huntington Beach did not properly classify in its March 1998 PMSR \$64.4 million (84 percent) of the \$76.9 million estimated cost variance (overrun) at contract completion. Although the data were developed to the level of detail necessary to require corrective actions, Boeing Huntington Beach classified the \$64.4 million as management reserve in an attempt to control the associated costs without specifically identifying them in the PMSR at the work breakdown structure level. Further, although Johnson officials were aware of the practice, they did not require Boeing to properly classify the variance. Because amounts classified as management reserve do not require corrective action, Boeing did not prepare corrective action plans to limit the estimated cost growth and, consequently, did not properly identify significant areas of program risks. After we discussed this condition with management, it took prompt action to direct Boeing to properly classify the cost variance in the PMSR, as required by the Space Station contract.

Negative Management Reserve

Management reserve is an amount of the total allocated budget withheld, for management control purposes, rather than designated for the accomplishment of a specific task or set of tasks. Essentially, management reserve is unallocated budget and, therefore, should not be a negative amount. Management reserve, as a budgetary resource, is a positive amount. Boeing Houston's Earned Value Management System specifically, and logically, precludes management reserve from being a negative amount. Boeing Huntington Beach's Earned Value Management System does not specifically address management reserve with respect to positive versus negative values. Boeing Huntington Beach's \$64.4 million of estimated cost variance (overrun), if expressed at the respective work breakdown structures, may have required corrective action plans. Instead, Boeing Huntington Beach reflected the \$64.4 million as management reserve. Since the amount was an overrun, management reserve had a negative value, the work breakdown structure did not include the \$64.4 million as overruns, and there was no reason to expect the associated corrective action plans.

Reclassification of Variance at Completion

At the direction of Boeing Houston, the three Boeing Development Sites introduced in the June 1998 PMSR an element for program risk. Similar to management reserve, program risk is not part of the performance baseline. Boeing Huntington Beach reclassified the variance at contract completion from management reserve to "program manager risk." However, Boeing did not identify the variances in the work breakdown structure and did not include corrective action plans in the PMSR. Also, Boeing Canoga Park had reported all variances in the work breakdown structure since at least November 1997, except for positive variances in management reserve. However, Boeing Canoga Park's June 1998 PMSR showed \$6.1 million of variance at

Appendix C

contract completion as “management risk.” Additionally, Boeing Huntsville added “risk/opportunities” to its June 1998 PMSR and in that category showed \$20.2 million of the \$35.7 million total estimated cost variance at completion.

PMSR Reliability

Not reporting the \$64.4 million overrun by work breakdown structure level adversely affected the reliability of the PMSR. First, 84 percent of the estimated overrun at contract completion was not reported in terms of cause and effect and, consequently, corrective action plans were not provided to limit the cost growth to the estimated amount. Second, the five items that were reported may not have represented the five largest variances. See Appendix B for work breakdown structure reporting requirements.

Effect of Contract Baseline Adjustment on Performance Efficiency

Program Office officials approved a contract baseline adjustment because they knew the variances could not be recovered. Also, the adjustment would allow potential problems on future tasks to be identified and corrected faster and more accurately. In September 1997, before the contract baseline adjustment, the PMSR showed a cost performance efficiency of 91.8 percent (\$398.2 million overrun) and a schedule performance efficiency of 97.0 percent (\$139.1 million overrun). The adjustment eliminated all variances and reset cost and schedule performance efficiency to 100 percent. However, after the contract baseline adjustment, Boeing’s performance efficiency decreased to about what it was before the adjustment. As of March 1998, Boeing’s cost performance efficiency was 95.7 percent (\$27.2 million overrun) and schedule performance efficiency was 93.5 percent (\$42.3 million overrun). As of June 1998, the cost performance efficiency was 93.9 percent (\$56.3 million overrun) and the schedule performance efficiency was 94.8 percent (\$48 million overrun). In addition, the June 1998 PMSR estimated the total overrun at contract completion to be \$183 million. In response to Boeing Houston’s direction to the Boeing Development Sites, \$85.3 million of the \$183 million was not classified and reported by work breakdown structure. The decrease in performance efficiency after rebaselining indicates that better corrective action plans are needed and that Program Office management needs to emphasize the importance of development and accomplishment of corrective action plans, particularly with respect to cost. Also, if corrective actions are not provided for all estimated variances by work breakdown structure, performance efficiency may continue to decline and overruns may continue to increase. Appendix D contains additional details on performance efficiency data and calculations before and after the baseline adjustment.

Appendix C

Management Action Initiated

On September 8, 1998, we discussed the results of our audit with Space Station Program officials. In a September 15, 1998, memorandum, the Space Station contracting officer directed Boeing to prepare the PMSR to identify the latest revised estimate at completion by work breakdown structure. The direction permits a small amount of the latest revised estimate to remain as program manager risk if it cannot be allocated to the cost account level. The contracting officer directed that the changes be made not later than in the September 1998 month-end report. The action by the Space Station contracting officer will resolve the conditions identified in this area.

Appendix D. Performance Efficiency Calculations

(dollars in millions)

| System Elements | Contract Inception to Before Baseline Adjustment | Contract Inception Through Baseline Adjustment | After Baseline Adjustment Through March 1998 | After Baseline Adjustment Through June 1998 | Notes |
|--|--|--|--|---|-------|
| Budgeted Cost of Work Scheduled | \$4,610.0 | \$4,869.0 | \$649.3 | \$914.1 | |
| Budgeted Cost of Work Performed | \$4,471.0 | \$4,869.0 | \$607.0 | \$866.1 | |
| Actual Cost of Work Performed | \$4,869.0 | \$4,869.0 | \$634.3 | \$922.4 | |
| Schedule Variance | (\$139.1) | \$0 | (\$42.3) | (\$48.0) | 1 |
| Cost Variance | (\$398.2) | \$0 | (\$27.2) | (\$56.3) | 2 |
| Schedule Performance Index | 97.0% | 100% | 93.5% | 94.8% | 3 |
| Cost Performance Index | 91.8% | 100% | 95.7% | 93.9% | 4 |
| Estimated Cost at Complete Variance | (\$600.0) | \$0 | (\$76.9) | (\$183.0) | 5 |
| Estimated Cost at Complete Variance Not Included by Work Breakdown Structure | (\$4.3) | \$0 | (\$65.5) | (\$85.3) | 6 |

Notes:

1. Negative schedule variance represents a behind-schedule condition and is calculated as budgeted cost of work performed less budgeted cost of work scheduled.
2. Negative cost variance represents an overrun and is calculated as budgeted cost of work performed less actual cost of work performed.
3. Schedule performance index represents the actual schedule performance efficiency and is calculated as budgeted cost of work performed divided by budgeted cost of work scheduled.
4. Cost performance index represents the actual cost performance efficiency and is calculated as budgeted cost of work performed divided by actual cost of work performed.
5. These amounts are the estimated costs at completion variances: \$600.0 million became the contract baseline adjustment; \$76.9 million at March 1998, before a program manager initiative adjustment; and \$183.0 million, which has developed since the contract baseline adjustment.
6. These are the estimated costs at completion variances not included in the work breakdown structure. Of the \$65.5 million after the contract baseline adjustment through March 1998, \$64.4 million represents the Boeing Huntington Beach amount discussed in Appendix C.

Appendix E. Management's Response

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



JAN 21 1999

Reply to Attn of:

BD

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

FROM: AA/Director

SUBJECT: Management Response to OIG's Draft Report on the Audit of Space
Station Corrective Action Plans, Assignment Number A-HA-98-020

We have reviewed the findings contained in the subject draft audit report, and thank you for the opportunity to provide our comments. The report discusses the Performance Measurement System Report (PMSR) prepared by Boeing, and used by the Space Station Program to assess performance trends and provide data on areas that need management attention. Space Station Program is a viable, on-going program requiring significant management oversight in all areas, and this report is only one of the management tools being used to manage cost, schedule and performance.

We appreciate your acknowledgment in the report of actions taken by the contracting officer to address any shortfalls in the contractor's reporting process. Since preliminary findings were briefed throughout the review, and meetings held with Space Station personnel to discuss the report findings, we are in general agreement with the audit findings and recommendations. Each recommendation is addressed individually in the enclosure, and we are also forwarding the Defense Contract Management Command (DCMC) response to the audit findings.

With actions taken and on-going to address the perceived weaknesses, and with your concurrence of those actions, we will consider the assignment closed on issuance of the final report. If you have any questions regarding this response, please contact Ms. Pat Ritterhouse, Audit Liaison Representative, at 281-483-4220.

A handwritten signature in black ink that reads "George W. S. Abbey".

George W. S. Abbey

Enclosure

cc:
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Appendix E

Management Response to OIG's Draft Report on the Audit of Space Station Corrective Action Plans, Assignment Number A-HA-98-020

Auditor's Findings

"The Space Station contract requires Boeing to have an Earned Value Management System, which produces an assessment of cost and schedule performance. The Earned Value Management System tracks and identifies contract results by work breakdown structure and identifies program elements (variances) that either exceeded or failed to meet contractually identified thresholds of performance jointly agreed to by the customer and program management."

* * * * *

"The DCMC Boeing Huntington Beach monitor had not attained the competencies and certifications required by DCMC and did not ensure that Boeing's corrective action plans were effectively accomplished. Because required training courses have been canceled, the current monitor does not expect to complete the competency and certification requirements until after fiscal year 1999."

Recommendations for Corrective Action

The Director, Johnson Space Center, should request that DCMC:

1. Provide adequate surveillance of the Earned Value Management System by personnel who have attained required competencies and have completed required courses.
2. Prepare the reports specified in the contract administration delegation and the DCMC surveillance plan."

JSC Comments

We concur with the recommendation. Actions already taken include the fact that the Earned Value Management System (EVMS) monitor at Huntington Beach has been Level I certified in Systems, Planning, Research, Development, and Engineering. Level II certification is planned for Fiscal Year (FY) 99, and an EVMS course is also scheduled for FY 99. We are confident that the Huntington Beach DCMC has the required competencies to perform the job, and that the personnel in that office are providing adequate surveillance of the EVMS system.

The DCMC office in Huntington Beach has now submitted a surveillance plan which ensures that they comply with their delegation requirements. The NASA EVMS Point of Contact has concurred with this plan. DCMC is currently submitting all reports as specified in their contract administration delegation and in the DCMC surveillance plan. The DCMC response to the audit findings which discusses specific corrective actions taken by DCMC is attached.

Enclosure

Auditor's Findings

"...the Program Office and Boeing had not resolved an earlier identified weakness on preparation and submission of the Variance Analysis Report. Officials of the Space Station Business Management Office explained that current priorities have been on cost management rather than reporting quality. As a result, Variance Analysis Reports may not have adequately addressed potential cost and schedule risk to the Space Station Program."

"Recommendation for Corrective Action

3. The Director, Johnson Space Center, should direct action to ensure Boeing includes in the PMSR Variance Analysis Reports major data requirements that meet the Space Station contract and contractor's Earned Value Management System criteria. Specifically, those requirements include, but are not limited to:
 - Expected completion dates for corrective actions plans.
 - Revised schedule and/or cost estimates based on corrective action plans.
 - Means of implementing corrective action plans.
 - Results of corrective action plans.
 - Status of progress on previously reported problems."

JSC Comments

We concur with the recommendation and have taken actions to correct this weakness. Specifically, the NASA International Space Station (ISS) Business Management Office (BMO) has assigned a budget analyst who is very knowledgeable in EVMS to validate the variance analysis reports (VAR) each month. He will ensure that each VAR includes the requirements listed in the contract and contractor's EVMS criteria, including the expected completion date of the corrective action plan (CAP), the cost and schedule impacts of the CAP, the means of implementing the CAP, the results of the CAP, and the status of progress on previously reported problems. If all the data for the significant VARs are not included in the PMSR, the report will be returned to Boeing for correction. The assigned NASA ISS analyst will independently assess the VAR data to ensure the CAP's are logical, realistic, and reflect the actual ISS development program. In addition, we will continue to emphasize the importance of an accurate, complete VAR in the Award Fee Process using the results of this monthly review.

Over the last year and a half we have seen improvements in the VARs. Some of that improvement can be attributed to the fact that Boeing implemented an Over-Target Baseline (OTB) adjustment and reset all cost and schedule variance and variance at completion (VAC) to \$0 in order to make the EVMS reporting tool more meaningful for performance management. However, the contractual baseline has not changed and the contractor has not been relieved of responsibility for the overrun. As a result of the OTB adjustment, there have been fewer VARs since the OTB, but they have addressed more current, post-OTB issues and recovery plans; eliminating repetitive narrative

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about issues and problems to a baseline which was no longer valid for the purposes of performance assessment.

NASA is still seeking improvements in the VARs, and has been working with Boeing to implement a more streamlined VAR format and a consistent format across all of the Boeing sites. A working group was established to implement a streamlined VAR format with more emphasis on the data that NASA expects to gain from these reports. As a result, all Boeing sites are currently using a consistent, streamlined VAR format. At the request of the NASA BMO, DCMC at each site recently performed a thorough assessment of the content and quality of the VARs provided by Boeing. This oversight will help ensure the variance analysis reports are accurate and effective management tools.

DCMC on-site EVMS representatives are of the opinion that, in general, the VARs meet the intent of the requirements of the system descriptions. However, DCMC noted areas for improvement which they are working with the Boeing business office at the respective sites. In addition, the regional Boeing EVMS representative has been contacted regarding providing "VAR writing" training to cost account managers. We will continue to emphasize the quality of VARs during regular joint surveillance reviews. We determine the actions taken and ongoing to be responsive to the recommendation.

Appendix E



DEFENSE LOGISTICS AGENCY
DEFENSE CONTRACT MANAGEMENT COMMAND
DCMC, BOEING - HUNTINGTON BEACH
5301 BOLSA AVE
HUNTINGTON BEACH, CALIFORNIA 92647-2099

IN REPLY
REFER TO

DCMDW-RMOC

December 9, 1998

MEMORANDUM FOR SPACE STATION PROGRAM OFFICE
ATTN: BG3 (LAURA PEPPER AND MARY PROUDY)

SUBJECT: Response to Draft Report on the Audit of Space Station Corrective Action Plans,
Assignment Number A-HA-98-020

Listed below are the recommendations for corrective action from the Inspector General during the May 1998 visit to DCMC Boeing Huntington Beach (BHB):

1. "The Director, Johnson Space Center, should request that DCMC:
 - a. Provide adequate surveillance of the Earned Value Management System by personnel who have attained required competencies and have completed required courses.
 - b. Prepare the reports specified in the contract administration delegation and the DCMC surveillance plan."

In response to the IG Visit, DCMC BHB states the following:

1. Since the NASA IG visit in early May 1998, DCMC BHB has implemented several corrective actions designed to improve EVMS support to the ISS NASA customer. The DCMC ISS Program Integration Team has improved the EVMS surveillance functions as evidenced and reported in the DCMC ISS Monthly Status Reports, (Reference MSRs for Apr - Oct 98). The ISS EVMS section of the MSR currently includes the following topics/improvements: Color status rating; corrective actions; table listing EVMS performance; chart trending cost and schedule variances; current period CV and SV analysis; Boeing staffing and overtime usage results; DCMC independent analysis and assessment; results of EVMS interviews; and a DCMC IEAC section.
2. EVMS surveillance is made up of system surveillance and program surveillance. System surveillance ensures that the program implements the PMSR in accordance with government requirements and continues to comply with the government requirements. Program surveillance deals with program specific issues by reviewing variance analysis and the Performance Measurement Baseline (PBM).
3. The EVMS monitor at Huntington Beach provides system surveillance for all programs at this location. This includes International Space Station as well as Titan IV Payload Fairings and Delta II Expendable Launch Vehicles. The NASA delegation for ISS has special

Attachment

instructions for EVMS surveillance, which are specific to the program. Our DCMC BHB EVMS Surveillance plan addresses our method for satisfying each specific action in the special instructions. EVMS program surveillance and reporting is done jointly by the ISS Program Integrator (PI) and DCMC BHB EVMS system monitor with the assistance of the ISS DCMC Team. (See file EVMSSURPLAN.DOC, ISS EVMS Surveillance Plan ORIGINAL SIGNED).

4. DCMC BHB has a Joint Surveillance Agreement in place and has been performing Joint Surveillance to the satisfaction of our DoD customers. The annual joint surveillance of the ISS program was conducted just prior to the NASA IG visit. An extensive report of our findings and recommendations was provided to the NASA IG and the ISS Program Office in October 1998.

5. In addition to the on-sight support, DCMC has other resources available to provide training, guidance, and operational assistance. For example, DCMC Headquarters has created an EVMS Center, which is staffed with high level professionals that provide system surveillance assistance nationwide.

6. Additionally, DCMC has created Senior Functional Advisors (SFAs) which are highly experienced leaders certified in Contract Administration Service (CAS) functional areas. They are assigned to regional geographic areas and provide assistance with engineering, quality assurance, contracting, property, and pricing issues. DCMC BHB has utilized these resources to the maximum extent possible to enhance our EVMS capability. The DCMC Engineering SFA for the Huntington Beach area, Andrew Yoo, has visited the ISS Team five times since the NASA IG audit. In approximately 30 hours, he has provided classroom training, assisted with interviews of senior ISS Boeing management, worked on base line reviews, and the development of our November 1998 Independent EAC.

7. DCMC also has Process Champions at the Eastern and Western Districts who provide additional training and surveillance assistance. We have elevated our training requirements to them and are awaiting EVMS course availability.

8. DCMC HQ has performed an Internal Operations Assessment (IOA) at Huntington Beach, which identified EVMS surveillance process weaknesses. The following actions have been taken since the IOA:

a. A corrective action plan was formulated and has been carried out. (See file EVMSCA.doc included in this transmittal, EVMS Corrective Action Plan)

b. Part of the corrective action plan was to update the Surveillance Plan and get NASA's approval. This was accomplished September 10, 1998. (See file EVMSSURPLAN.DOC, ISS EVMS Surveillance Plan ORIGINAL SIGNED)

c. Another milestone for the corrective action plan was to complete a DCMC Independent Estimate at Completion. This was accomplished November 10, 1998. (See file LTDIEAC.doc included in this transmittal, DCMC independent Estimate at Completion)

9. Other reports we have provided in accordance with the contract administration letter of delegation are:

- a. Contract Budget Base Log, Undistributed Budget, Management Reserve: baseline and revisions reconciliation. (Refer to October 1998 MSR)
- b. Cost Account Manager Interviews (Refer to interview section of MSR reports)
- c. Audit report by DCAA on Cost Performance Report (CPR) versus Contract Funds Status Report (CFSR). (Refer to Oct. 98 MSR)
- d. The DCAA audit report on indirect costs versus EAC will be issued with the November 1998 DCMC MSR.
- e. BHB is currently proposing a consolidation of the over 700 existing cost accounts to approximately 200 cost accounts. DCMC has been observing this process and will provide a report on the Cost Account Plans and BCWP techniques once the results have been reviewed

10. Again we would like to reiterate that DCMC BHB has accomplished the following actions to improve DCMC EVMS support to the ISS NASA customer:

- a. The DCMC ISS Program Integration Team has improved the EVMS surveillance functions and reporting.
- b. DCMC BHB updated the EVMS Surveillance Plan and received NASA JSC approval.
- c. Completed a DCMC Independent Estimate at Completion.
- d. The EVMS monitor has been Level I certified in Systems, Planning, Research, Development, and Engineering. Level II certification is planned for FY99. The EVMS courses (BCF-102 and BCF-203) were cancelled in FY98 and FY99. BCF-102 is soon to be released as a web-based training course and will be completed as soon as possible.
- e. In the absence of Defense Acquisition Courses BCF-102 and BCF-203 the DCMC BHB ISS Program Integrator has found an EVMS Course sponsored by the American Graduate University.
- f. The engineering SFA has been providing extensive assistance in completing the specific reports in the contract administration delegation.

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In summary, we have accounted for every item in the NASA Letter of Delegation and the DCMC Surveillance Plan. We are in the process of attaining the required training and certifications. We have access to qualified people with the necessary experience and certifications if assistance is needed. We have already accomplished our corrective actions and believe we can continue to provide full and complete EVMS surveillance.

BRAD L. SHAFFER,
LTC, USA
Team Leader, International Space Station
DCMDW-RMOC

Appendix F. Report Distribution

National Aeronautics and Space Administration (NASA) Headquarters

Code B/Chief Financial Officer
Code B/Comptroller
Code G/General Counsel
Code H/Acting Associate Administrator for Procurement
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Code HS/Director, Program Operations Division
Code J/Associate Administrator for Management Systems and Facilities
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John C. Stennis Space Center

Appendix F

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
Budget Examiner, Energy Science Division, Office of Management and Budget
Associate Director, National Security and International Affairs Division, General Accounting Office
Special Counsel, House Subcommittee on National Security, International Affairs, and Criminal Justice
Professional Assistant, Senate Subcommittee on Science, Technology and Space
Department of Defense, Office of Inspector General
U.S. General Accounting Office

Chairman and Ranking Minority Member - Congressional Committees and Subcommittees

Senate Committee on Appropriations
Senate Subcommittee on VA, HUD, 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, Independent Agencies
House Committee on Government Reform and Oversight
House Committee on Science
House Subcommittee on Space and Aeronautics, Committee on Science

Congressional Member

The Honorable Pete Sessions, U.S. House of Representatives

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