

GAO

Briefing Report to the Chairman,
Subcommittee on Investigations and
Oversight, Committee on Science, Space,
and Technology, House of Representatives

September 1992

SPACE STATION

Resolving Conflict Over Integration Contractor's Role



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**National Security and
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September 10, 1992

The Honorable Howard Wolpe
Chairman, Subcommittee on
Investigations and Oversight
Committee on Science, Space,
and Technology
House of Representatives

Dear Mr. Chairman:

As you requested, we reviewed the National Aeronautics and Space Administration's (NASA) contract with Grumman Corporation to provide program support, engineering, and integration services for the Space Station Freedom program. Specifically, we reviewed NASA and Grumman's working relationship relative to the contractor's integration role and NASA's evaluations of Grumman's performance of that role. The results of our preliminary work were presented in a briefing to your staff in June 1992. This report updates and provides additional details on the information provided at that briefing.

Background

The commission that investigated the destruction of the space shuttle Challenger noted that a contributory cause of the accident was the traditional way NASA organized itself to manage programs through its field centers instead of using a central program office.¹ As a consequence, according to the commission, information about potentially serious problems with the shuttle was not widely shared within NASA. The commission recommended that the authority over shuttle funding and work at the field centers be transferred to a central program manager.

In keeping with this recommendation, NASA officials created lines of management authority for the Space Station Freedom program that altered their traditional organizational arrangement. Specifically, they vested management authority in a central program office that is organizationally separate from the field centers. Under the program office, three field

¹Report by The Presidential Commission on the Space Shuttle Challenger Accident (June 6, 1986).

centers are responsible for developing different parts, or work packages, of the space station.² Grumman's cost-plus-award fee contract was awarded by NASA in July 1987 and is administered by the central program office. Although the name of the contract has been changed from "program support" to "engineering and integration" in order to recognize the current focus of Grumman's efforts, the contract statement of work has remained essentially the same since 1987. Grumman's work is defined in the statement by such broad areas as (1) program control and management; (2) information systems; (3) operations; (4) systems engineering and integration; (5) utilization; (6) safety, reliability, and quality assurance; and (7) information resources management.³

NASA formally evaluates Grumman's performance in relation to a set of "task orders" every 6 months.⁴ Within the context of the general contract statement of work, task orders are the program office's specific set of instructions to Grumman. The performance evaluations result in award fee determinations by a Fee Determination Official.⁵

Such determinations are based on the judgments of NASA officials using evaluation criteria stated in the contract. They are unilateral, and the contractor cannot appeal them under the "disputes clause" of the contract. In the last complete award fee period we reviewed—October 1991 through March 1992—Grumman's performance of its task orders was evaluated against two criteria: "technical achievement" (which included program management, systems engineering and integration, management integration, information systems integration, and safety and product assurance); and "business management and cost control." Technical achievement is the more heavily weighted of the two criteria.

This report focuses principally on a contentious issue between NASA and Grumman over the contractor's integration role. This conflict, which has defined the relationship between the space station program office and Grumman, is summarized in appendix I. While their relationship on this

²The field centers and their associated work package prime contractors are: Marshall Space Flight Center (Boeing Aerospace), Johnson Space Center (McDonnell Douglas Space Systems Company), and Lewis Research Center (Rocketdyne Division of Rockwell International).

³The information resources management section was added to the statement of work in 1992.

⁴The first evaluation period, July 31, 1987, through March 31, 1988, was for 8 months.

⁵In making the award, the Fee Determination Official considers the advice of the Award Fee Determination Board.

point has been turbulent, there are many instances where Grumman's performance was judged by program office officials to be excellent and many areas where the space station program office's relationship with Grumman has been consistently harmonious.

Results in Brief

NASA and Grumman's working relationship has been turbulent over much of the contract period primarily because of (1) NASA's belief that Grumman did not quickly change its role from a program support contractor to an engineering and integration contractor when asked to do so and (2) Grumman's belief that NASA's failure to resolve issues stemming from the changes in its organization following the Challenger accident had adversely affected Grumman's ability to quickly step up to the program integration role.

NASA's concern with Grumman's program management became so acute by early 1990 that the Fee Determination Official significantly reduced Grumman's award fee. Since that time, NASA and Grumman have made progress in redefining Grumman's role as the engineering and integration contractor. Both parties currently believe they have a mutual understanding of their roles and that there are no barriers to the contractor fully performing in that capacity.⁶

NASA and Grumman's Conflict Over Integration Role

Grumman officials distinguish between a program support contractor and a program engineering and integration contractor. Although the contract statement of work requires Grumman to perform systems engineering and integration tasks, it does not require Grumman to verify and certify that all elements and systems of the station properly fit and work together—that is, “integrated” with each other and ready for flight. To Grumman, the difference between “program support contractor” and “integration contractor” largely turns on this distinction.

To NASA officials, this distinction is not so important. The contract statement of work, in fact, has remained largely unchanged since July 1987, and it has always contained numerous systems engineering and integration tasks, as well as many other tasks. For example, in the first evaluation period, which began on July 31, 1987, NASA stated that it would

⁶For example, as of June 1992, Grumman was negotiating a Memorandum of Understanding with each of the work package prime contractors that will include agreements on nondisclosure of proprietary data.

evaluate Grumman in 10 “award fee areas of emphasis” related to the systems engineering and integration award fee evaluation criterion, including the development of “system-to-system test requirements” and “element and system verification plans.”⁷ Fifty-four additional areas of emphasis related to eight other criteria were also to be evaluated.

With regard to verification, NASA stated its expectation in its Request for Proposal:

The [program support contractor] will develop tests and technical procedures for the verification, assembly, and integration of the overall Space Station system and will assist NASA in the assessment and evaluation of the hardware developed by the Space Station Program . . . work package contractors to assure that all overall system performance requirements are met.

In its response to NASA’s solicitation, Grumman appeared to accept this expectation as it recognized that a “key challenge” in the program was to develop the “policies, plans, procedures, and facilities for the effective integration, verification and validation of the various elements and systems.” Thus, prior to the start of the contract period, NASA and Grumman appeared to have had similar formal expectations about Grumman’s verification role. The differences that developed later were not so much about a program support versus an integration role, as they were about the kind of verification role Grumman was expected to play. Verifying the proper integration of station elements and systems and certifying their flight readiness means assuming an added degree of accountability not present in the development of verification tests.

Perceptions Differ on the Nature of the Conflict

With respect to the conflict over Grumman’s role in the program, NASA viewed Grumman as insufficiently flexible to accommodate NASA’s needs as the space station program changed. On the other hand, the contractor believed that NASA arbitrarily and abruptly changed the definition of Grumman’s integration role.

⁷Space station “elements” include such items as the laboratory and habitation modules, the integrated truss assembly, and the mobile servicing system. Space station “systems” include, for example, data management; electrical power; thermal control; communications and tracking; environmental control and life support; and guidance, navigation, and control.

The Issue From NASA's Point of View

According to NASA officials, the difference between program support and integration is one of emphasis. The contract statement of work was meant to be broad so as to accommodate changes in the contractor's role. As the program matured, program officials expected Grumman to assume more of an integration role. To do this, Grumman needed the proper distribution of skills among its staff and an effective working relationship with the field centers and work package contractors. These skills and relationships, in turn, would help Grumman to anticipate cost, schedule, and performance issues and recommend solutions.

Thirteen months after the start of the contract period, the program office stated in its first evaluation that Grumman was not (1) anticipating program-related problems or (2) developing effective working relationships with other participants. These issues persisted over much of the contract period. To program officials, Grumman officials at corporate headquarters seemed unresponsive and noncommunicative about issues related to Grumman's evolving role as the engineering and integration contractor. Grumman's seeming indifference to its customer's concerns increasingly irritated some senior NASA officials, and ultimately resulted in lower award fees for Grumman.

The Issue From Grumman's Point of View

Senior Grumman officials told us that they patterned their response to NASA's Request for Proposal after the Aerospace Corporation's relationship with the Air Force's Space Systems Division.⁸ Although Aerospace verifies the flight readiness of Air Force spacecraft and launch vehicles, Grumman did not propose to perform a similar task for NASA.

Nevertheless, according to a senior Grumman official, NASA's space station program office personnel emphasized routine program support over engineering and integration tasks. At the program office's direction, Grumman became, in effect, a "body shop," its technical expertise dispersed by performing numerous and diverse tasks. A Grumman official described his role during this period as "not a take charge integrating contractor. We are an adjunct to support NASA in their duties."⁹

⁸The Aerospace Corporation, established in 1960, is one of several federally funded research and development centers sponsored by the Air Force. According to its 1985 contract, the corporation performs advanced systems analysis, systems engineering, and integration; recommends technical direction; makes technical, cost, and schedule assessments; and ensures proper integration between military requirements, technical capability, and fiscal constraints.

⁹Report by the staff of the Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies, House Appropriations Committee (Oct. 12, 1989).

Grumman officials did not question NASA about the apparent discrepancy between what they thought they would be doing based on their proposal and what program office personnel were requesting them to do. In retrospect, according to a senior Grumman official, this was a mistake.

By late 1989, NASA realized that it could not be the program integrator and requested that Grumman "step up" to this role. Grumman's ability and authority to do so had been complicated by its initial program support role. Grumman was seen by the work package contractors and field centers as closely associated with the program office, and the concept of a strong central program office was not universally applauded by NASA's field centers.

Grumman officials believed that they were being evaluated according to a new set of expectations before the program office had overcome resistance to Grumman's new role from the field centers and work package contractors. Specifically, Grumman believed that it would have to have access to information that the work package contractors were reluctant to share to meet those new expectations.

NASA's Evaluation of Grumman's Performance

Between July 1987 and March 1992 Grumman earned an average 72.2 percent of the total available award fee. The percentages of award fees earned by Grumman have varied from a low of 54 percent to a high of 81.4 percent of the award fee available for the nine evaluation periods since the contract began.

Grumman received its lowest fee in June 1990, when the Fee Determination Official significantly lowered the award fee from the amount recommended by the Performance Evaluation Board. Instead of earning \$2.58 million (71.1 percent of the award fee available), Grumman earned \$1.96 million (54 percent of the award fee available).¹⁰ The Fee Determination Official's decision, costing Grumman \$620,388, was based on what he called a "lack of demonstrable progress in performing the assigned responsibility of programwide system engineering and integration." Grumman, in turn, noted that "our performance is being evaluated as if we were, at present, an integrating contractor. The fact is that we are, contractually, a support contractor." Nevertheless, Grumman

¹⁰The available award fee in the evaluation period October 1, 1989, to March 31, 1990, was \$3.63 million.

promised in July 1990 to become a “fully operational engineering and integration contractor” by the end of the year.

According to NASA officials, it took Grumman until mid-1992 to largely fulfill its promise. During this period Grumman gradually eased NASA’s concerns to the point where it is now being evaluated as a full performance engineering and integration contractor that is responsible for verifying and certifying that all station elements and systems are fully integrated with each other and ready for flight. In June 1992, NASA observed that (1) an “early warning” system for identifying future technical and programmatic issues is being developed, (2) Grumman staff have a better distribution of skills, and (3) communication between all participants in the program is much improved. Grumman does not believe that any significant barriers remain that would prevent it from doing its job. NASA agrees.

Scope and Methodology

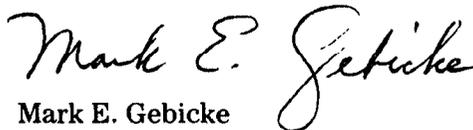
We reviewed the Request for Proposal, NASA’s contract with Grumman, award fee documents for all completed evaluation periods, and the 1990 through 1992 task orders. We discussed contract-related issues with NASA procurement and program personnel and Grumman officials.

We conducted our review from April to July 1992 in accordance with generally accepted government auditing standards. As requested, we did not obtain agency comments. However, we discussed a draft of this report with NASA procurement and program officials and Grumman representatives and considered their comments in preparing this report.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time we will send copies to the NASA Administrator and other appropriate congressional committees. Copies will also be made available to other interested parties on request.

Please contact me on (202) 275-5140 if you or your staff have any questions concerning this report. The major contributors to this report are Frank Degnan, Assistant Director, and Thomas E. Mills, Senior Evaluator.

Sincerely yours,

A handwritten signature in cursive script that reads "Mark E. Gebicke".

Mark E. Gebicke
Director, NASA Issues

NASA and Grumman Corporation: Conflict Over Contractor's Integration Role

The turbulence in NASA's relationship with Grumman has concentrated primarily on the contractor's integration role and has been documented by both parties during the award fee determination process. That process includes NASA's interim evaluation of Grumman's performance, Grumman's self-assessment, the Performance Evaluation Committee's report to the Performance Evaluation Board, the Board's recommendation to the Award Fee Determination Board, and its advice to the Fee Determination Official on the amount of award fee earned during the semiannual evaluation period, as well as Grumman's responses to NASA's evaluations.¹

The percentage of available award fee earned by Grumman is parenthetically included in each caption that introduces an evaluation period.

**First Evaluation
Period: July 31,
1987-March 31, 1988
(73.2 Percent)**

August 12, 1988: The Performance Evaluation Committee report stated that Grumman needed to (1) demonstrate greater initiative in identifying and recommending solutions to problems without NASA's direction, (2) improve its working relationships with other systems engineering and integration groups, and (3) improve the skill mix of its personnel. The Committee attributed some of these problems to Grumman's inexperience with the "NASA culture."

**Second Evaluation
Period: April 1,
1988-September 30,
1988 (74.8 Percent)**

March 6, 1989: The Performance Evaluation Board stated that Grumman Corporation (as distinct from Grumman's Space Station Program Support Division) was not providing the level of support to the contract that was anticipated by NASA.

March 24, 1989: Grumman asked the Board for specifics regarding the alleged deficiency in Grumman Corporation's support.

April 24, 1989: The Fee Determination Official's letter to Grumman stated that the intention of the Board was not to specify deficiencies in corporate support, but rather to express concern that Grumman Corporation, "in the fullest meaning of that term," had not participated in the contract at a level commensurate with NASA's expectations. He listed the following areas of

¹In this appendix, we refer to the "Performance Evaluation Committee's report" and the "Performance Evaluation Board's report." Generally, the Board adopts the Committee's report with few, if any, textual changes. We cited the Board's report if it was part of an award fee file; otherwise, we cited the Committee's report.

concern: (1) the Program Support Contract Senior Review Board apparently had not met, (2) some subcontracts had not been "definitized" (i.e., priced), (3) a key Grumman official had been appointed who did not meet the government's requirements, and (4) complexities and experience requirements associated with the start-up and operation of contract were "seriously underestimated."

Third Evaluation
Period: October 1,
1988-March 31, 1989
(78.4 Percent)

June 30, 1989: In response to the Performance Evaluation Committee's report, Grumman expressed concern about NASA's perceived lack of support by its Program Support Division and corporate management, and referred to the absence of stated specific problems.

July 19, 1989: The Fee Determination Official referred Grumman to NASA's April 24, 1989, letter for discussion of specific concerns. NASA stated that expectations regarding corporate support to the contract remained "almost completely unmet" by the contractor.

Fourth Evaluation
Period: April 1,
1989-September 30,
1989 (81.4 Percent)

November 27, 1989: During Grumman's briefing to NASA on its self-evaluation, a senior NASA official noted concern about Grumman's ability to do integration work. He noted that Grumman's role was not merely to note that problems were occurring, but also to explain why they occurred. The NASA official encouraged Grumman to be aggressive in not letting systems engineering and integration dollars flow to work package contractors; that is, he did not want Grumman to give away its work to others. During the discussion between NASA and Grumman officials on the question of Grumman's role as a program support contractor versus a systems integration contractor, a senior Grumman official noted that it had bid on a program support rather than an integration contract.²

December 8, 1989: The Performance Evaluation Board's report stated that Grumman was not addressing the personnel skill mix issues that were "within the contractor's purview."

December 11, 1989: Grumman stated in response to the Board's report that it would take further steps to ensure a proper skill mix.

²NASA's Request for Proposal invited offerors to bid on a "program support" contract whose proposed statement of work included systems engineering and integration tasks.

Fifth Evaluation
Period: October 1,
1989-March 31, 1990
(54 Percent)

May 21, 1990: The Performance Evaluation Committee's report stated that Grumman had "failed to demonstrate a comprehensive understanding of the assigned program engineering and integration responsibility" and was not mounting a "serious effort to become a full participant in the program."

June 11, 1990: Grumman noted in response to the Board's evaluation that it was fully supportive of the "Government's desire to change our role from the original Program Support Contract to that of integrating Contractor."

June 12, 1990: In a briefing to the Fee Determination Official on the Board's report, a NASA official said that the emphasis on the integrating contractor role versus the support role was a change. He also noted that the Request for Proposal and the contract statement of work referred, in effect, to the contractor's need to be flexible in performing its integration role.

June 25, 1990: The Fee Determination Official lowered the available award fee from 71.1 percent of the amount available, as recommended by the Performance Evaluation Board, to 54 percent. In a letter to the Chairman of the Board and President of Grumman Corporation, he cited a lack of progress in addressing NASA's concerns from the fourth to the fifth evaluation periods and termed performance by Grumman "a serious concern to NASA."

July 26, 1990: In response to the Fee Determination Official's decision, the Chairman of the Board and President of Grumman objected that Grumman was being evaluated as an integration contractor and noted that Grumman contractually was a "support contractor." He also stated that Grumman expected that its performance would be evaluated against a "framework of the negotiated level-of-effort, task order type contract as it exists today," but that it was willing to "evolve" into the integration role envisioned and become a "fully operational" engineering and integration contractor by the end of 1990.

Sixth Evaluation
Period: April 1,
1990-September 30,
1990 (74.7 Percent)

August 17, 1990: NASA stated in its interim performance evaluation that there was "little evidence" of any changes under way or contemplated that would result in the required improvements. Six points were used to illustrate Grumman's "lack of a comprehensive understanding" of its assigned programwide engineering and integration responsibility. NASA stated that Grumman's

- “boarding party” approach (inspect and audit) to work package contractors would “quickly alienate” all participants,
- Engineering Master Schedule and Technical Operating Plan “ignored” the requirements of work package contractors,
- lack of confidence in its ability to perform a programwide integration role left the perception that it was “comfortable” with two work package contractors assuming major integration activity,
- hiring had not included enough recognized experts who “command the respect of their technical peers,”
- failure in 2-1/2 years to develop acceptable nondisclosure procedures and working agreements with other contractors across the program had only just started to improve, and
- approach to adjusting personnel and skills to meet changing work conditions had been to request authorization to hire additional people rather than to lower “rigid barriers within Grumman” that limited staffing flexibility.

December 3, 1990: The Performance Evaluation Committee’s report stated that Grumman had taken several incremental steps that “offer some encouragement” in the program management area. “Significant improvements,” however, needed to be made.

**Seventh Evaluation
Period: October 1,
1990-March 31, 1991
(69 Percent)**

March 6, 1991: NASA stated in its interim performance evaluation that Grumman’s progress in assuming the critical role of the programwide integrating contractor “continues to be lacking.” Grumman was not considered a full partner in the program. Eight specific areas “where the necessary leadership has been lacking” were cited:

- establishment of the program plan and schedule,
- baselining design criteria,
- allocation of resources,
- development of verification products,
- analysis of minimum crew-tended capability,
- planning for two design reviews,
- approach for “stage definition” documentation, and
- prioritization of change request evaluations.

April 1, 1991: Grumman’s response to NASA’s March 6, 1991, letter expressed disappointment with the interim performance evaluation and stated that it would take whatever additional steps were necessary to gain NASA’s confidence. Grumman commented on each of the eight points noted

by NASA in its interim evaluation. With one exception (analysis of minimum crew-tended capability was completed), Grumman noted that it was addressing all of NASA's concerns.

May 31, 1991: The Performance Evaluation Committee's report stated that the improved performance noted in the sixth evaluation period had not become the "way of life" throughout the program, and that NASA was still looking for Grumman to assume "full partnership" in the program. The Committee's report listed four specific areas of concern where it believed Grumman's leadership was still lacking:

- overall program plan,
- baseline of design criteria,
- allocation of resources, and
- development of overall program verification approach.

June 14, 1991: Grumman agreed in response to the Committee's report that further improvements were needed in achieving integration across the program. Grumman addressed each of four areas of concern in the Committee's report and requested an upward adjustment of its award fee score. In an undated rebuttal to Grumman's response, NASA noted: "Weaknesses stand as written. No changes in score merited."

**Eighth Evaluation
Period: April 1,
1991-September 30,
1991 (66 Percent)**

July 30, 1991: NASA noted in the interim performance evaluation that while progress was being made in the program management area, there was a continuing need for Grumman to take a "strong and visible" leadership role in programwide issues involving the work package contractors. According to NASA, Grumman "must develop an understanding of the environment and take the steps necessary to be accepted by the other principal program contractors as a full partner."

November 18, 1991: While still noting improvement in the program management area during the evaluation period, NASA cited Grumman as failing to assert the leadership role required of an integration contractor. According to NASA, Grumman had not established effective relationships with the work package contractors and did not anticipate issues. In short, Grumman was scored as being too passive. In NASA's December 6, 1991, letter to Grumman, NASA noted that Grumman made a commitment to NASA in the summer of 1990 to "step up to the system integrator role" by January 1991. As a consequence, "the Government's expectations have

been increasing over the last few evaluation periods and will continue to do so."

December 17, 1991: Grumman noted actions to improve program management, including developing (1) "practical methods" of assessing the status of the program's cost and schedule, (2) a "broadbased Total Quality Management Program," and (3) a "timely and accurate Engineering Master Schedule."

January 6, 1992: A task order on program management was prepared. Grumman agreed to

- establish fully effective and cooperative working relationships with work package contractors,
- implement "early warning" of key programmatic and technical issues,
- demonstrate technical excellence necessary to become a full partner, and
- develop staff with all skills required of an integration contractor.

Grumman was required to develop specific recommended approaches by February 17, 1992.

April 2, 1992: Grumman briefed NASA officials on its response to the task order on program management and noted progress in all four areas covered by the task order.

Ninth Evaluation
Period: October 1,
1991-March 31, 1992
(78 Percent)

June 1, 1992: Grumman reviewed its past, present, and future role as program support and integration contractor with senior NASA officials. Grumman officials stated that it was now organized to perform as NASA's engineering and integration prime contractor, to be, in effect, an "honest broker" among other program contractors to "ensure total programmatic and technical success."

June 15, 1992: The Performance Evaluation Board report evaluated, in part, Grumman's response to the program management task order. NASA noted that while working relationships "cannot yet be judged fully effective, the steps taken to date have been promising." Grumman's intention of providing "early warning" of impending key programmatic and technical issues was judged to be on the "right track." NASA noted, however, that the ability to consistently provide across-the-board programwide leadership and direction "was not convincingly demonstrated."

Appendix I
NASA and Grumman Corporation: Conflict
Over Contractor's Integration Role

In summarizing Grumman's response to the task order, NASA noted that "responsive plans have been developed, many initial actions have been implemented successfully and other planned steps offer a great deal of promise of eventually satisfying the task requirements." NASA cautioned that "aggressive, effective implementation" of these plans must continue.

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