United States General Accounting Office

GAO

Transition Series

November 1988

NASA Issues

GAO/OCG-89-15TR

GAO United States
General Accounting Office
Washington, D.C. 20548

Comptroller General
of the United States

B-158195

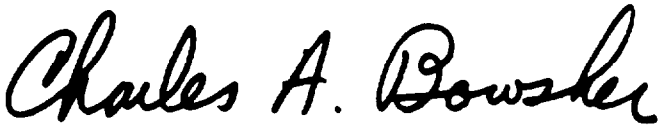
November 1988

The President of the Senate
The Speaker of the House of Representatives
The Administrator-designate of the National Aeronautics and Space Administration

This transition report is one in a series which address critical program management issues facing the new administration and Congress. The issues, the problems associated with each, and recommended actions are based on the results of our work in the National Aeronautics and Space Administration (NASA). Some of our concerns are new, while others represent unresolved problems over many years.

This report identifies three important issues we believe should be included in whatever agenda Congress and the Administrator of NASA set for the agency. They are (1) providing better information on where NASA is headed and at what cost, (2) minimizing the future cost of the space station, and (3) launching deep space science missions on time.

These issues are discussed in detail in the reports listed at the end of this report. We expect to identify other issues in the near future since we have expanded our work effort at NASA in anticipation of its recovery from the Challenger accident and the Agency's increased efforts on other major programs, such as the space station.



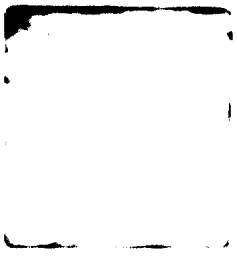
Charles A. Bowsher

Contents

NASA Must Develop a Strategic Plan and Report Full Project Costs to the Congress

Congressional and executive branch decisionmakers will soon be making the difficult choices on what civil space projects the nation will undertake. Effective decisions require reliable information on where NASA is headed and what it will cost to get there. However, NASA does not yet have a strategic long-term plan nor does it consistently report the full costs of its projects.

NASA's future funding requirements will triple by the year 2000—to $32 billion or more—if some recently proposed initiatives, such as a lunar outpost or a staffed Mars expedition, are adopted. Even without such significant new initiatives, NASA's future funding requirements could double.



If NASA is to provide the technological leadership necessary to put the United States at the forefront of advancements in aeronautics, space science, and exploration, it must develop a strategic plan which clearly states its vision for the future and the steps to realize that future in an affordable manner. NASA is currently evolving a strategic planning process throughout the Agency and has made a commitment to prepare an overall strategic plan. We support these efforts and urge

that NASA set a timetable and follow through on them.

As NASA has recognized in developing its strategic planning process, all Agency planning should be interrelated and consistent. For example, while strategic planning imparts overall direction and purpose to an agency's programs, the nearer term budget process is used to justify and provide the resources needed to implement those programs and their supporting projects.

In support of these linkages, one thing NASA must do is to report the full picture of resources required to develop and operate specific projects. This will help the Congress and the executive branch to set the content and pace of NASA's pursuit of its overall strategic goals and objectives and to make the best possible decisions on what NASA projects the nation can afford to fund. However, NASA does not typically report the full costs of its projects to the Congress.

The space station dramatically illustrates how incomplete NASA's project cost reports can be. In 1987, NASA told the Congress that the space station would cost $14 billion, leaving out an additional $14 billion needed to launch and assemble it in

space. Omissions of this type are not unusual. The project cost estimates reported by NASA typically have not included such directly related project costs as launch and assembly, personnel and facilities, and work provided by other U.S. agencies.

NASA has the capability to report more complete project costs and on occasion has done so in project status reports (PSRs) requested by one of its oversight committees. We believe that routine full-cost reporting to the Congress will facilitate decisions on what projects the nation should undertake. We are currently assessing how the PSRs can be adapted to provide more complete project cost estimates to the Congress in a systematic fashion across all significant NASA projects. We will report to NASA's oversight committees in the spring of 1989 on the utility of the PSRs for providing better project cost estimates and on NASA's efforts to expand their use.

NASA Must Institutionalize a Life-Cycle Cost Management Process for the Space Station

The space station will consume a substantial portion of NASA's annual funding for decades to come. Development costs are already estimated at $28 billion, and annual operations costs are currently estimated at $1.4 billion. Both estimates are expected to rise. It is imperative that NASA employ a management system that identifies design proposals which minimize costs over the space station's 30-year life.

Thinking in life-cycle terms can clearly save money in the long term. For example, while NASA does not yet have a life-cycle cost management system, it has studied designs it believes will have major impacts on operations costs. One such study examined water system alternatives for the station and found that a system which recycles water costs $52 million more to develop than a system where water must be discarded and replaced. However, the recycle system costs over $1 billion less to operate over the life of the station. Given comparable performance and schedule results, the best interests of the government would obviously be served by the system which initially costs more to develop, and NASA did elect to develop the recycle system.

There are, however, intense pressures to hold down current government spending, increasing the risk that NASA will select

increasing the risk that NASA will select design options with low front-end development costs even though they may require much higher outlays over the life of the project. In such an environment, a life-cycle cost management process is clearly needed.

It is imperative that NASA institutionalize a life-cycle cost management process—and do it now—before space station managers begin making firm design decisions. Without such a process, NASA will be unable to assure itself and the Congress that it has identified the most cost-effective space station design.

NASA has been asked by its House Authorizing Committee to expedite development of the process and to report on its establishment prior to starting the preliminary design review phase of the space station, which is scheduled to begin during April-June 1989. Funding of this phase, and all subsequent space station activities, should be contingent on NASA's satisfactory response to these requirements.

NASA Must Launch Deep Space Science Missions on Schedule to Avoid Costly Delays

Hundreds of millions of dollars and the time and talents of hundreds of scientists and engineers could be wasted if NASA does not launch its deep space science missions on time. NASA cannot afford such extra costs and therefore must fully weigh the consequences of any decision not to launch these missions on schedule.

When a deep space science mission is not launched as scheduled, the mission must wait for the planets to move into another acceptable configuration—this frequently takes years. For example, if NASA fails to launch the Magellan mission to Venus in the spring of 1989, it will be delayed 25 months and cost $100 million more to prepare.

The extra $100 million is based on the $4 million NASA spends every month that a deep space science mission is delayed to (1) re-plan the route to and around the target planet, (2) update and maintain the scientific instruments, (3) reprogram the flight software, and (4) support the scientists and engineers and keep them interested in staying on a project which is not producing any scientific data.

Operations costs can also go up when NASA misses a launch. A mission's complexity and length can be increased when

there is a less than optimum configuration of planets and NASA cannot use the fastest, most direct route consistent with the mission's scientific objectives.

For example, Galileo would have reached Jupiter in as little as 2 years if it had not missed a launch date with a fast and direct route. The current launch requires a much longer and slower route, with a total cruise time of 6 years. So far, the increased flight time has added $250 million to Galileo's projected operations costs.

These increased costs to develop and operate deep space science missions provide no comparable increased benefits in the scientific data collected. Thus, it is imperative that decisions to not launch on schedule be made with full recognition of the unique requirements of such missions and the cost versus benefit consequences of the no-launch decision.

Of course, not all causes for future deep space science mission launch delays will be foreseeable or controllable by NASA, such as greater than expected difficulties in developing a mission's scientific instruments. However, when there are controllable situations, such as deciding on competing launch proposals from within and outside NASA, including from DOD,

NASA's new top management should not agree to postpone the launch of any deep space science mission which is, or will be, ready to go without fully weighing the consequences. Such action would be consistent with the fact that NASA program officials recently established the protection of all space science missions' schedules, resources, and launch opportunities as their highest priority.

Civil Space: A Strategic Planning Process Is Being Developed by NASA (NSIAD-89-30BR, Nov. 1988).

Space Station: National Aeronautics and Space Administration's 1987 Cost Estimate (NSIAD-87-180FS, June 1987).

National Aero-Space Plane: A Technology Development and Demonstration Program to Build the X-30 (NSIAD-88-122, Apr. 1988).

Space Science: Status of the Hubble Space Telescope Program (NSIAD-88-118BR, May 1988).

Space Station: NASA Efforts to Establish a Design-to-Life-Cycle Cost Process (NSIAD-88-147, May 1988).

Space Exploration: NASA's Deep Space Missions Are Experiencing Long Delays (NSIAD-88-128BR, May 1988).

Space Exploration: Cost, Schedule, and Performance of NASA's Magellan Mission to Venus (NSIAD-88-130FS, May 1988).

Space Exploration: Cost, Schedule, and Performance of NASA's Galileo Mission to Jupiter (NSIAD-88-138FS, May 1988).

Space Exploration: Cost, Schedule, and Performance of NASA's Ulysses Mission to the Sun (NSIAD-88-129FS, May 1988).

Space Exploration: Cost, Schedule, and Performance of NASA's Mars Observer Mission (NSIAD-88-137FS, May 1988).

The Budget Deficit (GAO/OCG-89-1TR)

The Public Service (GAO/OCG-89-2TR)

Revenue Options (GAO/OCG-89-3TR)

Financial Services Industry Issues (GAO/OCG-89-4TR)

International Trade Issues (GAO/OCG-89-5TR)

Information Technology Issues (GAO/OCG-89-6TR)

Financial Management Issues (GAO/OCG-89-7TR)

Program Evaluation Issues (GAO/OCG-89-8TR)

Defense Issues (GAO/OCG-89-9TR)

Health and Human Services Issues (GAO/OCG-89-10TR)

Commerce Issues (GAO/OCG-89-11TR)

Agriculture Issues (GAO/OCG-89-12TR)

Justice Issues (GAO/OCG-89-13TR)

Veterans Affairs Issues (GAO/OCG-89-14TR)

NASA Issues (GAO/OCG-89-15TR)

Energy Issues (GAO/OCG-89-16TR)

Treasury Issues (GAO/OCG-89-17TR)

Education Issues (GAO/OCG-89-18TR)

Department of State Issues (GAO/OCG-89-19TR)

Environmental Protection Agency Issues (GAO/OCG-89-20TR)

Department of Labor Issues (GAO/OCG-89-21TR)

Housing and Urban Development Issues (GAO/OCG-89-22TR)

Foreign Economic Assistance Issues (GAO/OCG-89-23TR)

Interior Issues (GAO/OCG-89-24TR)

Transportation Issues (GAO/OCG-89-25TR)

Internal Revenue Service Issues (GAO/OCG-89-26TR)

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are $2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use $300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100