

April 4, 1986

WHAT NEXT FOR NASA

INTRODUCTION

The January 28th explosion of the Challenger Space Shuttle and the death of its seven-member crew dealt the U.S. space program the most serious setback in its quarter-century history. The Challenger tragedy was America's first in-flight loss of life. It destroyed one-fourth of the Space Shuttle fleet. And it grounded Challenger's sister spacecraft. Despite this, there has been a remarkable declaration of national resolve not to allow the disaster to block America's future in space. But admirable though this expression of national will certainly is, more than money and a "can do" attitude is needed to get the space program back on course.

The televised hearings of the Presidential Commission empaneled to investigate the Challenger loss, together with revelations in the press, have damaged seriously the widespread public respect and confidence once enjoyed by the National Aeronautics and Space Administration (NASA). Serious questions about the agency's management, policies, and procedures have been raised. More important, questions have emerged concerning the agency's overall direction and mission. Indeed, it seems that NASA has lost sight of its primary function as a science and research body and increasingly has sought to monopolize American space development.

As fundamental questions regarding NASA and the U.S. role in space are being considered, the pressing issue is: how can the U.S. bridge the gap in space launch capability caused by the Challenger's loss. Pressure to speed up the frequency of Shuttle launches was building well before the January 28th accident, leading some to argue that an accelerated Shuttle launch schedule, to keep up with demand, may have contributed to the tragedy.

With the loss of Challenger, it is certain that no Shuttles will be launched for at least 12 to 18 months. Concerns regarding the safety of the basic Shuttle, moreover, have provoked calls for basic design alterations. This could delay returning the Shuttles to service for an even longer period. And replacing the spacecraft that has been destroyed will take at least 2 1/2 years from the time work is initiated. When the Shuttles are again operational, safety concerns almost surely will dictate fewer flights, and, in all likelihood, additional restrictions on payloads.

In short, even when a full Space Shuttle fleet is restored to operation, it is unlikely that the fleet will be able to meet the demand for launch services. As such, an alternative space launch capability must be found. One alternative already exists: the so-called Expendable Launch Vehicles (ELVs), the unmanned rocket systems that launched payloads before the Shuttle program. Ironically, the most serious problem that the ELVs face may be NASA. In the 1970s, NASA ended ELV production and then hindered private efforts to develop the ELV commercially. NASA even tried to block an Air Force decision to purchase a number of ELVs. Had the Air Force not succeeded in overcoming NASA objections, the Department of Defense would not have had an alternative space launch system available when the Shuttle was lost.

With NASA suffering a crisis of confidence--implicating its long-term policy for the space program--and with a huge gap in America's launch capability, the Reagan Administration must devise a space strategy that restores public confidence, focuses NASA's mission, and assures greater flexibility in the nation's space transportation system. The Administration should:

- 1) Revise NASA's mission, making science and research once again its primary concern.
- 2) Restrict NASA launches of commercial satellites to those that cannot be launched on commercial vehicles.
- 3) Require that any commercial payload flown on a NASA spacecraft pay the full cost of its launch.
- 4) Return the Chief Engineer's Office at NASA to its traditional role as an independent overseer for safety-related matters with full authority to approve or disapprove design modifications and to stop launches if safety is in question.
- 5) Increase the number of inspectors and require that they perform on-site inspections at fabrication facilities for NASA space vehicles.

6) Strengthen the role of NASA's Aerospace Safety Advisory Review Panel in the planning and design of NASA spacecraft.

7) Impose strict limitations on the amount of overtime maintenance crews are allowed to perform to prevent excessive fatigue.

8) Create an open line of communication to the Deputy Administrator for employees with safety concerns.

To complement these actions, steps are needed to increase launch flexibility by encouraging development of a strong private space launch industry. These include:

1) Make advance purchases of ELVs for government missions and pay a bonus for early delivery.

2) Develop a private Space Shuttle capability through "lease-back" arrangements.

3) Require all federal agencies to hire--or contract out to--the private sector for launch services that can be performed at the same or lower cost than the government would incur by building and launching the vehicles itself.

4) Quickly develop at the Department of Transportation the guidelines and regulations necessary for governing ELVs.

These reforms can restore confidence in NASA and refocus its mission. Even before the Challenger accident, it was becoming evident that the Space Shuttle would be unable to accommodate all the demand for space launch services. It should have been clear that some alternative means of sending payloads into orbit was needed. The loss of Challenger makes an alternative undeniable.

Developing alternative space launch capabilities, instituting necessary reforms at NASA and refocusing the agency's mission will be a formidable task. The potential of space for commercial and military purposes is enormous, a fact recognized by Moscow. The U.S. has the capability to lead man to the stars. Now it must also demonstrate that it has the ingenuity and the will to overcome the current crisis.

PICKING UP THE PIECES: REFORMING NASA

Even at this early stage of the investigation into the Challenger accident, it is clear that there are two broad categories of reforms needed at the National Aeronautics and Space Administration. The first

consists of reforms that relate to the agency's overall sense of mission--its policy direction. Other reforms concern those areas that are directly related to the maintenance of necessary safety standards, quality control, and reliability.

Rethinking NASA's Policy Goals

The most important policy reform is to return the agency's mission to a greater emphasis on basic research and exploration. Its commercial role should be limited to encouragement and technical assistance.

In the late 1970s, the Carter Administration decided to cast the Space Shuttle as a commercial vehicle. This was to justify its budget. The result was that NASA became increasingly involved in commercial activities. As the preoccupation with commercial development grew, so did pressure for the Space Shuttle fleet to meet a regular and frequent launch schedule. This, in turn, led NASA to a decision to discontinue production of Expendable Launch Vehicles (unmanned rockets--ELVs) and to shut down their production lines. The current deficit of space transportation capability is a direct consequence of this decision.

To prove that the Shuttle was a commercial vehicle, NASA moved to monopolize private sector commercial space activities. To accomplish this, the agency offered assistance and encouragement to private firms with space projects so that they would consider using the Shuttle for transportation. This assistance came in the form of free, or heavily discounted, launches on the Shuttle, joint venture agreements under which NASA would bear some of the development costs of a project and other direct and indirect subsidies. At the same time, the agency discouraged private competition to the Shuttle. NASA denied potential competitors access to facilities or technical assistance, for example, and kept the price of Shuttle launches artificially low to undercut private launch systems. NASA officials even publicly denigrated private launch proposals. The price paid, apparently, for NASA's determination to dominate commercial space was less attention paid to science and safety.

It should not have been necessary to justify the Space Shuttle on a dollars and cents basis. It was, and remains, an invaluable scientific tool. More important, and despite the Challenger disaster, it is an efficient means to transport astronauts regularly into space to gain important experience in manned space flight, an area in which the U.S. continues to lag far behind the Soviet Union. The lessons learned by astronaut crews on successive Shuttle flights have been an essential element in providing the information necessary to the development of a more permanent presence in space. The expenditure could be justified on that basis alone.

There are tasks in space, moreover, that can be performed only by astronauts. Therefore a means of putting men into orbit has always been necessary: this was demonstrated once again last year, when astronauts were able to repair a crane on the Shuttle to retrieve a satellite. By justifying the Shuttle's existence on commercial terms, the agency in the end pushed the vehicle beyond its limits--with disastrous consequences.

To relieve NASA of self-imposed pressures and to ensure that the agency's mission is returned to its original tasks of basic science and exploration, the President should issue a policy statement. It unambiguously must define NASA's mission as basic scientific research, exploration, and the encouragement of private commercial projects. The statement should prohibit the agency's direct participation in commercial projects and ban the use of the Space Shuttle fleet, or any other NASA space vehicle, for the launch of commercial satellites--unless the satellites cannot be placed in orbit by any other means. The President further should instruct NASA to charge any commercial user of the Shuttle the full cost of its launch, so that alternative launch systems are not unfairly underpriced.

Such a policy statement would give clear guidance to NASA regarding its mission and would restrict the agency's purely commercial projects. It would prevent NASA from being able to influence commercial projects through hidden or overt subsidies, thereby ensuring that it could no longer impede space entrepreneurs.

Operational Reforms at NASA: Ensuring Safety

Until the loss of Challenger, NASA enjoyed the reputation of having one of the most advanced quality assurance and safety programs in the world. The mounting evidence of the erosion of this program has been among the most damaging revelations of the hearings currently being conducted by the Presidential Commission. As a result, the reinstatement of adequate safety measures is among the most important operational reforms the agency must adopt.

The first, and perhaps the most important, reform would be to return the Chief Engineer's Office to its traditional role as an independent overseer for safety-related matters. Prior to 1983, the Chief Engineer had the authority to stop launches, to require design changes, and to approve or disapprove changes in space vehicle designs. The Chief Engineer also maintained inspectors at plants that manufactured the principal components of spacecraft, and he was responsible for inspections at launch facilities.

After February 1983, however, responsibility for inspections was shifted to contractors, and the number of inspectors in the Chief Engineer's Office was reduced. In addition, travel funds were so curtailed that inspection of manufacturing facilities became virtually

impossible. Worse still, at the very time that the level of inspection was being reduced, the demand for inspection rose dramatically, thanks to the rapidly accelerating pace of Space Shuttle launches.

NASA should increase the number of inspectors on the staff of the Chief Engineer's Office, as well as beefing up its role, and ensure that inspectors make on-site inspections of manufacturing plants where primary Shuttle components, such as the solid rocket boosters, are made. Among other things, this would signal a greater concern with safety to firms building key Shuttle systems.

A second important reform would be the creation of a stronger role for NASA's Aerospace Safety Advisory Review Panel. It had expressed concerns about a number of safety-related matters that may have contributed to Challenger's loss. Many of their concerns, however, elicited little action. A system should be put in place that requires NASA to act on Advisory Panel recommendations within a set period of time and to report back to the Panel the results of that action.

A third area for review is the excessive overtime by workers in such critical areas as repair and maintenance of the Shuttles. NASA may have the best workforce of any federal agency. But its employees are often required to work excessively long hours for extended periods of time, increasing the likelihood of mistakes and diminishing performance. Immediately before the Challenger loss, workers at the launch site reportedly were subjected to 70 and 80 hour work weeks. Strict limitations on overtime should be imposed for workers in such fields.

A final reform to improve safety would be the creation of a direct "hotline" to NASA's Deputy Administrator for use by any employee with a safety concern. In the hearings on the Challenger accident, it was discovered that strong objections to the launch were voiced by several employees of at least two of the Shuttle's prime contractors. Yet their objections never reached the upper echelons of the agency's management. A hotline alarm system would ensure that this set of circumstances could not be repeated.

FILLING THE GAP

While a loss of space transportation capability such as that which followed in the wake of the Challenger tragedy would be an enormous blow at any time, it is particularly devastating now. It was apparent before the accident that the capabilities of the Space Shuttle fleet would be taxed sorely by the launch requirements of the Strategic Defense Initiative. In addition, a host of promising new commercial endeavors were emerging that would have created additional

demand for launch services. It was, in fact, the perception of this new demand that convinced some private firms to initiate private ELV programs.

Because of general federal budget constraints, NASA may find it hard to obtain the funds to replace Challenger, much less to initiate production of the ELVs needed to provide additional launch services. There have already been suggestions that any monies required for the construction of a fourth orbiter come from other NASA programs. This would be a severe blow to the agency's scientific mission. Therefore, an alternative means of funding for an orbiter to replace the Challenger would be preferable. Fortunately, such an alternative does exist.

Recent estimates by NASA indicate that it would cost more than \$5 billion to replace the lost orbiter and to provide some ELVs to help reduce the launch pressures on the Shuttles. These figures rest on the assumption that the government would build and operate the vehicles. Private firms, however, should be able to raise the money to open the production lines to build the ELVs, if the federal government provides the necessary commitment to use the vehicles. Private firms, in fact, for some time have been attempting to purchase ELV production lines from NASA. In one case, they even offered to purchase an additional Space Shuttle. Now is the time to take them up on the offer.

To do this, the government must:

- 1) Prepurchase from the private firms the ELVs that NASA and the Department of Defense will require for government missions. These purchase commitments, of course, would be for vehicles that the government has to obtain by some means--either building them itself or purchasing them. As such, there would be no subsidy involved in the transaction. Rather, a prepurchase agreement would simply provide the guarantee of a sufficient market to justify the opening of private production lines. Since the space program is falling rapidly behind schedule because of the problems of the Space Shuttle fleet, bonuses should be offered for early delivery of the vehicles.

- 2) Consider the offer of several firms that want to finance and build an additional orbiter. The firms would provide the capital and lease the orbiter to the government for use on official missions. The firms, however, also could fly the vehicle for strictly commercial missions. Under such a lease-back arrangement, the federal government would avoid the initial cost of building the vehicle and would pay only for government use. At the same time, the firm providing the financing and construction services would have the guarantee of a sufficient market (again, for missions the government planned to fly on a Shuttle anyway) to justify the investment. In this way, private firms would be assuming all of the initial costs of developing the needed alternative space transportation capability. At the moment, of course, exactly the opposite is the case. NASA has had to provide all

the up-front funding and then search for commercial payloads to offset part of the staggering initial outlays.

3) Contract out space launches to private firms if the cost of doing so would be below that of the federal government building and launching the vehicles itself. This would cut federal outlays and help establish a private sector capability in this area.

4) Move rapidly to complete the rules and guidelines for commercial launches currently being formulated by the Department of Transportation. These new rules are aimed at expediting the licensing of commercial ELVs. They are a response to the experience of early space entrepreneurs who had to apply to dozens of agencies and spend hundreds of thousands of dollars to obtain a permit for a single launch. Clearly no commercial firm could long operate under such conditions.

CONCLUSION

The loss of the Challenger Space Shuttle is a tragedy that will leave a lasting mark on the nation. In its aftermath, NASA no longer can avoid its long simmering internal problems. Only by solving these problems can the U.S. continue exploring the heavens. Neither NASA nor Washington can do this without the private sector.

It is time, therefore, for NASA not only to tighten its internal safety procedures, but to stop undermining the efforts of private firms to help keep the U.S. the leading nation in space.

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