The future of the U.S. space program

Carol White evaluates the prospects for NASA, in the aftermath of the explosion of the Space Shuttle Challenger.

Despite the tragedy of the recent explosion of the Space Shuttle Challenger, America will achieve a great triumph, if the spirit with which Americans rallied to NASA as news of the tragedy was broadcast, becomes the basis for a new resurgence of national will. We must move forward resolutely into space.

There can be no question of merely covering our losses. The resounding support of the American people for the space program, should have made it unmistakably clear to all policymakers, lawgivers, and budget-cutters that NASA has a mandate to expand its program.

The United States is a nation which has always welcomed the challenge of new frontiers. And, despite myths to the country, our Western frontier, like our frontier in space, depended upon a cascade of new developments in technology and heavy capitalization.

The U.S. House of Representatives and the Senate have now begun hearings on the accident and the future of the program. Even according to official government statistics, which vastly undervalue the rate of inflation, the projected budget for NASA calls for a 3.5% cut, when the dollar figure is adjusted for inflation.

The 1986 figure for the NASA budget was $7.65 billion, compared to the proposed $7.69 billion for fiscal '87. The point is not that with the loss of the Shuttle, NASA will need additional funds to rebuild its capabilities; the point is that our space program was being remorselessly whittled away even before the accident.

And under the 4.3% across-the-board cuts directed by the Gramm-Rudman bill, NASA had already lost $223 million in this year.

Daily, we hear new scenarios to account for how the accident occurred. Many of these emphasize the poor performance record of seals, while others point to possible effects of the Florida cold snap.

It may well turn out that there were avoidable errors of judgment involved, connected with allowing the flight to proceed. But every one of the errors so far suggested, can be traced to pressures to perform, placed upon NASA, while money was being held back.

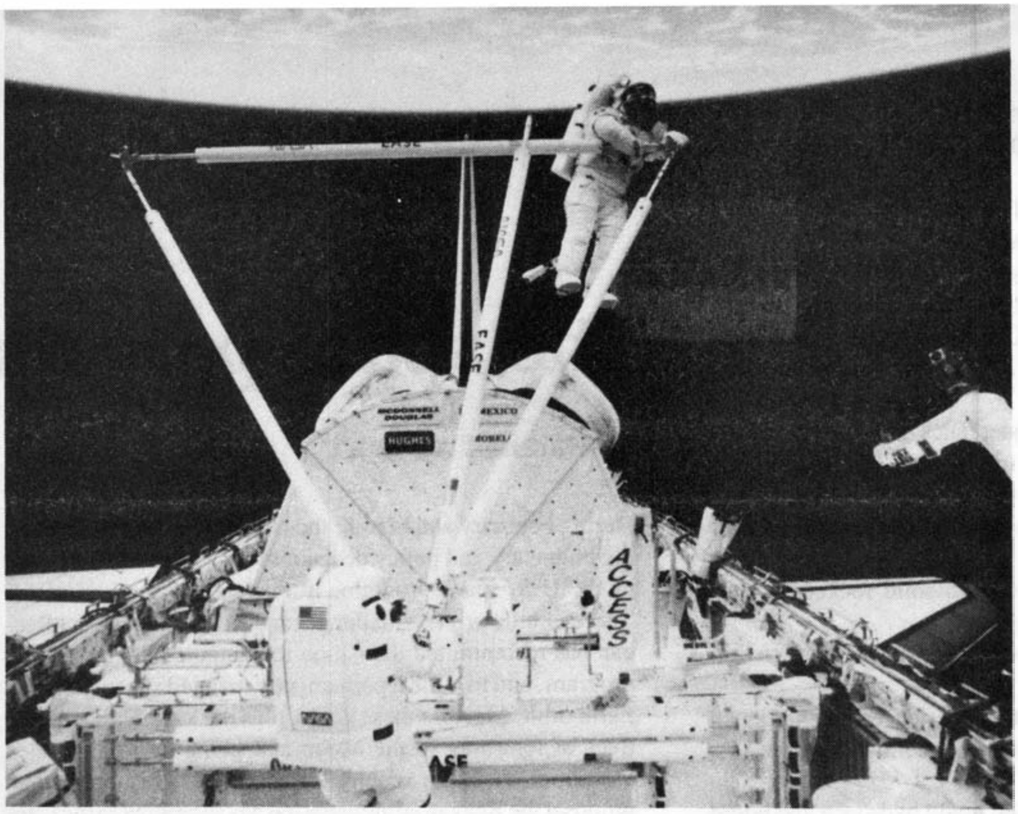
One example, is the problem NASA had in assembling a spare-parts inventory without cannibalizing from other orbiters in the fleet. Or, for that matter, the fact that the fleet itself was one orbiter short of the planned five, and trying to hold to a tight flight schedule.

More to the point, was the fact that from the start the construction of the Shuttle was justified according to criteria set by the Office of Management and Budget. Its aim was not to assure the conquest of space; no, its mandate was to be "cost-effective."

Each Shuttle trip was ultimately intended to pay for itself from the fees charged for hauling cargo. This year the charge to industry for cargo space was approximately doubled.

This has resulted in a situation in which commercial users of the Shuttle are billed $71 million to add a commercial satellite to a Shuttle mission, while the cost to NASA can be as low as $43 million if the flight is already scheduled. Policies such as this are not being followed by NASA's successful French competitor Ariane, which, appropriately, is government-subsidized for commercial as well as other space flights.

NASA was being forced into the impossible box of being a commercial success by the narrow-minded, free-market ideologues who controlled its budget and determined its pricing policy. If there were failures of judgment involved in the



NASA

Astronauts aboard the Space Shuttle, launched Nov. 26, 1985. Only a manned space program can achieve the noble purpose which the Challenger pioneers gave their lives to achieve.

accident, we can be assured that they will trace back to pressures generated by failure to adequately fund the program.

What went wrong?

The following time sequence of the events leading up to the disaster has been released by NASA, compiled from computer data and photographs. The computer data were not available in real time to Mission Control.

6.600 seconds before launch: Challenger's three liquid-fueled engines fire up one at a time and are throttled to 90% power.

0.000 seconds: Electronic ignition command is sent to the Shuttle's twin solid rocket boosters at 11.38 a.m.

0.059 seconds: Eight giant bolts holding rockets—and the Shuttle—to the launch pad are detonated and the first vertical motion is recorded.

0.445 seconds: Film shows a hint of abnormal black smoke appearing near a joint connecting the lower two of four propellant segments that make up righthand booster.

1.606 seconds: Black smoke appears darkest.

2.147 seconds: Smoke appears to extend halfway across the rocket booster.

7.724 seconds: The Shuttle clears the launch tower and begins a manuever to roll over, putting the crew in a "heads down" position below the external tank.

12.00 seconds: The last traces of smoke disappear from view of the tracking cameras.

20.084 seconds: Challenger's three main engines throttle down to 94% thrust, to reduce acceleration as aerodynamic pressure builds up.

40.000 seconds: Telemetry data show that the Shuttle's computer system responds to apparent wind shear to adjust the ship's flight path.

52.084 seconds: Tracking cameras show traces of smoke from lower side of righthand booster, facing away from the Shuttle.

59.000 seconds: Challenger passes through region of maximum aerodynamic pressure.

59.249 seconds: Well-defined intense plume of exhaust is seen on the side of the suspect booster by tracking cameras.

60.164 seconds: Data radioed from the Shuttle show that internal pressure in the rocket begins to change, probably dropping slightly.

60.600 seconds: Clear evidence of flame from the failing booster is photographed by tracking cameras.

62.484 seconds: Challenger's computers order the Shuttle's righthand "elevon," or wing flap, to move suddenly, apparently in response to flame from the rocket or because of unexpected thrust variations.

64.604 seconds: The Shuttle begins to pitch slightly as it maneuvers.

64.937 seconds: Engine nozzles vary position.

65.404 seconds: The Shuttle stops its minute pitching.

65.524 seconds: Data show left main engine nozzle begins moving.

66.174 seconds: A bright spot suddenly appears in the exhaust plume from the side of the righthand solid rocket motor, and bright spots are detected on the side of rocket which is facing the belly of the Shuttle.

66.484 seconds: Pressure in liquid hydrogen tank begins to deviate from normal.

66.625 seconds: A bright, sustained glow is photographed on the side of the righthand rocket booster that is facing the Shuttle.

67.650 seconds: Abnormal plumes on bottom and top of booster appear to merge into one.

67.684 seconds: Telemetry indicates falling pressure in the liquid oxygen propellant lines feeding the main engines.

68.000 seconds: Mission Control tells the crew that the main engines are operating at 104% power and all systems look good.

69.000 seconds: Commander Dick Scobee calmly responds: "Challenger at throttle up." That is last transmission from crew.

72.141 seconds: Data show a lateral acceleration of .227 times normal gravity.

72.201 seconds: Nozzles of two solid rocket boosters change position.

72.400 seconds: Last data received by the Shuttle tracking satellite.

72.661 seconds: The Shuttle experiences another small but detectable jolt, in the opposite direction from the first one.

72.884 seconds: Main engine liquid hydrogen and liquid oxygen propellant pressures drop.

73.044 seconds: Internal pressure in the righthand rocket booster is recorded as below that of its counterpart.

73.175 seconds: Ground cameras show a sudden cloud, apparently rocket fuel, appearing along the side of the external tank.

73.200 seconds: A sudden brilliant flash is photographed between the Shuttle and the external tank.

73.226 seconds: An explosion occurs near the forward part of the tank, where solid rocket boosters are attached.

73.326 seconds: Explosion intensifies and begins consuming the external fuel tank.

73.339 seconds: Data indicate that the main engines are approaching redline limits on their powerful fuel pumps.

73.473 seconds: Pressure fluctuates in the Shuttle's onboard rocket fuel supplies

73.534 seconds: Main Engine no. 1 shuts down because of high temperatures.

73.605 seconds: Last valid data from the Shuttle are recorded.

73.621 seconds: Telemetry stops.

This, of course, is merely a phenomenology of the accident. We will know more when the right booster is recovered, which is expected soon. There has been a good deal of speculation as to why the accident occurred.

Aviation Week magazine has advanced the plausible hypothesis that at 72 seconds, the righthand booster became unmoored and rotated so that its nose penetrated the main fuel tank, causing the final explosion. Speculation sells newspapers, but it will no doubt be some time before the true explanation emerges.

The space program

by Marsha Freeman

During February and March, the U.S. Congress will be making budgetary and policy decisions that will define the future of the U.S. space program. In response to the loss of the Space Shuttle orbiter Challenger and its crew, President Reagan has recommitted the nation to continue with the shuttle program, and to build a permanently manned space station in Earth orbit. Meeting these goals, plus the longer-term objectives of returning to the Moon and going on to a manned expedition to Mars, require scrapping not only the budget proposal the Reagan administration has submitted to the Congress to cut the funding for the space program, but also the irrational approach to economics, which for 15 years has dictated that space technology must be "cost effective."

One of the obvious questions facing the Congress is, what needs to be done to ensure that the nation has the launch capabilities needed to meet scientific, commercial, and defense requirements for the next decade? The National Aeronautics and Space Administration (NASA) had planned its original program with a fleet of five orbiters. The fifth orbiter has never been authorized, funded, or built. With the loss of Challenger, only three orbiters remain.

Though there are some simple commercial and defense payloads that could theoretically be launched on tried and true unmanned expendable rockets, the satellites that have been designed and built for Shuttle launching cannot be reconfigured as expendables without great cost and delay. The payloads planned for the Shuttle that are the most interesting and important, can only be deployed on a manned spaceship. These include the testing of new sensing, tracking, and other technologies required for the Strategic Defense Initiative (SDI), the scientific experiments in Spacelab, the construction missions to work out procedures for building a space station, the launch of very large reconnaissance satellites for the Department of Defense, and the repair and maintenance of free-flying scientific telescopes and spacecraft. While we need to continue to have expendable rockets, especially for military back-up, they cannot replace the manned Space Shuttle.

The anti-science mob in the press, which led the rallying call to destroy the space program before we even landed on the Moon, and which is now ready to ditch the Space Shuttle program, has claimed that one of the reasons for the Chal-