NASA Gets a Fifth Orbiter Kit

The White House will let NASA stockpile enough "spare parts" to build a new orbiter; but will it be needed?

The National Aeronautics and Space Administration (NASA) fought hard in the budget wars last fall for permission to augment its four-orbiter space shuttle fleet with a fifth. The battle ended in a standoff, with NASA unable to persuade the White House that future demand would require a fifth orbiter, and the White House unable to prove that it would not. The impasse was broken with an ingenious compromise that enables both sides to claim victory; the genesis of that compromise illuminates one of the major uncertainties in shaping the nation's space program for the rest of the decade.

NASA had always intended to have five orbiters, relying throughout the 1970's on ambitious flight projections that said the agency would need at least that many. But the production cost of an orbiter is about $2 billion (in current dollars), and in 1977 the decision to build a fifth orbiter was deferred by the Carter Administration as a cost-saving measure. NASA has been trying to get it back in the budget ever since.

By last year the effort had become particularly urgent. Even though the fourth orbiter, Atlantis, would not fly until 1985, many of its components were already finished. NASA was keeping the production lines open with well-timed purchases of spare parts, but that could not last forever. If the agency was ever going to get a fifth orbiter it was going to have to start in fiscal year 1984 at the latest. Otherwise the production lines would shut down and the skilled workforce would disperse. Starting things up again later would grossly inflate the cost.

NASA was still convinced that the launch demand would eventually justify the fifth orbiter, if not on its delivery date in 1988, then certainly by the 1990's. The boom in communications satellites showed every sign of continuing. The Pentagon had finally begun to get enthusiastic about the shuttle, and was planning lots of national security missions. NASA itself had a large backlog of science and applications missions. And there was promise of a whole new industry in space, based on zero-gravity materials processing. If nothing else, the fifth orbiter was required as insurance, a guarantee that NASA could meet its launch obligations if something should happen to one of the first four.

As it happens, NASA officials were not alone in their optimism. In February 1982, the Space Transportation Company (SpaceTrans) of Princeton, New Jersey, a band of entrepreneurs headed by economist Klaus Heiss, had offered to buy a fifth orbiter and let NASA use it—in return for exclusive marketing rights on all foreign and commercial payloads (about a third of the total). On paper this sounded too good to pass up. But NASA was leery. Quite aside from agency officials' very human reluctance to give up control, it seemed that SpaceTrans was talking about a "stripped" orbiter, with engines and spare parts to be provided by NASA. The agency was also concerned about giving away a monopoly marketing position. NASA continued (and still continues) to talk with Heiss. But it decided to press ahead for a fifth orbiter through standard channels, asking the White House Office of Management and Budget (OMB) for $200 million to start production in fiscal 1984.

> Historically, argued NASA, demand for transportation has always risen to fill the available capacity

OMB, however, was as jaundiced as NASA was optimistic. To begin with, NASA had a credibility problem. The agency's first mission models, drawn up in the mid-1970's, called for up to 60 flights per year, a total of 572 over 12 years. But bit by bit, as Carter deferred the fifth orbiter, as the Reagan Administration placed budgetary limits on the production rates of the shuttle's external fuel tanks and solid rocket boosters, and as more realistic assessments were made of the orbiter turnaround time on the ground, NASA mission projections inexorably fell. The current plan calls for a maximum of 24 flights per year and a total of 233 over 12 years.

And that is just the shuttle's capability for launch. Even though the shuttle is booked up for now, the actual long-term *demand* for launches is extremely nebulous. NASA plans its science and applications missions far in advance, but those depend on highly unpredictable budgets. The Pentagon also has long lead-time missions, but many of those are in the "call-up" category: NASA only knows the earliest possible date for launch; they could be later. The communications industry tends to use standardized satellites that can be built in only 2 years or so; they do not start talking seriously until 3 or 4 years before launch. And the hypothetical zero-gravity industries do not even exist yet.

To get a feel for the numbers, consider that the shuttle payload bay can hold three separate "Delta class" payloads, satellites that in earlier days would have been launched on NASA's expendable Delta rocket. Even with the four-orbiter fleet, 24 launches per year times three payloads per launch is 72 Delta-equivalents per year—when NASA has never had more than 13 Delta launches in a year. Granted that many of those 24 launches would actually be used for other things, a skeptical observer would still have to wonder about overcapacity.

OMB could also point to the known competition to the shuttle from Europe's Ariane launcher and the potential competition from the privately financed Conestoga rocket of Space Services, Inc. (SSI). On top of that, NASA may be generating still more competitors as it phases out its three expendable launchers—the Delta, the Atlas-Centaur, and the Titan. SpaceTrans is talking about buying rights to the Titan as a backup to its fifth orbiter; General Dynamics and SSI both want the Atlas/Centaur; and TransSpace Carriers, Inc.—headed by David Grimes, former manager of the Delta program for NASA—wants the Delta. These private launch services may be a threat to the shuttle, they may be healthy competition, or they may fall flat. But in OMB's view, they certainly weaken NASA's case for a fifth orbiter.

A final hurdle, perhaps the highest, was a decree by OMB director David Stockman. ". . . it should not be assumed that the U.S. government should

have responsibility to fund an operational system with sufficient capacity to meet non-U.S. government needs once the shuttle technology has been developed," he wrote last summer in a letter to NASA administrator James M. Beggs. In other words, commercial customers would have to fit into whatever leftover shuttle space they could find, because the White House was certainly not going to let NASA build extra orbiters to accommodate them—not even on a pay-as-you-go basis.

Stockman's position was perfectly consistent with his loathing for subsidy. But disgruntled shuttlephiles pointed out that it was also a self-fulfilling prophecy: constraining the space available to commercial users would drive them elsewhere and guarantee a lack of demand for the shuttle. Moreover, OMB was judging the need for a fifth orbiter on very narrow grounds: the demand projections in 1988, when the orbiter would roll off the assembly line. But the orbiter would presumably be in service for a decade or more, and the uncertainty in long-range demand can be interpreted both ways. Historically, argued the optimists at NASA, in transportation networks ranging from railroads, highways, and airlines, to expendable rockets, demand has always risen to fill the available capacity.

(It is worth noting that this same optimism is behind NASA's desire to build a permanent space station. If the demand is high, it makes sense to use the shuttle as a truck, ferrying lots of instruments and supplies to a permanent workshop in orbit; if the demand is low, however, one can afford to do what presidential science adviser George A. Keyworth suggests: leave the shuttle in orbit for weeks at a time and use it as a mobile workshop.)

Be that as it may, it was clear to NASA by late fall that OMB was not going to be persuaded by arguments about demand for the shuttle. So the agency took a different tack, focusing on a more clearly defined White House priority: the fifth orbiter was insurance, said NASA; the agency wanted to be able to meet its launch obligations to the Pentagon if something should happen to one of the first four.

OMB replied, in effect, "Prove you need four."

To which NASA said, in effect: "We're phasing out the expendable launch vehicles. We're tying our entire space program and our entire national security apparatus to the space shuttle. If we shut down the orbiter production line now it's going to cost you a fortune to get it started again. Do you really want to risk that on the chance that demand will *not* rise?"

OMB: "Well . . . no."

It was a standoff. Neither side could prove its point, and OMB, for its part, was unwilling to simply assert its budgetary authority lest NASA appeal the issue higher in the White House and win.

Ironically, the solution only appeared as NASA's planners began to contemplate the consequences of losing. If they were really going to have to live with four orbiters, they were also going to have to think very hard about maintenance and repair. What would happen if one of the four made a bad landing and, say, nicked a wing? It would take 3 years to get a replacement wing and another 18 months to cover it with thermal protection tiles. One relatively minor accident and an orbiter could be out of commission for 5 years. Come to think of it, it would make a lot of sense to start stocking "structural" spares—wings, a midbody, a tail, and so forth—even if the White House relented.

Then, as this idea was discussed internally, it began to dawn on people that here was the answer. Why not just ask OMB for the structural spares in fiscal year 1984? That way, OMB could avoid having to commit itself to the fifth orbiter, but NASA would be able to keep the production lines running. OMB could keep the budget down this year—the structural spares would cost $100 million in fiscal 1984, versus $200 million for a full-scale start on the orbiter—and NASA could preserve the option of putting the parts together in a year or two if demand for the shuttle started to pick up.

As a compromise it was elegant. It fooled no one, yet it appealed to everyone. NASA and a relieved OMB quickly reached an understanding, and in January, the structural spares were in the President's budget proposal.

Congress seems likely to go along with the idea. Indeed, the space committees in both houses have been pushing the fifth orbiter all along. Senator Slade Gorton (R–Wash.), the new chairman of the subcommittee on science, technology, and space, recently named the fifth orbiter acquisition as the "largest and most prominent" of the unresolved issues in NASA's latest budget. And a House committee staffer predicts that approval of the structural spares will be accompanied by language urging the Administration to "make up its mind."

But the fact is, neither Congress nor anyone else knows what the ultimate demand for the shuttle will be.

—M. MITCHELL WALDROP

Soviets Lag in Key Weapons Technology

Richard DeLauer, the Pentagon's top scientist, recently made some uncommonly kind remarks about the quality of U.S. weapons. In a detailed report on research and development in the Defense Department budget proposed for 1984, DeLauer said that the United States is superior or equal to the Soviet Union in 19 of 20 basic technologies that will influence the balance of power during the next 10 to 20 years. In addition, he stated that the quality of U.S. weapons is equal or superior to the quality of Soviet weapons in 27 of 32 separate categories, including land-based nuclear missiles, submarines, and bombers.

DeLauer's assessment is significant because it appears to contradict the statements of other Reagan Administration officials, including Defense Secretary Caspar Weinberger, that the Soviets now lead in many military technologies, and that the United States must spend billions of dollars in order to catch up. "The United States has maintained its lead in most of the basic technologies critical to defense," DeLauer said, "although the Soviets are eroding the lead in some of the basic technologies where the U.S. now leads."

Among the areas where the United States leads are computers, electro-optical sensors, microelectronics, guidance and navigation, optics, propulsion, radars, signal processing, computer software, stealth technology, structural materials, submarine detection, and telecommunications. The Soviets are adjudged equal to the United States only in aerodynamics, directed energy, nuclear warheads, and mobile power sources; they lead only in conventional explosives.

According to DeLauer's estimate, the Soviet Union has improved its relative position during the last year in only one weapons category, that of intermediate range ballistic missiles. Soviet superiority in four other weapons categories persists, he says. These include antiballistic missiles, antisatellite weapons, and chemical warfare munitions. Although Congress rejected the Administration's request for new chemical munitions last year, DeLauer says that the request