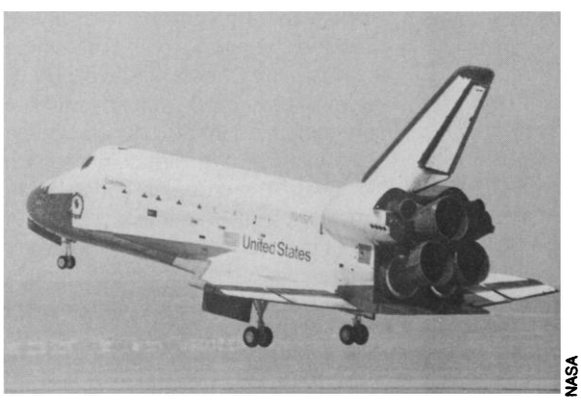
NASA Struggles with Space Shuttle Pricing

The agency is charging users far less for shuttle flights than they will cost; the result is budgetary disaster

Even as the space shuttle Columbia is proving itself a technological triumph in orbit, officials of the National Aeronautics and Space Administration (NASA) back in Washington are struggling to rectify a pricing policy that would force NASA to subsidize shuttle users by several billion dollars over the next 3 years—at the same time it is slashing much of its own scientific and applications research.

The policy dates from 1977, as NASA began its planning for the transition to the shuttle's operational phase. The goal was to recover the total operating costs of the fleet over 12 years. At the time, it was estimated that those total costs would average $16.1 million* per flight. So adding in what seemed an adequate margin for error, NASA announced that its base price for foreign, commercial, and federal civilian agency users would be $18 million per flight. Special services, such as upper stages for boosting the satellite to higher orbit, would cost extra. In addition, nongovernment customers would be assessed a user fee of $4.3 million per flight to help NASA recover its capital investment in the orbiter fleet and ground facilities. At any rate, the $18-million base price would be guaranteed for the first 3 years of shuttle operation (phase 1), after which the agency would adjust the price to reflect actual operating experience and to recoup any losses.



NASA

Columbia returns to Earth

With the Department of Defense (DOD), however, NASA made a special arrangement. Just as NASA would launch some DOD shuttle missions from the Kennedy Space Center in Florida, DOD would launch some NASA and commercial flights into polar orbit from Vandenberg Air Force Base in California. Balancing the projected flight schedules from each, NASA in 1977 figured that everything would come out roughly even if it simply charged DOD $12.2 million per flight to cover such items as the shuttle's external tank and solid rocket boosters. There would be no user fee, since that would simply amount to the government paying a fee to itself.

In addition, however, NASA guaranteed the $12.2-million price to DOD for 6 years instead of 3, and it promised not to try to recoup any losses afterwards. This was an extraordinarily sweet deal for the Pentagon, and NASA officials attribute it to the agency's efforts to court DOD support for the shuttle at a time when the vehicle was already being plagued with delays and cost overruns. The Pentagon's managers were disturbed that NASA could not guarantee them a date for getting their spy satellites on board; this way, NASA was at least guaranteeing them a long-term price.

Unfortunately for NASA, however, the cost per flight has since escalated from $18 million to something in excess of $30 million. This is due partly to large increases in hardware costs, and partly to there being fewer missions over which to allocate fixed costs. Both the Carter and Reagan Administrations have refused to fund a fifth orbiter; with only four orbiters now planned, NASA has cut back the 12-year mission plan from 572 flights to 487.

Whatever the reason, however, the $30-million figure is only a 12-year average. In phase 1, while the program is still in its infancy, the 44 planned flights will average much more, nearly $60 million apiece. The result can best be described as budgetary hemorrhage. The contracts and agreements are signed, and for 3 years NASA is locked into the older prices. The General Accounting Office (GAO) estimates that the space agency stands to lose some $1.2 billion by 1985. And that figure is in 1975 dollars; inflation could more than double it in current dollars. Moreover, NASA is already incurring these costs. External tanks and solid rocket boosters have to be ordered 33 months ahead of launch.

While it is true that NASA will be able to recoup much of this money later, this is small comfort to people in the agency's science and application offices. Congress and the White House look at budgets now, not 12 years from now. Programs such as planetary science, already battered by the cost overruns in developing the shuttle, are being squeezed into oblivion.

In its recent report (see footnote) the GAO is especially scathing about the DOD's "special customer" status. The cost of external tanks, solid rocket boosters, and other materials and services is no longer $12.2 million, as specified in the 1977 agreement, but $21 million (November 1980 estimate). Moreover, the non-DOD users will be flying fewer flights than estimated from Vandenberg (62 versus 84), while DOD will be flying more from Kennedy (91 versus 71). The quid pro quo balance is in shambles, and under the old agreement NASA cannot do anything for 6 years. Even then, it explicitly will not be allowed to recoup its losses.

This situation has hardly gone unnoticed at NASA headquarters, where Administrator James M. Beggs has given high priority to renegotiating the DOD arrangement. Although final agreement is still far off, the agencies have agreed in principle to raise the fixed price from $12.2 million to $16 million and to limit the guarantee to only 3 years instead of 6. The unbalanced quid pro quo is left in place for now but it could be addressed

*Unless otherwise noted all figures are given in 1975 dollars; NASA converts its fees to current dollars using standard inflation factors from the Bureau of Labor Statistics. All figures are taken from the report *NASA Must Reconsider Operations Pricing Policy to Compensate for Cost Growth on the Space Transportation System* (General Accounting Office, Washington, D.C., 23 February 1982).

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in an agreement for the post-1985 era, which is also under negotiation.

Meanwhile, NASA has embarked on the ticklish process of revising the non-DOD user charges for 1986 and beyond. Balanced against the need to recoup losses from phase 1 is the need to meet competition from Europe's new Ariane launcher and even from NASA's own fleet of expendable launchers. "If the automotive industry charged actual costs for the first vehicles off its assembly lines, it would be hard pressed to find any customers," Beggs notes.

In congressional testimony earlier this year Beggs mentioned a possible base price of $31 million per launch after 1985. This is quite a jump from $18 million, but Barbara Stone, NASA's pricing policy analyst, told *Science* that the shuttle would still be cheaper than its competition. Consider a small communications satellite destined for geosynchronous orbit, for example. In estimated 1986 dollars the launch would cost about $38.5 million using a Delta rocket, she says. An Ariane launch would cost an estimated $30 million. But that same payload would only have to pay a fraction of the shuttle launch charge, she says, since it could share the payload bay with several other satellites. Figuring in all the other costs, and converting to 1986 dollars, the shuttle launch would cost only $24 million.

On the other hand, the Europeans are aggressively marketing their rocket through Arianespace, a private French firm incorporated in 1980 by the 11 member nations of the European Space Agency. Quite aside from having a vehicle that can directly reach geosynchronous orbit, ideal for communications satellites, Arianespace is offering attractive financial terms and more favorable scheduling. But NASA's customers have to start putting up money as much as 3 years in advance, most of the early slots are already booked, and a payload might easily get bumped by the DOD. NASA itself estimates that Ariane could capture up to 30 percent of the launch market.

NASA could offer attractive financing too. But that means both Congress and the White House would have to agree to even larger subsidies to users in the early years. With the Reagan Administration this seems problematic at best. A more fundamental question is whether NASA, the research and development agency, should be running a high-technology trucking company at all. The President's science adviser, and many others, are studying ways of getting NASA out of the shuttle operations business entirely.—M. MITCHELL WALDROP

Audit May Cost UC Millions

The University of California (UC) may eventually have to repay several million dollars to the federal government because some UC faculty members have failed—and in some cases outright refused—to fill out detailed reports on how they spend their professional time. At UC San Francisco (UCSF) alone, federal auditors have questioned about $1 million worth of expenses associated with government-funded research projects because several of these so-called effort reports are missing. The auditors are now examining the books at all the other campuses in the UC system.

The UC audit is the first major test of how the universities are complying with controversial accounting regulations, known as Circular A-21, which govern the payment of federal research grants. The latest version of the A-21 rules, originally adopted in October 1970, requires researchers who have federal grants to document how they divide their time between research, teaching, and other tasks. Failure to do so could prompt auditors to disallow some costs, which the university would then have to repay to the federal government. According to Steven Selby, director of Cost Accounting and Financial Analysis at UC, "where there are no [effort] reports, the auditors are disallowing costs in droves."

The A-21 rules have long been a focus of bitter complaints from university researchers, who argue that they are burdensome yet provide little useful accounting information. The rule requiring faculty members to account for the time they spend on different tasks, for example, is derided because it fails to recognize that activities such as teaching and research are often inseparable. More than two dozen faculty senates have passed resolutions objecting to the rules and some individual researchers have refused to comply with them.

The audit of the UCSF books, which is being conducted by inspectors from the Department of Health and Human Services (HHS), is revealing because UCSF has not been a hotbed of opposition to the regulations. According to preliminary findings, which have not yet been published, 134 effort reports were not on file at UCSF, and the auditors are consequently objecting to about $1 million worth of payroll costs. (Although a large amount of money is at stake, it should be noted that compliance with A-21 was actually quite high. Some 6000 effort reports were on file, and the $1 million under dispute represents only about 3 percent of the total amount audited.)

After completing their work at UCSF, the auditors moved across the San Francisco Bay to Berkeley, where opposition to the A-21 regulations has been much more vocal. Although the audit has not been completed there, early indications are that some serious problems have emerged. "It looks like we have substantial numbers coming out of there," says Selby.

The audit reports on each campus will be sent to the UC administration, which will have a chance to contest the findings in writing. Not every case is clear-cut; it is not always obvious who is required to fill out effort reports. Eventually, HHS will deliver a complete report of its findings to UC together with a demand for repayment of the disallowed costs. At that point, UC will have 30 days to appeal or pay up.

The outcome of all this is likely to increase tensions between faculty members and administrators in the UC system. Although the federal government sets the rules, university administrators must ensure that they are followed or risk losing substantial amounts of money. According to Selby, when the disallowed costs have been repaid to the federal government, each UC campus will have its budget reduced by the amount that was disallowed. This, he argues, will put pressure on department chairmen to make sure that researchers fill out their effort reports.

In cases where researchers refuse outright to comply with the A-21 regulations, however, strong-arm tactics may be used by the federal government. Selby says he has been told by the HHS auditors that in such cases they may recommend that the researchers be suspended from receiving future federal grants.—COLIN NORMAN

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