Reagan's Budget Boosts Basic Research

Physical sciences, mathematics, and engineering would be favored over life sciences; defense would get 69 percent of all R & D funds

President Reagan has sent Congress a budget for fiscal year (FY) 1984 that reflects in bold relief his Administration's scientific priorities. It would channel a growing share of the government's R & D funds into the military; provide a surprisingly large injection of cash into basic research in the physical sciences, mathematics and engineering; hold support for biomedical research approximately constant; and cut deeply into many nondefense applied research programs—particularly those aimed at developing nonnuclear energy sources.

These trends have been evident in previous Reagan budgets, but this year the message comes through loud and clear: the Administration is attempting to concentrate the government's scientific resources into areas likely to support the long-term needs of defense and high-technology industry. "In a climate of intense fiscal scrutiny, it's no longer possible to spread increases uniformly throughout science," says George A. (Jay) Keyworth II, President Reagan's science adviser.

Overall, Reagan's proposals would expand support for R & D from $38.86 billion this year to $45.8 billion next year.* Military R & D, including weapons-related research supported by the Department of Energy (DOE), would get $31.8 billion, or almost 70 percent of the total. When Reagan came to office, the military's share of the R & D budget was about 50 percent.

Nondefense R & D would be held at $14 billion, about the same level as this year. But the division of funds within that total would be far from static. In essence, the Administration is attempting to channel major increases into selected areas of basic research by cutting support for lower priority programs—especially those that it hopes will be picked up by private industry.

Thus, basic research funded by the National Science Foundation (NSF), the National Aeronautics and Space Administration, and DOE would climb by some 15 percent overall—well above the 5 percent inflation rate that the Administration is projecting. In contrast, agencies supporting basic research in the life sciences would get much less generous treatment; their research budgets would grow little, if at all (see table). And many applied research and development programs would be slashed. DOE's fossil fuels, solar, and conservation programs alone would drop by more than $400 million, for example—an amount equivalent to two-thirds of the increase in funding for basic research throughout the government.

This emphasis on basic research in physical sciences and engineering is aimed at overcoming years of relative neglect, according to Keyworth. In an interview with *Science*, he said that after steady growth during the 1970's, biomedical research is "basically healthy . . . there is no real need for the kind of growth that we are proposing for mathematical and physical sciences." In contrast, facilities for physics and engineering research are "positively shabby."

Why is the Administration so concerned that it is prepared to put huge increases into these areas when it is cutting back heavily in virtually every other area of domestic spending? According to Keyworth, one reason is that the research itself will be important for defense and high-technology industry. Another is that there is a pressing need to improve the environment for training scientists and engineers in these disciplines. Concern over the supply of trained people was expressed at a series of Cabinet Council meetings last summer and fall, and this led to high-level political support for boosting research funds.

This concern has also led the Administration to change course on support for science education. In previous budgets, it has attempted to eliminate entirely NSF's education programs, but this year it has proposed a modest increase and launched a new thrust through the Department of Education to improve the training of science and math teachers. A conspicuous new effort in this area is a Presidential Young Investigator Awards program, which is intended to provide unrestricted grants to young researchers

CONDUCT OF BASIC RESEARCH BY MAJOR DEPARTMENTS AND AGENCIES

(In millions of dollars)

Department or agency	Obligations			Outlays		
	1982 actual	1983 estimate	1984 estimate	1982 actual	1983 estimate	1984 estimate
Agencies supporting primarily physical sciences and engineering:						
National Science Foundation	916	998	1,181	954	943	1,083
Energy Related Activities	777	861	1,021	774	859	1,001
Defense—Military Functions	686	769	867	603	746	776
National Aeronautics and Space Administration	538	605	682	537	588	658
Interior	74	88	89	74	89	94
Commerce	17	18	16	16	16	17
Other Agencies	9	7	8	9	7	8
Subtotal	3,017	3,347	3,864	2,967	3,249	3,636
Agencies supporting primarily life and other sciences:						
Health and Human Services	1,953	2,184	2,238	1,962	2,154	2,214
(National Institutes of Health)	(1,840)	(2,049)	(2,086)	(1,835)	(2,022)	(2,068)
Agriculture	331	362	381	338	356	380
Smithsonian Institution	55	60	68	47	60	62
Environmental Protection Agency	33	21	17	30	25	22
Veterans Administration	13	15	15	13	15	15
Education	16	16	14	22	22	18
Other Agencies	22	22	22	22	23	13
Subtotal	2,422	2,678	2,755	2,434	2,655	2,723
Total	5,439	6,025	6,619	5,401	5,904	6,359

*The figures are for budgetary authority, not outlays. They do not include funds for R & D facilities, which are budgeted at $1.2 billion in FY 1984.

in an attempt to retain bright people in university teaching (see page 749). Keyworth, who briefed Reagan personally on the proposal, evidently regards it as a highlight of the R & D budget.

Another new effort that Keyworth points to with pride is the construction of the National Advanced Materials Research Laboratory at the Lawrence Berkeley Laboratory. A $200 million facility, it is "a perfect example of the Reagan Administration's approach to science and technology," Keyworth proclaimed. Although the details have yet to be worked out, it will be built in cooperation with industry, and will house industry, university, and federal scientists. Keyworth, whose office is now conducting a major review of policies for the national laboratories, says he would like to see more of the labs move toward this cooperative approach.

For months, Keyworth has been warning scientists that they must establish their own priorities for what should be funded in a period of tight budgets. He says he is delighted with the way planetary scientists have responded by coming up with a program of less expensive projects. As a result, there is a major new start in NASA's budget for a Venus mission. The response of the high energy physics community, however, is another matter.

Last year, the Administration added $65 million to the high energy physics budget. It was designed to increase the operating budgets of existing facilities rather than support construction of the Isabelle accelerator at Brookhaven. This emphasis was carefully worked out in advance with the community, Keyworth says, but when the budget was released, it was attacked because Isabelle had been scrapped. Unless high energy physicists can move beyond this "WPA mentality" and look at the overall health of the program rather than that of individual facilities, it will "tear itself apart," Keyworth says. The budget does provide funds to construct Stanford's Linear Collider as fast as it can be built.

One irony in this budget is that Keyworth, who has often argued that R & D should not be exempt from cuts, must now argue for big increases while most other programs are being slashed.

How will this budget fare on Capitol Hill? The climate for a boost in funds for basic research and science education is relatively good. The Democrats, in their response to Reagan's State of the Union message, put special emphasis on their plans to support R & D and high-technology industry. Representative Timothy Wirth (D–Colo.), who has long championed these plans, said in an interview that he is picking up support from the Democratic leadership, and suggests that "the Administration may finally have got the message."

Congress will, however, reorder the priorities somewhat. Last year, according to an analysis by the American Association for the Advancement of Science, it trimmed $1.8 billion from the Administration's request for military R & D and added $1.4 billion to the civilian R & D budget, chiefly by increasing funds for energy projects and biomedical research. This year should be a repeat performance.—**COLIN NORMAN**

Health

For the second year in a row, the Reagan Administration has proposed to hold the line on the budget for the National Institutes of Health (NIH) and to make cuts in two sensitive areas related to biomedical research—competing research grants and reimbursement to institutions for overhead costs. Outgoing Secretary of Health and Human Services Richard S. Schweiker is particularly angry about the cuts in grants and has already protested to David Stockman, director of the Office of Management and Budget (OMB).

For fiscal year 1984, the Administration has requested an NIH budget of $4.1 billion, an increase of $73 million or 1.8 percent over last year's proposal. The research agency, however, would end up losing the modest gain in terms of real dollars to the 4.9 percent inflation rate projected for fiscal 1983.

The Administration would allot all 11 institutes very small increases. The two largest institutes would receive the smallest budget additions. The National Cancer Institute and the National Heart, Lung and Blood Institute would expand less than one percent. The National Institute for Allergy and Infectious Diseases landed the biggest increase at 2.9 percent with a total of $281 million.

Officials at NIH, the department, and OMB are still battling over the number of competing research grants to be awarded. NIH announced that the Administration would allow only 3767 grants. But later the same day, top department officials said at a press briefing that the figure is still under negotiation. According to Robert J. Rubin, assistant secretary for planning and evaluation, Schweiker wrote to Stockman on 26 January, insisting that the number be raised to 5000. (The 5000 figure is a target set 4 years ago by the department to stabilize long-range planning of biomedical research.)

Schweiker is leaving the cabinet but if his view does not prevail, Congress is likely to come to the rescue. Last year, although the Administration requested 4100 grants, Congress boosted the number to 4900.

In any event, the Administration for fiscal 1984 sets aside $482 million for competing research grants, which would increase the average value of a grant by about 8 percent over last year's awards.

Money for the increase would be generated by savings NIH expects to make by reimbursing institutions 10 percent less for overhead or "indirect costs." Last year, the budget office made the same cut.

Although the number of competing research grants is in flux, the Administration's figure for research trainee awards is firm. The budget office proposes to support the training of only 9100 young scientists, compared to 9,969 last year. It requests $163 million for their training, a drop of 3 percent.

Although the budget office in December proposed to make drastic changes in other health divisions within the department, its final proposal kept things the same. The duties of Edward Brandt, Jr., assistant secretary for health, remained intact. Budget officials had toyed with the idea of restricting his responsibilities to health policy. There was also no mention of eliminating the commissioned corps of the Public Health Service.

The Alcohol, Drug Abuse, and Mental Health Administration would not be incorporated into NIH as suggested earlier. It received the biggest jump in research funding among the department's health agencies. Its budget would total $274 million, an increase of 15 percent.

The Centers for Disease Control would receive $270 million, an 8 percent increase. One of its agencies, the National Institute for Occupational Safety and Health would be cut again, this time to $55 million, a 5 percent drop. The proposed budget would phase out federal support for the training of occupational health specialists, a group which "is amply funded by state and private sources," the department says.

—**MARJORIE SUN**

NSF

The new Reagan budget assigns the National Science Foundation (NSF) the largest increase in R & D funding among civilian agencies. NSF's budget would rise to $1.29 billion next year, up $195

million or 18 percent from this year. If the estimated 5 percent inflation factor holds up, the increase in real terms would be 13 percent.

Major trends in the budget follow those established in the first 2 Reagan years. Increases above the 18 percent agency average were given to basic research in the foundation's biggest, mainline programs—mathematical and physical sciences and astronomical, atmospheric, earth and ocean sciences. Engineering got another hefty increase, bringing funding over the past 2 years up from $83 million to $123 million.

The biological, behavioral and social sciences got a smaller percentage increase overall, but research in physiology, and cellular and molecular biology got a 20 percent boost in funding. Social and economic and information sciences were at the other end of the spectrum but still on the plus side.

Newly confirmed NSF director Edward A. Knapp soloed at the agency budget briefing, carrying on in the absence of a deputy director and of assistant directors whose resignations he had recently collected (*Science*, 24 December 1982, p. 1286). At the briefing, Knapp declared he "couldn't be more pleased" with the NSF budget, a not unreasonable sentiment to express in view of the cutbacks called for elsewhere in government.

Not all NSF's problems have been solved, however. An example is the still unsettled future of the foundation's ocean drilling program. Funding would be raised to $26 million this year after being cut to about $14 million last. Knapp acknowledged that there is some "confusion about the direction the deep sea drilling program should take." He said he hoped a decision would be reached this summer on whether to continue using the aging research ship *Glomar Challenger*, activate the *Glomar Explorer*, which is more capable but also more costly to operate, or resort to a "third platform not specified."

His comments on the matter echoed the often-iterated view of President's science adviser George A. Keyworth that the scientific community should be more directly involved in making hard decisions on federal science activities. Knapp said he hoped that a recently formed committee of experts on crustal research will provide guidance on deep sea drilling and other issues and that other scientific disciplines will rally and give helpful advice as have astronomers.

NSF is claiming progress on the nagging problem of underinvestment in research instrumentation by giving them high priority in disciplinary budgets. NSF estimates that expenditures on R & D equipment and instrumentation across the agency would rise from $112.3 million this year to $180.2 million next, up more than 60 percent.

The biggest change of heart signaled in the new budget is toward science education and manpower training. The Administration when it took office sought to strictly limit the federal role in these sectors. The major departure this year is a proposal to fund scholarships through the Department of Education to produce 7,000 badly needed math and science teachers a year.

Support of precollege education at NSF—excised when the Administration took office—would be revived with a 2-part program. Awards for teaching excellence would be made to 100 teachers, with $5000 grants going to the winners' schools. The main initiative is a $19 million item to improve science and math education in secondary schools by retraining teachers. The program was actually adopted by the Administration after Congress insisted on inserting $15 million for precollege instruction in the current budget. Federal funds for the program would be provided on a 50/50 matching basis.

In the scientific manpower sector, stipends for NSF graduate fellowships would be increased to $8,100 from the current $6,900. Some $6 million is being earmarked within research activities for a new program of Presidential Young Investigators Research Awards. Young faculty from research universities will be eligible for grants of up to $50,000 for as much as 5 years. Here too the terms are that federal funds be matched, a requirement that appears to be an emerging theme of Administration education and manpower policy.—JOHN WALSH

NSF OBLIGATIONS BY BUDGET ACTIVITY FY 1983–1984 (DOLLARS IN MILLIONS)

BUDGET ACTIVITY	FY 1983	FY 1984	% CHANGE FY 84/83
MATHEMATICAL AND PHYSICAL SCIENCES	$299.7	$364.3	21.5%
ENGINEERING	100.8	123.0	22.0%
BIOLOGICAL, BEHAVIORAL, AND SOCIAL SCIENCES	190.2	223.6	17.5%
ASTRONOMICAL, ATMOSPHERIC, EARTH, AND OCEAN SCIENCES	276.2	334.9	21.3%
U.S. ANTARCTIC PROGRAM	83.2	102.1	22.7%
SCIENTIFIC, TECHNOLOGICAL, AND INTERNATIONAL AFFAIRS	44.2	36.8	-16.7%
PROGRAM DEVELOPMENT AND MANAGEMENT	65.3	66.0	1.1%
UNDISTRIBUTED	4.5	.0	-100.0%
SUBTOTAL, RESEARCH & RELATED ACTIVITIES	1,064.1	1,250.7	17.5%
SCIENCE AND ENGINEERING EDUCATION	30.0	39.0	30.0%
SPECIAL FOREIGN CURRENCY	3.1	2.6	-16.6%
TOTAL	$1,097.2	$1,292.3	17.8%

Environment

At a time when critics are demanding more action out of the Environmental Protection Agency (EPA), the Reagan Administration has proposed paring the agency's budget for fiscal year 1984 to $949 million, a 9 percent reduction compared to last year's request. The Superfund program, however, which is separate from EPA's operating budget would be increased by $100 million to $300 million. This money has been generated mainly by taxes on industry.

The budgets of most of EPA's major programs remained basically the same. The program on toxic wastes would receive $67 million; energy, $24 million; radiation, $11 million; and pesticides, $53 million. The acid rain program would be boosted $1 million to $24 million despite the Administration's earlier efforts to take big cuts in this area. The proposed funds, however, are much less than its fiscal 1982 budget of $40 million.

A few areas, including those of particular concern to the states, would suffer heavy casualties. The water quality program would be slashed 30 percent to $151 million and the clean drinking water

program would be reduced by 26 percent to $173 million. "We realize that the states are unhappy," says Joseph Cannon, associate administrator. State officials are likely to find more sympathy on Capitol Hill as they did last year when faced with grant cuts.

Research and development funds would be decreased by $23 million or 10 percent to $206 million. The staff would also be cut by 10 percent. Programs that would absorb the cuts include research on engineering to control air pollution, wastewater and chemical spills.

A few programs would receive some increases. The Administration would boost funds for enforcement by 12 percent to $103 million, but the budget does not allow for staff increases. The extra money would be used instead for contracts and the hiring of expert witnesses during litigation.

The agency's "interdisciplinary program" would double in size to $41 million. The program is a hodgepodge of activities such as the development of enforcement policy, compliance and exploratory research.

The huge increase in Superfund money would be used to clean up more hazardous waste sites. About $95 million would be made available to states so they can manage their own cleanup programs. Research and development within the Superfund program would be kept at last year's level of $6 million.

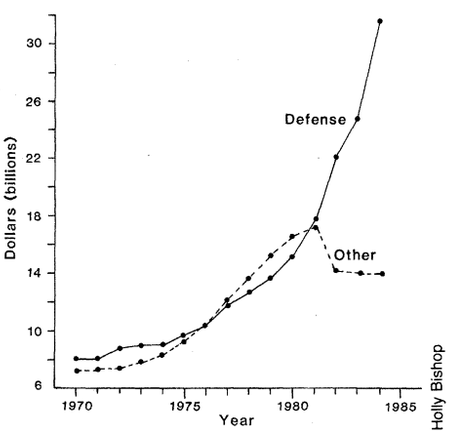
The Administration has also requested $2.4 billion for the construction of municipal sewage treatment plants. The budget office made the same request last year. These funds are also separate from EPA's operating budget.

—MARJORIE SUN

Defense

Perhaps no budget will receive as much scrutiny or attract as much controversy this year as that proposed for the Department of Defense (DOD). Congressional Republicans and Democrats alike seem concerned that President Reagan has proposed another large increase in military expenditures. Since his election, annual outlays at DOD have increased by 33 percent, and will jump another 14 percent under the budget for 1984. Given the enormous federal debt and recessionary economy, it appears likely that—sooner or later—the Pentagon will be forced to share in the privation.

Consequently, the Administration's proposed increase of $34 billion and the total of $274 billion should be viewed with skepticism. Senator Howard Baker (R–Tenn.) has predicted that Congress will lop off at least $15 billion, and prominent members of the business community have been lobbying for reductions of $20 billion or more. It is too early to know where the cuts will be taken, but many congressmen will zero in on the military hardware account, which is slated for the largest dollar increase. The cost of sophisticated military hardware has been climbing so fast that every year the Pentagon spends more and more money on fewer and fewer items, many of them incapable of operation in battlefield conditions. The M-1 tank, for example, has performed poorly in Army field tests and requires frequent repairs. The Reagan Administration wants to buy 720 in 1984, at a cost of $1.7 billion. The Maverick anti-tank missile has also performed poorly in field tests, often hitting rocks or shrubbery instead of tanks. The budget calls for purchase of 165 Mavericks, at a cost of $45 million.



The militarization of federal R & D

Additional fire may be directed at the account for nuclear weapons, which is scheduled to increase by $7.5 billion, to reach a total of $28 billion, or 10 percent of the DOD budget. The MX missile alone receives $6.6 billion, including $3.3 billion for research and $2.7 billion to pay for the first 27 missiles. The President will decide in March on a basing plan for the MX. The B-1 bomber will receive the next highest amount, $5.2 billion. As a hedge against waning congressional enthusiasm for the B-1, the Air Force wants to sign a contract this spring for all 92 remaining B-1 bombers, forcing the government to pay a costly penalty if the program is subsequently cancelled.

The research budget for the highly accurate Trident II missile, to be deployed aboard submarines, will increase from $369 million to $1.4 billion, and the budget for research on ballistic missile defense will double, to $1.5 billion.

Overall, research and development in DOD will increase by 30 percent, reaching a total of $29 billion, or 65 percent of the total U.S. budget for R & D. Funds for basic research, which are administered by the Defense Advanced Research Projects Agency, will increase by 13 percent, from $769 million to $867 million. The budget for the Very High Speed Integrated Circuits program will be doubled to $125 million, supporting the construction of a pilot production line capable of fabricating digital devices with an internal feature size of 0.5 microns. Research on improved aircraft engines will consume $142 million, research on two new torpedoes will cost $328 million, and research on a new vertical lift aircraft will cost $96 million.

The White House tried to anticipate congressional efforts to chop DOD's budget by promising to pare $55 billion from its projections for the next 5 years. But this is chimerical, as the total reflects only lessened fuel and procurement costs stemming from a surprisingly low rate of inflation, as well as a share of the pay freeze applied to civilians throughout the government. As President Reagan said, the reduction will not "interfere with the production of any weapons systems at all."

—R. JEFFREY SMITH

Energy

"I have expunged the word 'dismantlement' from my vocabulary," said Donald Hodel, speaking at his first budget briefing as secretary of a department the Administration had planned to dismantle this year—the Department of Energy (DOE). He prefers the term "reorganization." Even using the gentler word, Hodel was unable to give any description of the nature or timing of legislation that may be proposed for doing away with the agency.

Budget documents for 1984, unlike last year's, make no mention of DOE's demise. The department will continue on its present course, cutting back solar and conservation projects and spending more on weapons, nuclear power, and high-tech research and development. Staff reductions are to be made by attrition.

Although DOE's budget drops 7 percent between 1983 and 1984, the Administration would like to increase spending on nuclear weapons by $1 billion. According to budget briefers, this will pay for the startup of the "L" reactor at Savannah River, Georgia, to produce weapons material for the strategic defense buildup; restart of the PUREX

chemical processing plant at Richland, Washington; and production of a new atomic artillery shell, new air bombs, missile warheads, and a new Trident warhead. In order to increase spending in this area while coming up with a total request lower than last year's ($11.9 rather than $12.8 billion), other things were sacrificed.

The largest single cutback is in the strategic petroleum reserve. Funding drops from $2.3 billion to $741 million, reflecting a slowdown in the fill rate. The relaxed world oil situation makes this acceptable, Hodel says. Still, it must be negotiated with Congress.

Another $520 million is to be lost by cutting research and development. The big losers are fossil energy, conservation, solar, and renewable energy programs. For example, DOE notes, "Activities in the coal program will be conducted principally at the bench and laboratory scale level." There will be no more demonstration plants. The largest reduction comes by ending $230 million in conservation grants to state and local agencies. All categories of solar research are slashed or zeroed out, except for work on photovoltaics, which is cut by slightly more than one third, and solar thermal, which is cut in half. Ocean thermal and low-head hydropower research are ended. Wind and geothermal projects are cut severely.

These areas were reduced by greater amounts in the proposed 1983 budget, but Congressional backers of solar and conservation, like Representative Richard Ottinger (D–NY), are not impressed. Ottinger released his own budget analysis, the first salvo in what is likely to be a rerun of last year's debate, with the heading: "DOE 1984 budget proposal would turn it into the department of nuclear weapons."

The growth in the R & D budget is in basic science, nuclear fission, and fusion research. Support for basic science grows considerably, from $283 to $350 million, including $12 million for improving facilities, split evenly between the university and national laboratories supported by DOE. The rest goes to such projects as the Synchrotron Light Source at Brookhaven, the 1.5 Mev electron microscope at Lawrence Berkeley, and materials research.

DOE also seeks a $69 million increase for high energy physics and a $23 million boost for nuclear physics. These funds will pay for the first full year's operation of the superconducting synchrotron at Fermilab and continued work on the Tevatron I and II projects. Construction will begin on the Stanford Linear Collider, which will use an original and untested technique to search for fundamental bits of matter, such as the Z^0 particle. The growth in nuclear physics will finance new experiments at accelerators at the DOE laboratories, Stanford, Yale, and the University of Washington.

DOE continues support for the Clinch River breeder at $270 million, with a condition. The continuing resolution passed in December stipulates that DOE may subsidize this demonstration project only if it comes up with a scheme for increasing private support. Hodel says that if a new funding scheme cannot be arranged by March, DOE may have to cut its support. The same rule that limits spending on the breeder affects other projects in high energy physics carried in the same appropriations bill. DOE is trying to devise a plan, with the concurrence of the appropriations committees, allowing funds to be shifted out of "overfunded programs" into basic physics.

Finally, this budget provides for the startup of the federal nuclear waste disposal program, which was signed into law on 7 January. DOE's share will be $306 million, and the utilities will contribute $448 million beginning in April.

—ELIOT MARSHALL

Space

In July last year, President Reagan's new space policy promised a renewed commitment to a strong aeronautics and space program. At first glance the National Aeronautics and Space Administration's new budget proposal does not bear that out: its $7.1 billion request is only 4 percent higher than the current plan for fiscal 1983, and barely keeps abreast of inflation. Moreover, NASA could not sell the White House on its top priority this year, a fifth space shuttle orbiter. Nonetheless, the decline in shuttle development costs has left room for a number of new initiatives in space science and applications, and the agency in fact seems to show more forward momentum than it has for years.

Even the veto of the fifth orbiter is not absolute. When NASA first broached the subject last year, the Office of Management and Budget warned that it would not expand the shuttle fleet just to cope with increasing commercial traffic. That was a job for the private sector. And indeed, NASA Administrator James M. Beggs now admits that Europe's Ariane launcher will siphon off much of that increase in any case. The agency then tried stressing the fifth orbiter's role in national security, as a way of guaranteeing the agency's launch commitments to the Pentagon should one of the first four orbiters be lost or damaged in an accident. That did not work either, but OMB did agree to a deal. This year, while contractors' production lines are still open for the fourth orbiter, NASA will be allowed to buy a set of "spare parts" that just happen to include all the shuttle's major structural components. If NASA should suddenly discover next year that the parts could be assembled quite cheaply—well, that will be another budget.

Meanwhile, NASA continues its trend of spending more on shuttle operations and less on development. Highlights of the 9 flights in fiscal 1984 will include the attempted repair of the Solar Maximum Mission and the second flight of the European-built Spacelab. Development of the controversial Centaur upper stage will continue as planned (*Science*, 10 September 1982, p. 1012).

There are four major new initiatives this year. The Venus Radar Mapper, the first new start in planetary science since 1977, comes a year after the administration threatened to cancel the planetary program unless something could be done about escalating mission costs. The mapper is the product of heroic cost-cutting efforts (*Science*, 12 November 1982, p. 665), and its inclusion in this year's budget was considered by many in the scientific community as a test of the administration's good faith.

Meanwhile, the Tethered Satellite System will be a joint U.S./Italian effort to lower a retrievable upper atmosphere probe from the shuttle on a 100 kilometer line. The Advanced Communications Technology Satellite will be a joint venture with industry. The long-awaited Numerical Aerodynamic Simulation project will allow aircraft designers to do much of their development on a new system of advanced computers, thereby cutting down on expensive wind tunnel and flight testing.

The Explorer satellite program will also be enhanced, with new starts on the Cosmic Background, X-ray Timing, and Extreme Ultraviolet Explorers. Phase B studies will start on the Advanced X-ray Astronomy Facility, a top priority among astronomers.

The space station, Beggs' own highest priority for the coming decade, does not appear as a line item in the new budget. However, the total spent on design and mission definition studies in the various NASA divisions will rise from some $33 million in fiscal 1983 to $43 million in fiscal 1984.—M. MITCHELL WALDROP