

US boosts basic science, but overall R & D drops

Defence, energy and space head for large increases in basic research funding in President Carter's 1980 budget.

David Dickson reports

"THE budget for fiscal year 1980 is lean and austere". The words that President Carter chose to open his budget message to Congress on Monday apply directly to proposed funding levels for research and development—but in a time of financial conservatism basic science has done relatively well, being scheduled for a real growth of 20% above the expected level of inflation.

The overall size of the R&D budget reflects the President's choice of reduced public spending as a major weapon to fight inflation. Thus total R & D obligations are planned to rise only 4.1% to \$30.6 billion, the smallest increase in the R & D budget since the Nixon era.

Given this general constraint, the main issue that has occupied government agencies in preparing their budget requests has been to decide how the money should be distributed along

the R & D spectrum. And it seems to have been generally accepted that optimal long-term results can be achieved by shifting support for 'development' projects back to the basic research end (a trend initiated last year, though dealt with unsympathetically by Congress).

The net result of this is a projected increase of 9% in the funds available for the support of basic science, about 2% above the expected level of inflation, with increases of twice this amount for some agencies, such as the departments of energy and defence.

Those projects to have suffered are the ones which the administration feels have reached a stage at which they could be taken up in other ways—if at all. There will, for example, be a reduction in support for coal conversion technologies and hydroelectric and solar heating R & D, although more

money for basic research in solar energy.

One agency to have done well in the budget review is the Department of Defense, which accounts for about 45% of federal support for R & D. The department is scheduled to receive an increase of 7% in its total R & D funds to \$13.8 billion, and within this an increase in basic research of 17% from \$373 to \$436 million.

The department's research money, whose growth reflects a general growth in defence spending that characterises the whole budget, will be used to support projects such as the MX intercontinental ballistic missile and new research on very high speed integrated circuits. There will also be more defence money spent in university research departments.

An even greater increase—18.8%—is scheduled for basic research supported by the National Aeronautics and Space Administration. However, here the figure is slightly deceptive, since much of this will be required to

Space scientists disappointed: The budget for the National Aeronautics and Space Administration does not contain any major new mission starts. It comes as a disappointment to space scientists, who had hoped that at least some of their proposals might have escaped the cuts. Top of the list of projects which will not receive funding are plans to send an orbiting imaging radar to Venus—particularly important in view of the failure of some of the equipment on board the current Pioneer missions—and plans for a gamma ray observatory.

Other casualties include a national oceanographic satellite system, and plans to place a block order for a number of multi-mission satellites (mms). These will now be ordered individually, which could increase the costs of proposed British mms. Although these and other new projects were included in a \$4.9 billion request which NASA put to the Office of Management and Budget, they were all discounted to ensure that general budget constraints and increased shuttle costs did not cut into existing programmes.

10% more for university research: The total federal R&D outlays to universities and colleges is planned to increase by 10% in 1980, considerably above the overall increase in R&D funding. The largest increase will be in research funds from the Department of Defense, scheduled to grow on campuses by 13% to a total of \$359 million. Other major increases are planned for DHEW (11.9%) and the National Science Foundation (12.1%). In the proposed budget for the National Institutes of Health, funds for research projects awarded on a competitive basis are planned to fall from \$494 million to \$279 million, while non-competitive funds are scheduled to increase by approximately the same amount.

Boost for nuclear physics: After several years of relative neglect, there is some good news for nuclear physics, and government officials say that the increased support should continue "for some years to come". Funds have been

made available in the Department of Energy's budget for a major heavy-ion facility at Michigan State University; an energy doubling electron beam recirculator at the Bates Linear Accelerator of the Massachusetts Institute of Technology; and an experiment staging area at the Anderson Meson Facility of the Los Alamos Scientific Laboratory. The expansion in nuclear physics has been partly made possible by the near completion of the Cornell storage ring, funded by the National Science Foundation. Construction of the Michigan facility is to be transferred from the NSF to the Department of Energy, although the foundation will continue to cover research costs.

Research on environmental hazards: As a reflection of the growing importance of scientific findings in the control and regulations of environmental hazards, the administration is proposing to make a major increase in the research budget of the Environmental Protection Agency. Obligations for R&D will increase from \$400 million to \$436 million, with a 16% increase in longer term research.

NSF instrumentation grants up 50%: The National Science Foundation is planning a 50% increase in its allocation of funds for research instrumentation and equipment, a source of growing concern in recent years and one of the areas in which universities and research institutions have been hit hardest by inflation. Announcing this increase, NSF director Dr Richard C. Atkinson said: "There is no question that we have been lagging behind in equipping our laboratories". In many Western European countries, the proportion of the research budget devoted to instrumentation was almost three times as high as in the US. The increase will raise the funds for instrumentation from \$54.4 million in the current fiscal year to \$81.6 million. The extra money is contained in a 12.4% increase in NSF funds for research in physiology and cellular and molecular biology, and a 15.4% increase for environmental biology.



Carter: fighting inflation with spending cuts support projects that have already been initiated—such as the Jupiter Galileo mission—but are now moving into an expensive phase.

Another burden on NASA's budget is the increased costs of the Space Shuttle, for which the agency is already having to approach Congress for an extra \$185 million as a result of delays caused by engine test failures. The net result is that although there will be a 20% increase in NASA's sup-

port for space science and applications, there is no provision for any new programmes.

At the Department of Energy, which is having to bear much of the cutback in federal spending, there is said to have been considerable dispute over which end of the R & D spectrum should bear the brunt of the cuts. In the end demonstration projects were the ones to suffer. Within an overall R & D budget that will remain virtually constant in 1980 at \$4.6 billion, there will be a 17% increase in support for basic science, sufficient to ensure continued support of high energy physics at current levels, as well as a boost for nuclear physics and solar energy research.

As far as the National Science Foundation is concerned, the administration has asked for a relatively modest overall increase in funding of 8.4%, bringing the agency's budget to \$11.006 billion. Basic research is scheduled for an 11.8% increase, with large increases in chemistry, the earth sciences and environmental biology, and particular emphasis on upgrading equipment. Unlike previous years, no

great increase is suggested for NSF's applied science activities. The budget for "problem-focused research applications" is to fall by 11.6%.

Projected figures for the Department of Health, Education and Welfare are a somewhat unreliable guide to what will actually be spent, since traditionally they are raised substantially by Congress. With this in mind, the administration has requested a budget for the National Institutes of Health of \$1.4 billion, less than 1% higher than the current year.

Commenting on the overall budget figures, Dr Frank Press, Director of the Office of Science and Technology, said that "in general we feel that R & D has received good treatment. And when you add the basic research initiatives, we feel this is a very strong research budget."

Dr Press said that President Carter's initiative in increasing funds for basic research had become a model for other countries spurring similar increases, for example, in France, Britain, and West Germany. "It is nice to see that the US research dollar has leverage of this kind", Dr Press said. □

Sun shines on solar energy: Research on solar energy, a proposed cut in which last year brought a storm of protest from the environmental movement, is planned to receive an increase in funding of 24%. Longer term solar-related technology development and applied research will grow by 40% in 1980. In particular, the Department of Energy's budget request includes funds for the construction of a new 300-acre research facility at the Solar Energy Research Institute in Golden, Colorado.

Administration tries again on competitive agricultural research grants: The US Department of Agriculture is once more proposing a major increase in funding for competitive research grants, a proposal which has come under heavy fire in Congress for the last two years, during which such increase have been considerably cut back. In its proposed 1980 budget, the President has asked for a total of \$30 million, two-thirds of this for basic research on the efficiency of food production, and the rest for the improvement of human nutrition. One major initiative in agricultural research is a major inter-agency effort to assess the value of space remote sensing data in obtaining early estimates of the effect of natural disasters on crop conditions, and improving world-wide agricultural production forecasting. Total funding for these projects, which will involve the departments of Agriculture, Commerce and Interior, as well as NASA and AID, is estimated to increase from \$18 million in 1979 to \$29 million in 1980.

No funds for Clinch River or nuclear reprocessing: The Administration is sticking to its previous position on two hot political issues in the nuclear field by requesting no funds for either continuation of the liquid metal fast breeder reactor at Clinch River in Tennessee or for nuclear fuel reprocessing. Although \$504 million is being requested for LMFBR research and development, indicating a continued commitment to the fast breeder, the administration repeats its position that the proposed

Clinch River demonstration project "is both premature and uneconomical".

Research on nuclear fuel reprocessing is proposed for termination in 1980, in line with President Carter's non-proliferation policy. In its place, emphasis will be placed on "once through" nuclear fuel cycle that will be used in conjunction with improved and more efficient light water nuclear power plants. Research funds for the Department of Energy provide additional support for the examination of alternative geological sites for a deep nuclear waste depository, and for developing new waste forms that could be used for the disposal of high level defense wastes. President Carter has also announced that he plans to introduce a "spent nuclear fuel Act" which will authorise the department to accept spent nuclear fuel for storage and disposal in return for a one-time charge.

Major effort in microelectronics: Three federal agencies—the Department of Defense, the National Science Foundation, and the National Bureau of Standards—are proposing to carry out complementary efforts in the field of microelectronics and submicron science and technology in 1980, involving a total budget of \$41 million. At the NSF, efforts will be concentrated on fundamental research into the properties of microstructures, aimed at supporting a number of applications in electronics. The foundation will also provide training for scientists in this field, where a shortage of graduates is claimed by some to be holding back the efforts of private industry. The Defense Department is planning a major expansion of its research into very high speed integrated circuits, despite a major split in the defence industry over whether or not the technology already exists to meet the department's needs.

President halts child research building: Permission to construct a \$37 million child health research facility at the National Institutes of Health has been withdrawn. It was considered low priority in a time of budget stringencies.