

economic growth."

With such messages Reagan is making a strong pitch for the project in the final phase of his Presidency. The SSC is one of the major unfinished items of his second term. A concept even more closely identified with Reagan, the Strategic Defense Initiative, was the subject of a pep talk he delivered before a friendly audience of defense contractors and Pentagon

officials on 19 March, just four days before the fifth anniversary of his television talk launching the program. His promotions of such substantive projects as the SSC and SDI are "designed to show that the President is still fighting for his agenda," says a senior White House official. "He considers these among his most important unfinished business."

—IRWIN GOODWIN

NSF SURVEYS INDICATE SLOWER PACE FOR R&D, EVEN IN MILITARY WORK

In these uncertain economic times, the undercurrent of lab talk and conference gossip is about the availability of money for R&D. After Black Monday on Wall Street last October, economists anticipated a slowdown in corporate support of R&D, figuring that businessmen would hunker down and concentrate on products and processes already in the company pipeline. The conventional wisdom among Federal budget watchers was that government-funded R&D, already clobbered by Congress in fiscal 1988, would grow at a reduced rate for the next few years as well. The findings in two recent reports by the National Science Foundation's Science Resources Studies Division suggest that such expectations are self-fulfilling prophecies.

According to NSF, the nation's total spending on R&D is likely to reach about \$132 billion this year, which is 7% more than the estimated \$123 billion spent in 1987. Even so, the 1988 figure represents only a modest 3% increase after adjustment for the expected rate of inflation—the lowest real growth of R&D since 1977. By contrast, the real rate for all R&D expenditures by government, industrial and nonprofit institutional sources in the 1977–82 period had been 4% to 5% per year. Indeed, the increase in spending for R&D ran at 6.8% annually between 1982 and 1985 before receding to 4% in both 1986 and 1987.

NSF reckons that this year all government R&D will add up to \$65 billion, while industry will spend some \$63 billion, universities and colleges another \$2.9 billion, and independent research institutes about \$1.5 billion. About 68% of the country's total R&D money now goes into development work. While the Reagan Administration has sought to curtail nonmilitary applied research and prototype development, on the grounds that these are best left to

commercial firms, it has increased spending for defense R&D, which now accounts for about 70% of all US outlays for R&D.

According to the foundation's study team, the rise in Defense Department expenditures makes up fully 90% of the growth in Federal R&D since 1980. In fiscal 1987, which wound up last 30 September, Pentagon R&D obligations totaled \$40.7 billion, with 91% going to development. A decade earlier, DOD spent only \$11 billion on R&D, 84% of it for development work.

Outside of military circles, basic research is doing fairly well despite constraints on Federal budgets and corporate profits. In the past decade government appropriations for basic science soared by 60% in constant dollars. Spending by companies in the same period grew even faster, by a whopping 90%, following a nine-year period in which industrial outlays for basic research fell at an average annual rate of 2.3%.

The NSF survey shows that private firms expect to raise their spending in 1988 on all in-house R&D by about 3%, allowing for inflation. This rate is down from the first half of the decade, when corporations averaged 5.5% increases. The slowdown of growth in industrial R&D, which began in 1985, seems to confirm that the US economy is shifting gears as well as reacting to a reduction in the 25% tax credit on incremental R&D, which had been in effect since the passage of the Economic Recovery Tax Act in 1983.

Lowering expectations

Although some economists expect the US to enter its eighth consecutive year of business expansion around election day next November, even the most optimistic do not believe that the GNP will grow by more than a paltry 1% this year. This low expectation seems to be shared by management chiefs in 86 firms that do R&D,

including 15 of the top 20 in industrial research. In cautious responses to surveys and interviews conducted by NSF, most stated that their firms will be emphasizing development projects as prudent ways to commercialize on recent research.

It turns out, according to NSF, that the 18 firms in the surveys that had been subject to mergers, takeovers, divestitures and reorganizations in the past four years showed no increases in R&D. More than half of these companies, in fact, cut back on R&D. That should not surprise those physicists and other scientists and technicians at, for instance, the RCA David Sarnoff Research Center, which was acquired by General Electric and then spun off to SRI International, or at the Exxon and AT&T research labs.

As for the proportion of the GNP spent on R&D, the NSF study finds that this has remained virtually unchanged at 2.7% since 1985, after rising steadily from 2.1% of the GNP in 1978. The current percentage is greater than or equal to the rates of all other Western industrialized nations. But when NSF compared non-defense R&D spending with the GNP, it found that in 1983 the proportion for the US went down to 1.8%, where it has stayed ever since. During this same period the fraction of the GNP devoted to R&D increased in Japan, West Germany and France. In terms of actual investments, though, the US spends more on R&D, including basic research, than Japan, West Germany, France and the United Kingdom combined.

The entire US is expected to spend \$15 billion in 1988 on basic research, \$27 billion on applied research and \$90 billion on development. Washington provides nearly two-thirds of the money for basic research; another \$3 billion is spent by corporations, and the rest comes from such nonprofits as the Mitre Corp, Aerospace Corp and SRI International.

R&D outlays vary widely among industries. Although the 1988 estimates indicate a real increase of 10% in the machinery industry, which includes computers and robotics, they also reveal a 3% decrease in the oil industry. Among some other industries, R&D outlays after inflation are expected to increase by 5% in the aircraft industry, by 3% in professional and scientific instruments and by 3% in chemicals and pharmaceuticals. Decreases of 1% are anticipated in the electrical equipment and communications industry and in motor vehicles.

—IRWIN GOODWIN ■