14. GENERAL SCIENCE, SPACE, AND TECHNOLOGY

Table 14–1. FEDERAL RESOURCES IN SUPPORT OF GENERAL SCIENCE, SPACE, AND TECHNOLOGY

(In millions of dollars)

Function 250	1996 Actual	Estimate					
		1997	1998	1999	2000	2001	2002
Spending:							
Discretionary Budget Authority	16,692	16,629	16,439	16,427	16,246	16,235	16,226
Mandatory Outlays:							
Existing law	28	38	38	31	31	31	31
Tax Expenditures:							
Existing law	845	880	1,475	830	790	780	770
Proposed legislation	.....	430	787	540	234	111	41

Technology has become a major engine of economic growth, a significant contributor to our national security, a generator of new knowledge, and a critical tool in protecting our health and environment. Not only has technological innovation accounted for at least half of the Nation's productivity growth in the last 50 years, but the development of such new technologies as computers and jet aircraft has created new industries as well as millions of high-skilled, high-wage jobs.

All too often, though, companies will not make the investments that could benefit all of us down the road—either the risk is too great, or the return to the companies is too small. Thus, by making such investments, the Federal Government plays an indispensable role in science and technology. Federal investments must run the gamut from basic research, to applied research, to technology development—because scientific discovery and technological innovation are so profoundly interwoven.

The budget proposes $16.5 billion in 1998 to conduct science, space, and technology activities through the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the Energy Department's (DOE) general science programs. The Government also seeks to stimulate private investment in these activities through nearly $1 billion to $2 billion a year in tax credits and other preferences for research and development (R&D).

National Aeronautics and Space Administration

The Government created NASA in 1958 as the successor to the National Advisory Committee on Aeronautics, which had supported aeronautical technology since World War I. NASA, for which the budget proposes $12.1 billion in 1998, is the lead Federal agency for R&D in civil space activities, working to expand frontiers in air and space in order to serve America and improve the quality of life on Earth.

NASA pursues this vision through balanced investment in:

Space Science: These programs are designed to enhance our understanding of the creation of the universe, the formation of planets, and the possible existence of life beyond Earth. NASA has enjoyed major successes of late, including its discovery of possible evidence of past life on Mars. Also, NASA's Galileo spacecraft arrived at Jupiter, dropped

a probe into Jupiter's atmosphere, and found evidence of ice, possibly liquid waters, and volcanic activities on Jupiter's moons. NASA is shifting away from large, once-a-decade spacecraft missions and is instead focusing on smaller, cheaper missions that can fly frequently.

Environmental Research: These programs focus on examining Earth's natural and human-induced environmental changes through long-term observation, research, and analysis of Earth's land, oceans, and atmospheric processes. NASA will launch the first in a series of environmental monitoring spacecraft in 1998.

Space Transportation Technology: Working with the private sector, these programs explore technologies that could help produce an ambitious experimental launch vehicle—X–33—which should complete its first test flight by March 1999 and dramatically cut the costs of putting payloads in space.

Human Exploration: These programs focus on establishing a permanent human presence in Earth's orbit by developing and operating the International Space Station. What we learn from the Space Station also will support future decisions on whether to conduct further human space exploration. In 1996, this program supported the successful launch of eight Space Shuttle flights, three missions to the Russian Mir space station, and continued construction of the International Space Station.

NASA has about 21,000 employees at its headquarters and Federal research centers, and it conducts about 90 percent of its work through procurements with the private sector, leading to jobs for another 175,000 people. With a constrained budget, NASA has cut redundant operations, privatized some operations, improved its management processes, and reformed its procurement process.

National Science Foundation

The Government created the NSF in 1950 to support research and education in science and engineering. NSF-supported activities have led to breakthroughs and advances in many areas, including superconducting materials, Doppler radar, the Internet and World Wide Web, medical imaging systems, computer-assisted-design, genetics, polymers, plate tectonics, and global climate change. While NSF represents just three percent of Federal R&D spending, it supports nearly half of the non-medical basic research conducted at academic institutions. NSF also provides 30 percent of Federal support for mathematics and science education.

The budget proposes $3.3 billion in 1998 for NSF, which it would invest in four key program functions:

Research: Support for research projects, comprising 56 percent of NSF's budget, includes individual, small group, and center-based activities.

Education and Training: Education and training activities, accounting for 20 percent of NSF's budget, revolve around efforts to improve teaching and learning in science, mathematics, engineering, and technology at all educational levels.

Facilities: Investments in facilities, representing nearly 20 percent of NSF's budget, include support for large, multi-user facilities for cutting-edge research, such as observatories, supercomputing facilities, and oceanographic research vessels.

Administration: Administration, covering four percent of NSF's budget, includes internal salaries and expenses.

NSF, recognized around the world for its high standards of quality and efficiency, relies on a rigorous, competitive process of merit review to choose which among the 30,000 proposals it receives each year to fund. NSF funds about a third (although it views about 70 percent as deserving support). NSF-supported activities leverage over $1.4 billion a year in cooperative investments from outside sources, including $250 million by some 600 private corporations.

NSF funds support over 25,000 senior scientists, and its research funds support over 50,000 other professionals and graduate and undergraduate students. NSF education programs reach over 120,000 teachers in kindergarten through 12th grade. As evidence of the high quality of science that NSF supports, five of the six U.S. Nobel prize winners

in 1996 received NSF support early in their careers.

Department of Energy General Science Programs

DOE's general science programs, for which the budget proposes just over $1 billion, fund its high-energy and nuclear physics R&D to expand knowledge about the fundamental nature of matter and energy. DOE is responsible for long-range planning for the Federal Government's program in general science, for maintaining a balanced national program between investing in new facilities and supporting researchers, for assuring U.S. leadership in the world, and for coordinating its efforts with NSF—the other leading Federal supporter of these programs.

DOE provides over 90 percent of total Federal support for high-energy physics and 85 percent for nuclear physics. It also supports the premiere scientific facilities in both fields. DOE-supported research in these fields is conducted by 4,100 scientists and students from over 150 universities, 12 national laboratories, and other nations. About 2,000 U.S. users tap DOE's nuclear physics research facilities, and 2,500 U.S. users tap DOE's high-energy physics research facilities. DOE's high-energy and nuclear physics laboratories host about 500 visiting foreign scientists at any given time, and about 250 students a year earn their Ph.D.'s for research supported by these programs.

Scientists supported by DOE's high-energy and nuclear physics programs, or who conducted their research in DOE's laboratories, have been recognized around the world for their contributions to a variety of important fields. Thirty researchers have won Nobel Prizes since 1939 (most recently in 1995), and 49 researchers have won DOE's own highly-prestigious prizes—the Enrico Fermi Awards and the E.O. Lawrence Awards—demonstrating the excellence of DOE's programs.

Tax Incentives

Along with direct spending on R&D, the Federal Government has sought to stimulate private investment in these activities with nearly $1 billion to $2 billion in tax preferences a year. The law provides a 20–percent tax credit for private research and experimentation expenditures above a certain base amount. The credit, which has expired in the past, is due to expire once again on May 31, 1997, but the President's tax plan would extend it for one year—that is, through May 31, 1998. The law also enables companies to deduct, up front, the costs of certain kinds of research and experimentation.