

nomenal growth, diversity, and change in Federal activities in this field.

*Federal research and development activities and their impact*

Prior to World War II, the total Federal research and development program is estimated to have cost annually about 100 million dollars. In fiscal year 1950, total Federal research and development expenditures were about 1.1 billion dollars. In the fiscal year 1963, the total is expected to reach 12.4 billion dollars.

The fundamental reason for this growth in expenditures has been the importance of scientific and technical work to the achievement of major public purposes. Since World War II the national defense effort has rested more and more on the search for new technology. Our military posture has come to depend less on production capacity in being and more on the race for shorter lead times in the development and deployment of new weapons systems and of counter-measures against similar systems in the hands of potential enemies. The Defense Department alone is expected to spend 7.1 billion dollars on research and development in fiscal 1963, and the Atomic Energy Commission another 1.4 billion dollars.

Aside from the national defense, science and technology are of increasing significance to many other Federal programs. The Nation's effort in non-military space exploration—which is virtually entirely a research and development effort—is growing extremely rapidly; the National Aeronautics and Space Administration is expected to spend 2.4 billion dollars in fiscal 1963, and additional sums, related to the national space program will be spent by the Department of Commerce and other agencies. Moreover, scientific and technological efforts are of major significance in agriculture, health, natural resources, and many other Federal programs.

The end of this period of rapid growth is not yet in sight. Public purposes will continue to require larger and larger scientific and technological efforts for as far ahead as we can see.

The increase in Federal expenditures for research and development has had an enormous impact on the Nation's scientific and technical resources. It is not too much to say that the major initiative and responsibility for promoting and financing research and development have in many important areas been shifted from private enterprise (including academic as well as business institutions) to the Federal Government. Prior to World War II, the great bulk of the Nation's research achievements occurred with little support from Federal funds—although there were notable exceptions, such as in the field of agriculture. Today it is estimated by the National Science Foundation that the Federal Budget finances about 65 per cent of the total national expenditure for research and development. Moreover, the Federal share is rising.

Federal financing, however, does not necessarily imply Federal operation. As the Federal research and development effort has risen, there has been a steady reduction in the proportion conducted through direct Federal operations. Today about 80 per cent of Federal expenditures for research and development are made through non-Federal institutions. Furthermore, while a major finding of this report is that the Government's capabilities for direct operations in research and development need to be substantially strengthened, there is no doubt