

*Applications of R&D in the Civil Sector:
The Opportunity Provided by the Federal
Grant and Cooperative Agreement Act of
1977*

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**Applications of R&D
in the Civil Sector**

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and Cooperative Agreement Act of 1977**

 CONGRESS OF
THE UNITED STATES
Office of Technology Assessment
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FOREWORD

The Federal Government now spends about \$28 billion per year on research and development (R&D) activities and facilities in the United States. With another \$20 billion per year from the private sector, the total national investment in R&D approaches \$50 billion annually.

Large though this total is, it portrays only a small portion of the overall impact of R&D on the economy and the quality of life in our society. Research and development is the engine that drives the currents of change in our civilization. From R&D stem the inventions, techniques, and processes that propel innovations through our economic and social systems. Moreover, it has been estimated that, on the average, each person engaged in R&D eventually generates 6 to 10 other jobs throughout the economy. As a consequence, the \$48 billion annual national investment in R&D has a massive multiplier effect on our entire socioeconomic system.

Therefore, it behooves Congress to consider this investment carefully and to pay close attention to the ways in which it is allocated and used, as well as to the framework of laws, regulations, incentives, and constraints whereby the fruits of scientific research and development are converted into operational results.

Furthermore, R&D and the process of innovation help to determine the options and establish many of the parameters whereby specific technologies can be assessed for their potential impacts on society. In assessing a particular technology, the Office of Technology Assessment (OTA) compares its advantages and disadvantages with those of alternative technologies and assesses its impact on economic, social, environmental, and political factors within a perspective of probable future human needs, capabilities, and values.

To carry out its assessments effectively, OTA needs a thorough understanding of the Nation's R&D effort and of the process whereby R&D results are converted into useful innovations. While helping to strengthen and integrate OTA's overall assessment activities, such understanding also enables OTA to assist the Congress in better shaping the national investment in R&D by developing more soundly based R&D policies and priorities. Thus, through such understanding, OTA can more effectively fulfill its mandate to give Congress early indication of the impacts of technological change.

In response to these needs and the urging of a number of congressional committees and individual Members, the OTA Board authorized a Program of R&D Policies and Priorities, which became operational in May 1976.

Recognizing that such an assessment cannot be carried out effectively through a single, comprehensive project which attempts to address all facets of the problem, the Program was designed to proceed through a series of manageable, interrelated studies which will help to build an understanding of how to maximize the beneficial impacts of our total R&D enterprise.

The Program has operated with the guidance of three interrelated Advisory Panels made up of distinguished leaders of science, technology, industry, labor, the professions, and the consumer, environmental, and public interest movements.

The Panel on the Health of the Scientific and Technical Enterprise, chaired by Dr. Harvey Brooks, Benjamin Peirce Professor of Technology and Public Policy at Harvard University, has been concerned with ways we can maintain and enhance the health and vitality of the entire scientific and technical enterprise.

The Panel on the Applications of Science and Technology, chaired by Dr. Lewis M. Branscomb, Vice President and Chief Scientist of the IBM Corporation, has been concerned with how we can more effectively apply science and technology to ameliorate the processes of innovation, augment America's international competitive position, solve national and social problems, and enhance the quality of life.

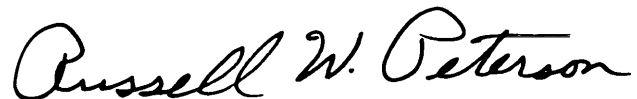
The Panel on Decisionmaking on R&D Policies and Priorities, chaired by Dr. Gilbert F. White, Director of the Institute of Behavioral Science at the University of Colorado, has been concerned with how we improve the decisionmaking processes whereby the Nation establishes policies and priorities for R&D.

During coming months, OTA will issue a series of reports on the Program all intended to inform and aid Congress in dealing with the complex issues of R&D policies and priorities.

The first of these reports is the Applications of R&D in the Civil Sector: The Opportunity Provided by the Federal Grant and Cooperative Agreement Act of 1977. This Act, which was signed into law February 3, 1978, is a major step forward in bringing greater order to the diversity of Federal assistance programs. The framework established by the Act has important implications for federally funded R&D and for the Federal impact on innovation involving private industry, the universities and nonprofit organizations, and State and local governments.

Over the next 2 years, the Office of Management and Budget (OMB) will be engaged in a major study of Federal assistance mandated by the Act. Through their oversight function, interested congressional committees have a key role to play in assuring the effective implementation of this Act.

America's scientific and technical enterprise is a powerful instrument with enormous potential for national progress. How effectively this Act is implemented will be an important factor in determining how fully we tap that potential. It is hoped this report will aid Congress in shaping the effort.

A handwritten signature in black ink, reading "Russell W. Peterson". The signature is fluid and cursive, with the first name "Russell" being the most prominent part.

RUSSELL W. PETERSON
Director
Office of Technology Assessment

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President
RAND Corporation

● During 1977 Adam Yarmolinsky served as Cochairman of the Advisory Panel but resigned as of November 18, 1977, to become Counsel for the Arms Control and Disarmament Agency.

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NOTE: While the Applications of Science and Technology Advisory Panel (listed on previous page) served as the principal advisory group for this report, the Decision-making on R&D Policies and Priorities Advisory Panel also provided advice, critique, and assistance during the project for which OTA is deeply grateful. Although these advisory panels recommended release of the report, OTA assumes full responsibility for the report and the accuracy of its contents.

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Federal efforts to foster technological change in the civil sector through the support of R&D have met with only limited success. In contrast, the Federal Government has been very successful in bringing about technological change in areas such as national security and space exploration, where it is the end user of the products of R&D. Bringing about technological change in the civil sector, however, requires that those non-Federal parties who produce, deliver, and use goods and services accept risk and commit resources. Consequently, the Federal Government's R&D role in the civil sector should differ in fundamental ways from its role in areas where it is the end user of the products of R&D.

Approximately one-third of the Federal budget is disbursed through procurement or assistance transactions between the Federal Government and non-Federal parties. As an initial step toward eliminating confusion over appropriate Federal and non-Federal roles and responsibilities in this major area of Federal spending, the Federal Grant and Cooperative Agreement Act of 1977:

- Requires that assistance relationships be distinguished as a class from procurement relationships;
- Establishes uniform, Government-wide criteria for the use of contracts, grants, and cooperative agreements; and
- Mandates a comprehensive, 2-year study of Federal assistance to be conducted by 'the Office of Management and Budget (OMB).

This report shows how the requirements of the Act provide an opportunity to address in a comprehensive, Government-wide manner the appropriate Federal and non-Federal roles in cooperative efforts to foster technological change in the civil sector. Chapters 11 and 111 show how the assistance perspective and the framework of Federal/non-Federal relationships established by the Act could be used to incorporate into Federal

R&D management the considerations that guide the actions of non-Federal users of the products of that R&D.

Chapter IV shows how this framework of relationships could facilitate congressional oversight of Federal efforts to foster technological innovation through revealing patterns of management practices that determine effectiveness.

Topics of particular interest included in the report are:

- Issues important to consider in the OMB Study (pp. 22-24) ;
- The issue of accountability and its relationship to effectiveness in stimulating technological change (p. 27);
- Background necessary for understanding the full significance of distinguishing assistance relationships as a class from procurement relationships (pp. 7-13);
- The issue of balancing public benefits and private gain in assistance relationships with commercial firms, and the role of openly competitive assistance awards (pp. 13-15);
- The characterization of Federal/non-Federal relationships reflected by the alternative legal instruments of grants, contracts, and cooperative agreements (pp. 19-20);
- The "joint business venture" character of the cooperative agreement and issues such as costsharing and patent rights associated with its use (pp. 20-22);
- Key questions with brief discussion to assist the Congress in overseeing Federal efforts to foster technological change (pp. 27-29); and
- A hypothetical scenario, dealing with innovation to meet a local government problem, to illustrate the approach to civil sector problems from an assistance perspective (appendix B).