The Role of Demonstrations in Federal R&D Policy

July 1978

NTIS order #PB-284387

Library of Congress Catalog Card Number 78-600070

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 Stock No. 052-003-00557-3

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 system. 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 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 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 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 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 second of these reports is *The Role of Demonstrations in Federal R&D Policies*. Demonstration projects are a significant instrument to aid in the formulation and implementation of national policy. More than $1 billion a year of Federal funds flow into demonstration projects; however, the effectiveness of demonstration projects to date has fallen far short of their potential.

This report analyzes the Nation's experience with demonstration projects to provide Congress with a perspective and a set of guidelines for evaluating and shaping proposed demonstrations. It is hoped this report will aid Congress in its authorization, appropriation, and oversight functions in: (1) determining when it is desirable to undertake demonstrations; (2) shaping legislative provisions to increase the likelihood of successful demonstrations; and (3) carrying out effective evaluation of demonstrations which have already been undertaken.

RUSSELL W. PETERSON
Director
Office of Technology Assessment

OTA R&D Policies and Priorities Program Staff

Eltis Mottur, Assistant Director, OTA and *Program* Manager
John H. Young, Project Director
Judith Angerman
Dorothy S. Poole

Contractors

The body of this report was prepared by:

Thomas K. Glennan, Jr.
William F. Hederman
Leland L. Johnson
Richard A. Rettig
of the RAND Corporation

OTA Publishing Staff

John C. Holmes, Publishing Officer
Kathie S. Boss
Joanne Heming

Program on R&D Policies and Priorities Steering Committee

Russell W. Peterson
Director
Office of Technology Assessment

Jerome B. Wiesner
Chairman
Technology Assessment Advisory Council

Lewis M. Branscomb
Chairman
Panel on the Applications of Science and Technology

Harvey Brooks
Chairman
Panel on Health Of the Scientific and Technical Enterprise

Gilbert F. White
Chairman
Panel on Decision making on R&D Policies and Priorities

Ellis Mottur
Ex Officio

Application of Science and Technology Advisory Panel

Lewis M. Branscomb, *Chairman*
Vice President and Chief Scientist, IBM Corporation

Preston T. Bankston
Deputy Director, Office of Science and Technology
Mississippi Fuel and Energy Management Commission

Barry R. Bloom
President, Central Research
Pfizer, Inc.

Irving Bluestone
Vice President, Director
United Auto Workers
General Motors Division

Edward E. David, Jr.
President
EXXON Research and Engineering Company

Charles J. Hitch
President
Resources for the Future, Inc.

C. Lester Hogan
President and Chief Executive Officer
Fairchild Camera and Instrument Corporation

Alice Tepper Marlin
Executive Director
Council on Economic Priorities

Claire Nader
Independent Consultant

Arthur S. Obermayer
President
MOLECULON Research Corporation

Robert M. Solow
Institute Professor
Massachusetts Institute of Technology

Philip H. Trezise
Senior Fellow
The Brookings Institute

Herbert F. York
Professor of Physics
University of California at San Diego