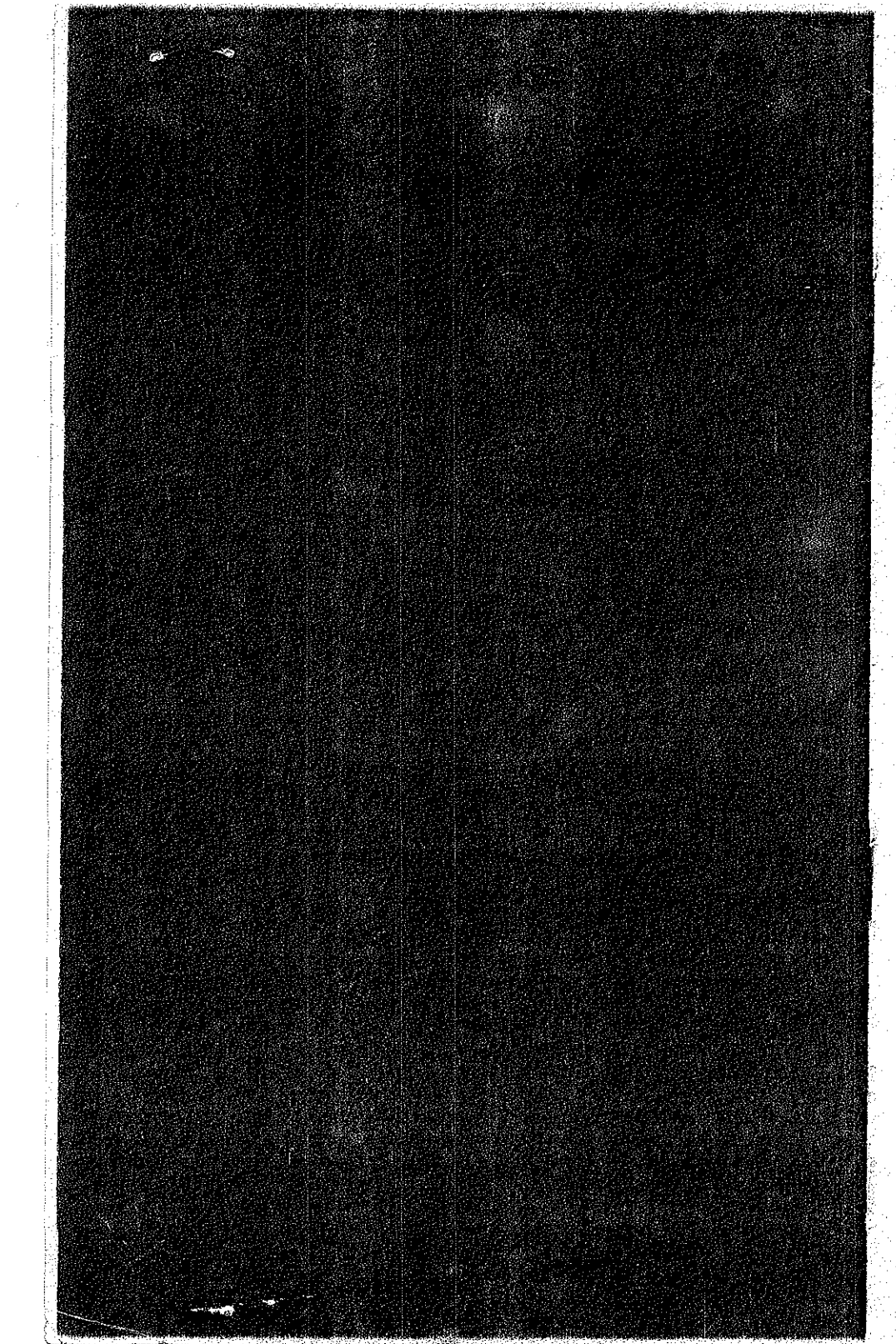

96TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 96-1199

Mowry

STEVENSON TECHNOLOGY INNOVATION ACT OF 1980

JULY 29, 1980.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. FUQUA, from the Committee on Science and Technology, submitted the following

REPORT

[To accompany S. 1250]

[Including the cost estimate of the Congressional Budget Office]

The Committee on Science and Technology, to which was referred the bill, S. 1250, to promote United States technological innovation for the achievement of national economic, environmental, and social goals, and for other purposes, having considered the same, reports favorably thereon with amendments and recommends that the bill do pass.

The full text of the amendments is shown in this report as part of the sectional analysis of the bill. A brief summary of the effect of the amendments is given in the first section of this report.

PURPOSE OF THE BILL

The purpose of the bill is to improve the economic, environmental, and social well-being of the United States by—(1) establishing organizations in the executive branch to study and stimulate technology, (2) promoting technology development through the establishment of centers for industrial technology, (3) stimulating improved utilization of federally funded technology developments by State and local governments and the private sector, (4) providing encouragement for the development of technology through the recognition of individuals and companies which have made outstanding contributions in technology, and (5) encouraging the exchange of scientific and technical personnel among academia, industry, and Federal laboratories.

The bill authorizes appropriations for fiscal years 1981 through 1985 in the amounts of 24, 49, 64, 74, and 74 million dollars, respectively.

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I. SUMMARY

A. Background

Technological innovation is the process by which industry generates and diffuses new and improved products and processes. It is a vital component of economic growth both in a domestic and an international context. The U.S. has traditionally been the leader in innovation. However, the extent of this lead may be diminishing in relation to past U.S. industrial performance and vis-a-vis foreign industrial performance.

In concern over the state of technological innovation, the House Committee on Science and Technology, and specifically its Subcommittee on Science, Research and Technology, has undertaken a program to address these issues. Various hearings, reports, and recommendations have culminated in the Committee's support of S. 1250, the Stevenson Technology Innovation Act of 1980, as amended.

S. 1250, as amended, provides for a multi-faceted approach to improving the environment in which industrial innovation occurs. The bill acts to strengthen the relationships between Government, industry, and academia such that each sector can contribute to the innovation process in a program of shared responsibilities. The resources available in the Federal laboratories are acknowledged and an effort to improve the utilization of this knowledge and expertise is prescribed. Several of President Carter's industrial innovation initiatives are given legislative mandates through this bill.

B. Rationale for the Bill

Overarching thrusts of the bill are (1) to build links between generators of knowledge (universities and Federal laboratories) and users of knowledge (industry and State and local governments); and (2) to build into the Federal Government a positive concern for the welfare of industry. It is the committee's judgment that these two matters have not heretofore received sufficient attention from the Federal Government, and the bill is intended to rectify the situation.

C. Brief Description of the Bill

1. MAIN THRUSTS

The bill, as amended, has five separate thrusts, as follows:

a. Centers for Industrial Technology (Sections 6 and 8)

The bill authorizes the Department of Commerce (DoC) and the National Science Foundation (NSF) to support Centers for Industrial Technology. The Centers would be similar to existing NSF centers that either focus on a specific technology area (e.g., polymer processing) or on training university students to be technological entrepreneurs. The bill leaves fairly broad latitude for center variety. The "generic technology" centers which have been planned by the Department of Commerce would be covered by the bill.

Federal government has not been developed. This lack of a national policy has prevented the institutionalization of the process and reduced the effectiveness of attempts, by many of the Federal laboratories, to provide technical assistance to help solve the problems of the public and the private sector.

2. SRT PROGRAM IN INNOVATION AND PRODUCTIVITY

The Subcommittee on Science, Research, and Technology has been active in legislative areas involving innovation and productivity throughout the 96th Congress. This interest has been manifest in a broad range of activities undertaken by the Subcommittee to study, delineate, and make recommendations concerning innovation. Mr. Brown, Chairman of the Subcommittee, introduced H.R. 4672 as a counterpart to S. 1250. This bill was the principal subject of hearings on university-industry relations held on July 31 and August 1 and 2, 1979. Mr. Brown also has introduced the National Technology Foundation Act on which the Subcommittee plans to hold hearings in the fall of 1980. In addition, the Science Research and Technology Subcommittee has participated in over two dozen hearings sessions on innovation-related topics during this Congress, including the October 31, 1979 hearings on the President's industrial innovation initiatives and hearings on the role of the Federal laboratories in domestic technology transfer held on June 12, 13, and 14, and July 10 and 12, 1979. Many of the subjects covered during these hearings have been included in the version of S. 1250 reported by the committee.

3. SRT HEARINGS PERTINENT TO THE BILL

As noted above, the Science, Research, and Technology Subcommittee held a series of hearings during the 96th Congress which addressed the issue of innovation and the United States economy. The major findings are summarized below.

a. Government and Innovation: University-Industry Relations (July 31; August 1 and 2, 1979)

These hearings on Government and innovation [13] were structured to examine the interaction between the academic community and the industrial sector to provide ideas for improving and facilitating this relationship as a means of increasing American innovation and productivity. The witnesses agreed that a definite innovation problem existed in the United States, especially in the context of the world marketplace, and that improved university-industry relations would enhance innovation. Various examples of successful university-industry interactions were offered to support this conclusion, including work in semiconductors, magnetism, lasers, synthetic fibers, and antibiotics. In the innovation process, universities generally provide the basic research component while the role of the industrial sector generally is in the development, commercialization, and marketing of new goods and services.

[13] Government and Innovation: University-Industry Relations, Hearings Record, Committee on Science and Technology, 96th Congress No. 53, 1979.

In this context, mutual interaction leading to successful innovation requires the transfer of information, expertise, and know-how between the two sectors. However, concern was expressed over the inadequacy of the technology transfer mechanisms between academia and the private sector. The Government was seen as one facilitator of this interaction, given the success of various prior and on-going programs such as the Agricultural Extension Service and the National Advisory Committee for Aeronautics. Specific suggestions—offered at the hearings—for Government activities to encourage university-industry relations included:

A change in fiscal policies to encourage industry to utilize university research;

An increase in Federal funding of basic research;

The provision of incentives for universities to develop and pursue relationships with industry (for example, a program of planning grants tied to that goal; matching grants); and

The provision of direct Federal support to universities to strengthen dissemination of research results.

b. The Role of the Federal Laboratories in Domestic Technology Transfer (June 12, 13, 14; July 10 and 12, 1979)

The Federal Government has an extensive system of Federal laboratories within which resides a wealth of scientific and technical knowledge and expertise. However, there is a general belief that the potential for using these resources has not been fully tapped. These hearings were held to identify the resources available in the Federal laboratories; to develop an understanding of what constraints there are to using these resources; and to determine how this knowledge and expertise can be utilized in other sectors, including industry and State and local governments.

The hearings [14] pointed to the lack of a national policy concerning technology transfer in the Federal Government. This has, in part, prevented the institutionalization of the transfer process and thus reduced the effectiveness of any attempt to provide technical assistance and apply technical expertise to the problems of the public and private sectors. The Federal laboratories were developed to assist in meeting the mission requirements of the parent agency. With a few exceptions such as NASA, the technology transfer activity is not an explicit part of the agency's mandate and is secondary to its primary responsibilities. Coupled with this situation are various statutory and budgetary restrictions which limit the interaction of Federal laboratories with private industry and State and local jurisdictions.

In general, the witnesses indicated that the provision of a mandate for the Federal laboratories to undertake technology transfer and technical assistance would be a major step in encouraging commercialization and utilization of the results of federally-funded research and development which would contribute to the growth of the Nation and to the solution of many national problems. Experience has shown that those programs which have been in operation to tap the resources of

[14] The Role of the Federal Laboratories in Domestic Technology Transfer, Hearings Record, Committee on Science and Technology, 96th Congress, No. 77, 1979.

The bulk of the dollars authorized, as noted below, would be authorized for the centers.

b. Office of Industrial Technology (Section 5)

The bill establishes an Office of Industrial Technology in DoC. This would provide a legislative basis for the Office of Productivity, Technology, and Innovation (OPTI) which is being formed in DoC. The Office would undertake policy studies and experiments, and would be in charge of Centers for Industrial Technology established by DoC.

c. Utilization of Federal Technology (Section 11)

The bill declares a policy that Federal technology should be fully used, requires the establishment of Research and Technology Applications Offices in Federal laboratories, and establishes a single Center for Utilizing Federal Technology (CUFT). CUFT is being established by DoC anyway, and the bill would provide a legislative basis for it.

d. National Technology Medal (Section 12)

The bill establishes a National Technology Medal to recognize individuals making outstanding contributions to technology. The President has announced his intention to have such a medal, and this would provide a legislative basis for it, similar to the legislative basis for the National Medal of Science.

e. Personnel Exchanges (Section 13)

The bill requires DoC and NSF to establish a program to foster the exchange of scientific and technical personnel among academia, industry, and government laboratories.

2. OTHER FEATURES

The bill establishes a 16-member National Industrial Technology Board. The Board would provide advice to the Secretary of Commerce about activities of the Office of Industrial Technology and related matters. The Board would replace the existing Commerce Technical Advisory Board.

3. AUTHORIZATIONS (SECTION 14)

The bill authorizes a total of $285 million over five fiscal years (1981–85). No funds are authorized to the National Science Foundation; rather, NSF funds for purposes of the bill would be included in the annual NSF authorization bill.

In addition, the bill provides that one half of one percent of the research and development budget of each agency with a Federal laboratory shall be available for technology utilization efforts in the agency.

The authorizations of the bill are shown in the following table.

[In millions of dollars; fiscal years]

	1981	1982	1983	1984	1985	Total
Purpose:						
Centers	19.0	40	50	60	60	229
Other	5.0	9	14	14	14	56
General	(3.0)	(5)	(10)	(10)	(10)	
CUFT	(1.2)	(2)	(2)	(2)	(2)	
Personnel	(.8)	(2)	(2)	(2)	(2)	
Total	24.0	49	64	74	74	285

D. EFFECT OF THE COMMITTEE AMENDMENTS

The bill, as passed by the Senate, included the Centers for Industrial Technology and the Office of Industrial Technology noted above. The Committee amendments make no substantive deletions from the Senate-passed version, but add material on the Utilization of Federal Technology, the National Technology Medal, and Personnel Exchanges, as noted below. The Committee amendments also add a role for the National Science Foundation, as shown below.

The Committee amendments also perfect subsection 6(e) regarding the disposition of rights to inventions made in Centers for Industrial Technology by explicitly permitting inventor compensation and appeal of certain administrative decisions.

1. Utilization of Federal Technology.
   - (a) All of Section 11
   - (b) The new material in Finding (3), in part
   - (c) The new material in Finding (8), and all of Findings (9) and (10)
   - (d) Item (3) of the Purpose (Section 3)
   - (e) Item (7) of the Definitions (Section 4)
   - (f) Increases in authorizations of $1.2 million in fiscal year 1981 and $2 million in each of fiscal years 1982–5
2. National Technology Medal.
   - (a) All of Section 12
   - (b) Finding (11)
   - (c) Item (4) of the Purpose (Section 3)
3. Personnel Exchanges.
   - (a) All of Section 13
   - (b) The new material in Finding (3), in part
   - (c) Item (5) of the Purpose (Section 3)
   - (d) Increases in authorizations of $0.8 million in fiscal year 1981 and $2 million in each of fiscal years 1982–5
4. Role for the National Science Foundation.

NSF had no role in the Senate-passed version, except to coordinate, as specified in Section 9. The bill as reported by the committee gives NSF a role in supporting centers for industrial technology and in supporting personnel exchanges. To accomplish this:

- (a) Section 8 has been added
- (b) The term "supporting agency" has been defined in item (8) of the definitions (Section 4) and has replaced "Director" or "Secretary" in several places (the latter refer to DoC officials, while "supporting agency" would refer to either DoC or NSF, as appropriate)
- (c) NSF has been written into Section 13 for sponsoring personnel exchanges
- (d) Subsection 14(d) has been added regarding NSF authorization

the Federal establishment, including the Federal Laboratory Consortium for Technology Transfer, have been successful in extending the benefits of the Federal R&D endeavor beyond its original mission.

c. Joint Hearings on the President's Industrial Innovation Initiatives

Joint hearings on President Carter's industrial innovation initiatives were held on October 31, 1979 by the Senate Committee on Commerce, Science, and Transportation, the Senate Select Committee on Small Business, the House Committee on Science and Technology, and the House Committee on Small Business. The participants agreed that innovation can provide an important mechanism to meet many of the Nation's problems, including inflation, energy shortages, and declining productivity and economic growth. As former Secretary of Commerce Juanita Kreps testified, "innovation underlies our ability to promote the health, welfare, well-being, and prosperity of the American people." [15] However, it was noted that the innovation leadership of the United States can no longer be taken for granted, as various technological and economic indicators point to decreased levels of innovation and productivity.

The testimony indicated a widespread belief that it is now incumbent on the Government to assess policies which affect the innovation process and to develop new options for improving the environment in which innovation takes place. As a basis for taking such action, the President initiated the Domestic Policy Review (DPR) on industrial innovation which led to the recommendations described in his message of October 31, 1979. The DPR, according to Jordan Baruch, used as a major premise the idea that the Federal Government ". . . impacts on the private sector where industrial innovation takes place in two ways: it can make available by one route or another the resources that a firm needs so that it will be able to innovate and it can make available incentives so that a firm will decide to innovate." [16]

The President's proposals were generally received as a first step in addressing the innovation problem. However, various concerns were expressed over activities and issues which were perceived as having been omitted from the President's initiatives. Such issues included tax policy, small business set-asides, and the modestness of some of the proposals, such as activities proposed to promote commercialization of, and spin-off from, technological developments in the Federal establishment with potential for leading to new industrial processes and products.

4. EXECUTIVE BRANCH BACKGROUND PERTINENT TO S. 1250

a. National Science Foundation

In pursuit of increasing technological innovation and national productivity, the National Science Foundation (NSF) has developed and supported several programs in a multifaceted approach to the issue, portions of which are described here.

As part of an effort to stimulate university-industry interactions leading to innovation, the Foundation has created and financed both generic technology centers and technology innovation centers as part of its university-industry center program. In the first case, the generic technology centers promote institutional arrangements between the two sectors in conducting research and innovation in cross-industry technologies which generally involve large businesses. In this activity, the universities are intended to provide the basic research to be used for industrial application and commercialization. These experimental centers include the Massachusetts Institute of Technology Polymer Processing Center, the North Carolina State University Furniture R&D Applications Institute, and the New England Energy Development Systems Center. The Foundation established this program with the intention of providing incentives to industry to support the centers and eventually make them self-sustaining.

The innovation centers are structured to address the processes of invention and entrepreneurship. The work done in these centers concentrates basically on the development of a business, rather than on the development of a technology for an existing industry as is done at the generic technology centers. The innovation centers, including those at the Massachusetts Institute of Technology, Carnegie Mellon University, and the University of Oregon, are concerned with research, education, demonstration, and operational analysis in the creation of a business and the development of an idea into a product.

The university-industry centers supported by NSF are:

University of Oregon*
Carnegie-Mellon University*
University of Utah*
Massachusetts Institute of Technology*
North Carolina State University
Mitre Corporation
Massachusetts Institute of Technology
Rensselaer Polytechnic Institute
University of Kansas
Kent State University
University of Texas (San Antonio)*
University of Arkansas
Georgia Institute of Technology
Phoenix International Corporation*
University of California (Santa Cruz)*
Ohio State University
University of Massachusetts.

The Foundation also directs a program of personnel exchange under its Science Faculty Professional Development Program. This activity makes awards to individual undergraduate science professors for study in industry, academia, non-profit organizations, or government for the purpose of improving science teaching. Of the 70 awards made in fiscal year 1980, 22 were for non-academic placements (industry, not-for-profits, and government).

Technology transfer is also supported to some extent through NSF's Intergovernmental Science and Public Technology Program (ISPT). The thrust of portions of this activity is to develop and fund mechan-

[15] Industrial Innovation, Hearings Record, Committee on Science and Technology, 96th Congress. No. 69, 1979, p. 13.
[16] Ibid, p. 23.

*Innovative Centers.

isms to help State and local governments apply technology to meet demands for goods and services. Through the application and utilization of technology, it is expected that innovation can foster increased productivity and effectiveness in the State and local sectors. Part of this program includes participation in, and support for, the Federal Laboratory Consortium for Technology Transfer. The consortium is a voluntary association of approximately 200 Federal laboratories which works to identify and delineate problems at the State and local level which are amenable to technical solutions and then provides assistance in addressing these problems. The program manager for the Consortium is located in the Intergovernmental Science and Public Technology Program.

Another effort under NSF's Intergovernmental program is the State Science Engineering, and Technology (SSET) program. Established under congressional direction, SSET is designed to assist the executive and legislative branches of State governments to get and use scientific, engineering, and technical resources in the formulation and management of public policy and in the resolution of policy issues with scientific or technical components.

The Committee notes that funding for these programs has decreased. The fiscal year 1980 budget of $5 million for the ISPT core program was reduced by internal budget cuts to $3.43 million; down from the fiscal year 1979 budget of $5 million. The SSET program in fiscal year 1980 was reduced from its original $3 million to $1.02 million. The fiscal year 1981 proposed funding is $4 million for the core program and $1.6 million for the State Science, Engineering, and Technology activity.

In addition to the NSF programs already described which are activities which would receive a firmer legislative basis from the bill, the Foundation operates a large program of Industry/University Cooperative Research, programs of policy research and analysis on the Socioeconomic Effects of Science and Technology and on Innovation Processes and Their Management, and a Small Business Innovation Research Program. The Committee commends the Foundation for its efforts in innovation and productivity through these other programs and urges their continued support by the Foundation, even though they are not among the subjects of this bill.

b. Department of Commerce

The Department of Commerce has lead agency responsibility for the executive branch initiatives to promote innovation. To administer activities to encourage and increase innovation and productivity, and to oversee implementation of the presidential industrial innovation program, the Office of Productivity, Technology and Innovation (OPTI) was created. This Office includes the National Technical Information Service and the Experimental Technology Incentives Program (which will become the Office of Strategy and Evaluation). Among the major initiatives OPTI will institute—in accordance with the President's innovation message—are Cooperative Generic Technology Centers and the Center for the Utilization of Federal Technology. Both efforts are in the planning stage and are budgeted to start operations in fiscal year 1981.

According to Secretary of Commerce Philip Klutznick, the Cooperative Generic Technology Centers are designed to "develop specific, strategic technologies that can have significant impact on the productivity and competitiveness of a wide range of individual firms and industries." Slated to be a joint Federal/university/industry effort, the centers will undertake research, problem analysis, and technical assistance, and will provide those support services which are necessary to foster the development, improvement, and transfer of generic technologies in selected areas. This activity is expected to allow for the sharing of costs, risks, and ideas in technological areas where it is inappropriate for the private sector to undertake research and development alone, but which are vital to increased innovation and productivity.

The Department of Commerce has issued a notice of proposed procedures for the Cooperative Generic Technology Centers program (Federal Register, v. 45, June 1, 1980). According to this plan, the centers will provide for in-house generic research and development, consulting and technical services, information system services, training, technical evaluation, and strategic planning. Proposals for the establishment of a center will be invited, reviewed, and selected according to compatibility with program goals and budget constraints. These non-profit centers will be located at universities or other private sector organizations. The Department has requested $5.2 million for this program in the fiscal year 1981 budget.

The Commerce Department also is planning for the establishment of a Center for the Utilization of Federal Technology (CUFT). To be located within the National Technical Information Service, this effort will concentrate on the active marketing of Federal technology to the private sector to assist in the commercialization and utilization of the results of federally-funded research and development work. According to Assistant Secretary of Commerce Baruch, in testimony before the House Committee on Science and Technology, Subcommittee on Space Science and Applications (June 11, 1980), CUFT's objectives are:

To stimulate industrial demand for Federal technologies;

To promote networks of interpersonal communication between Federal and industrial personnel through a fellowship program in which industrial personnel will track user needs for, and potential applications of, Federal technology;

To facilitate access to information about industrial needs and technological opportunities through use of computerized reviews of Federal projects; and

To support industrial efforts to adapt Federal work to industrial needs.

The operational planning now being done for CUFT is based upon an active outreach program to work with industry in identifying opportunities for new markets and for the development and commercialization of Federal technology to improve the Nation's competitive position in the international marketplace. The Center also will interface with the Federal laboratory system to promote technology transfer to industry. This effort is scheduled to include workshops, conferences, and seminars. It also is expected that a fellowship program will be instituted to foster cooperation and interaction between the private

sector and the Federal laboratories. The Department has requested $1.2 million for this activity in fiscal year 1981.

Other significant OPTI initiatives include the Productivity Reference Service, which is designed to coordinate and disseminate information, data, and case histories on productivity improvement, and the National Technical Information Service's Information for Innovators, a biweekly information service on current technological developments.

c. Selected Additional Technology Transfer Programs [16]

The Agricultural Extension Service.—The Agricultural Extension Service was created in 1914 to provide technical education and technology transfer to assist in increasing farmer productivity. Fiscal, administrative, and policy support is provided jointly by Federal, State, and local jurisdictions. The program is based upon technology development, demonstration, dissemination, and assistance to the agricultural community through the land grant colleges and an extensive field staff located in most counties. Agents serve as a link between research and the practitioners' needs for technology and information. The Extension Service staff generally works directly with farmers to identify and solve agricultural problems. Private enterprise also participates in application and commercialization of R&D for the farm industry.

The National Aeronautics and Space Administration's Technology Utilization Program.—The Technology Utilization Program at the National Aeronautics and Space Administration has been developed to accelerate and broaden the transfer of aerospace technology to the public and private sectors. Following the legislative mandate to ". . . provide for the widest practical and appropriate dissemination of information concerning its activities and the results thereof," NASA has established a number of mechanisms to accomplish this mission requirement. To promote technology transfer within the Nation's industrial complex, the agency operates a network of Industrial Applications Centers (IACs) which provide information retrieval services and technical assistance to industrial clients. Staffed by scientists, engineers, managers, and computer information specialists experienced in industry liaison, the IACs seek to increase and expedite technology transfer by assisting the private sector to find and apply information and/or technology and thus to avoid duplication of research and development already accomplished.

A related service to industry is provided by NASA's Computer Software Management and Information Center (COSMIC) at the University of Georgia. COSMIC collects, screens, and stores computer programs developed by NASA and other Government agencies. Adaptable to secondary use by industry, Government, or other organizations, these programs perform such tasks as structural analysis, electronic circuit design, chemical analysis, design of fluid systems, determination of building energy requirements, and a variety of other functions.

[16] For additional information on the various technology transfer programs of the Federal Government see: U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. Domestic technology transfer: issues and options. 95th Congress, 2d session. Serial CCC. Washington, U.S. Government Printing Office, 1978. 853 pp. at head of title: Committee Print.

NASA also operates a Remote Sensing Applications Program to assist State and local governments in utilizing satellite remote sensing technology as a source for their resource management and planning decisions.

Transfer of remote sensing technology is accomplished through:

Orientation programs to acquaint State and local decisionmakers with remote sensing capabilities, applications, and limitations;

Training programs which enable key State and local personnel to utilize remote sensing data;

Application demonstrations of proven technology to acquaint potential users with specific applications in operational environments; and

Technical assistance to help users establish independent self-sustaining capability to use remotely sensed data.

The program draws on all NASA field centers in the development of activities in the States and for support of specific projects.

NASA also works with the Federal Laboratory Consortium for Technology Transfer.

d. Domestic Policy Review on Industrial Innovation and Resulting Presidential Initiatives

In May 1978, President Carter initiated a Domestic Policy Review (DPR) on Industrial Innovation. Headed by the Secretary of Commerce, this activity was undertaken to identify and recommend Government actions to encourage increased industrial productivity and innovation. Representatives from industry, academia, Government, and the public participated in this study designed to illuminate policies affecting the innovation process and to enumerate positive steps to increase the innovative capabilities of U.S. industry. An interagency committee conducted the effort advised by several panels of industrial executives. Twenty-eight agencies and approximately 500 private sector representatives participated. A series of public hearings was held on economic, tax, and trade policy; environmental, health, and safety regulations; Federal procurement and research grant policy; patents; and antitrust policy. The principal documents resulting from the Domestic Policy Review were a series of subcommittee reports [17] and a paper sent to the President which has not been made available outside the executive branch.

On October 31, 1979 President Carter announced various initiatives to provide a positive environment for industrial innovation which were based on the Domestic Policy Review. These "President's Initiatives on Industrial Innovation" were presented to Congress on the same day.[18] Specific recommendations were made in nine areas:

Enhancing the Transfer of Information;
Increasing Technical Knowledge;
Strengthening the Patent System;
Clarifying Antitrust Policy;
Fostering the Development of Small Innovative Firms;

[17] United States Department of Commerce, Final Report of the Advisory Committee on Industrial Innovation, September 1979.
[18] Industrial Innovation, Hearings Record, op. cit.

Opening Federal Procurement to Innovations;
Improving Our Regulatory System;
Facilitating Labor/Management Adjustment to Technical Change; and
Maintaining a Supportive Climate for Innovation.

Several of the President's initiatives are strengthened by this bill. President Carter's program included the creation of the NTIS Center for the Utilization of Federal Technology, which is also addressed in S. 1250.

The Generic Technology Centers and the NSF industry-university program identified in the executive initiatives also are incorporated into S. 1250, as reported. The presidential directive to clarify antitrust impacts on innovation is paralled by the requirement in the Stevenson Technology Innovation Act for a judgment on antitrust violations prior to establishment of Innovation Centers. A legislative basis for the President's initiative to establish an award for technological innovation is provided by the bill.

Other of the initiatives include efforts to utilize foreign technology; regulatory technology development to assist industry in complying with environmental, health, and safety regulations; uniform patent policy and additional improvements in the patent system; support and extension of the NSF Small Business Innovation Research Program; Corporations for Innovation Development to assist in providing start-up capital; additional Federal policies and support for small R&D firms; efforts to increase the availability of venture capital; opening Federal procurement to innovations; improvements in the regulatory system; and activities to facilitate labor/management adjustment to technological change. The Committee has taken steps other than this bill to strengthen the President's initiatives in some of these other areas and is analyzing the entire range of initiatives.

B. Legislative History of S.1250

1. SENATE

On May 24, 1979 S. 1250 was introduced by Mr. Stevenson with Senators Cannon, Hollings, Inouye, W. H. Ford, Riegle, Moynihan, Schmitt, Bradley, Randolph, Heinz, and Magnuson as cosponsors. The bill was referred to the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Science, Technology, and Space. Hearings were held by the Subcommittee on June 21, June 27, and November 21, 1979.

On April 29, 1980 a Commerce, Science, and Transportation Committee mark-up was held. The bill was ordered to be favorably reported, with amendments. The report (S. Rpt. 96-781) was filed on May 15, 1980.

The bill passed the Senate, as reported, on the Consent Calendar on May 28, 1980.

2. HOUSE

On June 28, 1979 H.R. 4672 was introduced as a companion bill to S. 1250 by Mr. Brown of California with Representatives Fuqua, Ertel, Watkins, Wydler, Hollenbeck, and Ritter as cosponsors. The bill was referred to the House Committee on Science and Technology, Subcommittee on Science, Research, and Technology. On July 31, August 1 and 2, 1979 hearings were held by the Subcommittee on Science, Research, and Technology on H.R. 4672, and university industry relations generally.

Following passage by the Senate, S. 1250 was referred to the House Committee on Science and Technology on May 30, 1980, and then to the Subcommittee on Science, Research, and Technology on June 4.

Based on its hearings on H.R. 4672, on hearings into the role of the Federal laboratories in domestic technology transfer, on hearings regarding the President's Industrial Innovation Initiatives, on other hearings regarding innovation and productivity, and on the GAO analysis of the House hearings on H.R. 4672 and the Senate hearings on S. 1250, the Subcommittee considered and marked up S. 1250 on June 17, 1980. The bill was ordered reported to the full Committee, as amended.

Full Committee consideration and mark-up of S. 1250 took place on July 2, 1980. The bill was ordered to be reported, as further amended.

M. Section 11—Utilization of Federal Technology

SEC. 11. UTILIZATION OF FEDERAL TECHNOLOGY.

(a) Policy.—It is the continuing responsibility of the Federal Government to ensure the full use of the results of the Nation's Federal investment in research and development. To this end the Federal Government shall strive to transfer federally owned or originated technology to State and local governments and to the private sector.

The phrase "technology transfer," as used throughout this section, is intended to mean the transformation of R. & D. into processes, products, and services that can be applied to State and local government and private sector needs.

This definition is broad and the determination of which agency activities fall under the umbrella of "technology transfer" will admittedly, be subject to each agency's interpretation of the definition in view of its unique organizational characteristics and R. & D. activities. However, the overriding consideration in making a determination as to what should be categorized as technology transfer is that the activity so classified should be dedicated to technology transfer from the outset. Many Federal R. & D. activities ultimately result in processes or products or services useful in meeting State and local government or private sector needs. However, this is not technology transfer because technology transfer, as defined here, is the transformation process itself. NASA's Technology Transfer and Technology Utilization programs are good examples of programs dedicated to achieving this transformation. Likewise, many agencies have technical information dissemination programs aimed at achieving the same goal.

It is recognized that a strong national policy concerning technology transfer in the Federal government has not been developed. This lack of a national policy has prevented the institutionalization of the process and reduced the efficacy of attempts, by many Federal laboratories, to provide technical assistance for solving the problems of the public and private sectors.

The Federal laboratories have been established to assist their parent agencies to meet their mission requirements. With the exception of NASA, the technology transfer activity is not a part of the congressionally mandated mission of Federal agencies. Thus, technology transfer activities are, at best, secondary to those endeavors which support the agencies' primary responsibilities.

A major objective of the Act is to clearly articulate that it is the intent of Congress to mandate and promote technology transfer activities at the Federal agencies and their laboratories. Thus, Section 11 begins by specifically stating a congressional policy on technology transfer in the Federal government. It is intended that this policy will provide the basis for the inclusion of technology transfer programs in the mission requirements of every Federal agency engaged in R. & D. activities.

(b) Establishment of Research and Technology Applications Offices.—Each Federal laboratory shall establish an Office of Research and Technology Applications. Laboratories having existing organizational structures which perform the functions of this section may elect to combine the Office of Research and Technology Applications within the existing organization. The staffing and funding levels for these offices shall be determined between each Federal laboratory and the Federal agency operating or directing the laboratory; except that (1) each laboratory having a total annual budget exceeding $20,000,000 shall provide at least one professional individual full-time as staff for its Office of Research and Technology Applications, and (2) after September 30, 1981, each Federal agency which operates or directs one or more Federal laboratories shall make available not less than 0.5 percent of the agency's research and development budget to support the technology transfer function at the agency and at its laboratories, including support of the Offices of Research and Technology Applications.

Section 11(b) establishes an institutional framework for the performance of the technology transfer function at the Federal laboratories. Institutionalizing the technology transfer function is crucial in order to ensure that the technology transfer activities at the laboratories are given the visibility and resources needed to carry out the requirements of the Act.

At the same time, it is recognized that the Federal agencies, due to their differing missions and structures, need a degree of flexibility in handling the technology transfer requirement. Thus, the Act provides that each agency shall determine in consultation with its laboratories, how the Research and Technology Applications Offices shall be staffed and funded and whether to combine the functions of the applications offices with any existing units at the laboratories which perform similar functions. Where there are existing units, it is not the committee's intent to force them to be renamed; there should be a designation of what unit is the Office of Research and Technology Applications at each laboratory, however, so that the Center for the Utilization of Federal Technology and other groups know whom to contact with regard to the functions of this section. Although this considerable flexibility is provided, the Act mandates that, at a minimum, laboratories having an annual budget exceeding $20 million, must commit at least one full time staff person to the Research and Technology Applications Office.

It is further noted that there are few incentives at most Federal laboratories for scientists or other professionals to become actively involved in technology transfer activities because it is not part of their mission. As a corollary, because technology transfer is not a recognized, officially sanctioned activity of the majority of Federal laboratories, work performed in this capacity is not often relevant to professional promotion within the organization. In fact, career development of staff engaged in technology transfer is sometimes detrimentally affected because time is spent on activities other than those specified in positions descriptions upon which promotions are based.

Laboratory Directors are hesitant to encourage what often has been perceived as volunteer work for State and local governments and private organizations due to the fear that, at budget time, OMB and Congressional Committees will view these activities as evidence of surplus staff time and other resources.

For the above reasons, it is considered crucial to the accomplishment of the objectives of the Act that officially sanctioned offices, specifically assigned the mission of promoting technology transfer at the laboratories, be established, and that, at least in the case of laboratories with annual budgets exceeding $20 million, a full time staff member is assigned to the Office.

To provide the fiscal resources necessary to carry out the functions of the Research and Technology Applications Offices (as defined in Section 11(c)), Section 11(b) mandates that each Federal agency which operates or directs one or more Federal laboratories shall make available *not less than* 0.5 percent of the agency's research and development budget to support the technology transfer function at the agency and its laboratories. It should be noted that this 0.5 percent set-aside is not effectively mandated until fiscal year 1982 in order to provide Federal agencies the time they need to plan and develop the activities mandated by this Act.

It should also be noted that the set-aside is to be applied both to agency level and laboratory activities in support of the requirements of section 11 of this Act. The determination as to how the set-aside is to be allocated among the laboratories under the agency's control and agency level technology transfer activities is left to each agency's discretion. It is *not* the intent of the Act that, where an agency is currently funding technology transfer endeavors in excess of 0.5 percent of its annual R & D budget, the agency view the 0.5 percent set aside as a justification to cut back on such endeavors to the 0.5 percent level. The Act specifically states that "not less than 0.5 percent of agency's R & D budget" be committed to this function. The set-aside, therefore, is to be viewed as a minimum rather than a maximum budget commitment.

That the 0.5 percent minimum is truly minimal may be seen in the testimony of William C. Norris, founder and Chief Executive Officer of Control Data Corporation: "We recommend, therefore, that each Federal agency allocate five percent of its R & D funds for technology transfer."[1] This is ten times the minimum stipulated by the bill.

(c) FUNCTIONS OF RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—It shall be the function of each Office of Research and Technology Applications—

(1) to prepare an application assessment of each research and development project in which that laboratory is engaged which has potential for successful application in State or local government or in private industry;

(2) to provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry;

(3) to cooperate with and assist the Center for the Utilization of Federal Technology and other organizations which link the research and development resources of that laboratory and the Federal Government as a whole to potential users in State and local government and private industry; and

(4) to provide technical assistance in response to requests from State and local government officials.

Agencies which have established organizational structures outside their Federal laboratories which have as their principal purpose the transfer of Federally owned or originated technology to State and local government and to the private sector may elect to perform the functions of this subsection in such organizational structures. No Office of Research and Technology Applications or other organizational structures performing the functions of this subsection shall substantially compete with similar services available in the private sector.

[1] Norris, William C., in testimony before a joint hearing of the Task Force on Inflation of the House Budget Committee and the Subcommittee on Science, Research and Technology of the House Committee on Science and Technology, "Productivity and Technical Innovation," Committee on Science and Technology, No. 36, 1979, p. 46.

Subsection (c) identifies a number of specific functions which will aid in the achievement of technology transfer throughout the Federal laboratory system. It will be necessary that each agency further define these functions in accordance with its peculiar characteristics. The concluding paragraph of subsection (c) permits an agency, such as NASA, which already has extensive technology transfer programs outside its laboratories, to carry out the bulk of these functions in its existing programs.

Subsection (c)(1) requires that an application assessment be prepared for each R. & D. project at the laboratory which has potential for successful application in State and local government or in private industry. It is not intended that every R. & D. project be formally assessed. Rather, it is left to the discretion of those agency personnel assigned to the Research and Technology Applications Offices to determine when, how, and for which R. & D. activities such an assessment must be prepared. The only criterion provided by the Act is that an assessment is required when an R. & D. project is determined to have potential for successful application in State and local government or in private industry. The Act's intent is to encourage the Research and Technology Offices to constantly scrutinize laboratories' R. & D. activities at all stages with a view toward the possibility of successful technology transfer to State and local government and private industry.

Subsection (c)(2) requires the Research and Technology Applications offices to provide and disseminate information on products, processes, and services which have potential application to State and local government and to private industry. The intent is to provide the potential user the opportunity to receive information directly from the source of the technology rather than indirectly from third parties. However, it is not the intent of this subsection that existing information dissemination services be duplicated where they effectively communicate such information.

Subsection (c)(3) requires each Research and Technology office to cooperate with the Center for the Utilization of Federal Technology and other organizations that act as overall links between the R. & D. resources in the Federal government and potential uses in State and local government and private industry. Again the intent is to provide to the potential user greater access to the source of technical assistance through the facilities offered by such crosscutting organizations as the Center for the Utilization of Federal Technology.

Subsection (c)(4) identifies an extremely critical function of the Research and Technology Applications Offices with regard to technology transfer to State and local governments. Subsection (c)(4) recognizes that technology transfer must, to be effective, consist of more than information dissemination. Technical assistance, often in the form of person-to-person assistance, is also required. Where feasible, personnel from laboratories which are the source of useful technologies should be committed to assist State and local officials in their attempts to apply these technologies to their specific needs. Each agency, in

tions to the promotion of technology or technological manpower for the improvement of the economic, environmental, or social well-being of the United States.

(c) PRESENTATION.—The presentation of the award shall be made by the President with such ceremonies as he may deem proper.

This section creates the National Technology Medal to be awarded to individuals or companies in recognition of an outstanding contribution to the promotion of technology or technological manpower in the national interest. This activity is in accordance with one of the initiatives called for in the President's industrial innovation message. The provision would establish the legislative basis for a National Technology Medal similar to that of the National Medal of Science.

O. SECTION 13—PERSONNEL EXCHANGES

SEC. 13. PERSONNEL EXCHANGES.

The Director and the National Science Foundation, jointly, shall establish a program to foster the exchange of scientific and technical personnel among academia, industry, and Federal laboratories. Such program shall include both (1) federally supported exchanges and (2) efforts to stimulate exchanges without Federal funding.

Section 13 mandates the creation of a joint NSF/DOC program of personnel exchanges between industry, academia, and Federal laboratories designed to encourage intersectoral cooperation and understanding and to provide education and training to promote technological innovation. The Science Faculty Professional Development Program at the National Science Foundation, as noted earlier, is one such activity of personnel exchange. The committee directs the Foundation not to decrease funds available in this program for year-long awards to experienced, full-time 2- and 4-year college and university science teachers who are involved primarily in undergraduate science instruction to increase their competence in science, as it increases funding for the type of exchanges mandated by the bill.

The Department of Commerce is planning for a fellowship program to be administered by the Center for the Utilization of Federal Technology. In its initial stage, this effort is expected to place individuals from private industry in the Federal laboratories to track user needs and potential applications of Federal technology.

The most extensive program of personnel exchanges of this type, which is compatible with this Act, is that established and operated under the Intergovernmental Personnel Act of 1970. This legislation created a program of grants and training assistance designed to give State and local personnel the administrative, professional, and technical skills vital to governmental operation. Grants are made available to non-Federal jurisdictions for programs to develop and institute improved administration methods. State and local employees may be permitted to participate in Federal training programs under the provisions of this law and funds are designated for these governmental units to provide training and education to develop such skills. Of primary importance with respect to S. 1250 is Title IV which allows for the temporary assignment of personnel from States and localities to the Federal Government and vice versa.

The mandate for the exchange program has been left purposely broad to allow for flexibility in program development. An example of what the Committee would consider as a viable plan for such an individual academic/industry exchange activity is the following:

DESCRIPTION OF PROGRAM

The program would encourage the exchange of individual researchers between the academic and industrial sectors. Individuals would spend from 3 to 12 months working in areas of high technology science and engineering. It would have between 200 and 500 participants per year. The exchanges could be arranged on an individual basis (or through a clearing-house, within the Department of Commerce Office of Industrial Technology). Industrial participants would spend their time at an academic department in the capacity of research associates or lecturers or both. Academic participants, (who would most likely be tenured faculty members from Ph. D. degree granting institutions) would spend their time at an industrial research or manufacturing facility, working on an industrial project. The project would not be restricted to generic research, but could include proprietary work as well.

AIMS OF PROGRAM

A program such as this would complement the centers for Industrial Technology by exposing more individual scientists to the unique situations, constraints, and problems of each sector. The development of such an understanding should help with: (1) more efficient communications, (2) exchange of information, and (3) attention to manpower needs and training for Ph. D. scientists.

FUNDING

The best method for funding would be that in which the industrial concerns were to support the entire program, with the incentive that they could deduct the direct expenses as part of a research tax incentive approach, similar to that in the "Vanik Bill". This would remove Government from direct financing and operation of the program.

Other alternatives are for the establishment of a new sabbatical program within N.S.F. which would cover the academic participants' costs. Industry would still be responsible for its costs. However, this removes some of the incentives.

P. SECTION 14—AUTHORIZATION OF APPROPRIATIONS

SEC. 10. *14.* AUTHORIZATION OF APPROPRIATIONS.

(a) There is authorized to be appropriated to the Secretary for purposes of carrying out section 6, not to exceed $19,000,000 for the fiscal year ending September 30, 1981, $40,000,000 for the fiscal year ending September 30, 1982, $50,000,000 for the fiscal year ending September 30, 1983, and $60,000,000 for each of the fiscal years ending September 30, 1984, and 1985.

(b) In addition to authorizations of appropriations under subsection (a), there is authorized to be appropriated *to the Secretary* for purposes of carrying out the provisions of this Act, not to