THE TECHNOLOGY ASSESSMENT ACT OF 1972

(P.L. 92-484)

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PREFACE

This document has been prepared to give Members and their staffs a brief and comprehensive view of recent key documents describing the Office of Technology Assessment. Wherever possible the exact terminology of the primary reports is used to minimize the need for reference to the many original sources.

The first two facing pages (p. i & ii) of this study are a condensed chart of the provisions of the Act, showing the "OTA at a glance". This listing is followed by a summary (I) of the concepts, background and rationale underlying the creation of the Office.

The two main chapters (II and III) of the report review the provisions of the Act and its legislative history.

Appendices include a reprint of the Act (A), the list and biographies of the initial members of the Board (B), a reprint of "Operational Concepts for Implementing Technology Assessment" from the Senate committee print (C), and a selected annotated bibliography (D) of several key documents Members and their staffs may wish to acquire for further information.

OTA AT A GLANCE - FUNCTIONS AND STRUCTURE

Rationale -- the Congress needs to:

"(1) equip itself with new and effective means for securing competent, unbiased information concerning the physical, biological, economic, social, and political effects of such(technological) applications, and

(2) utilize this information, whenever appropriate, as one factor in the legislative assessment of matters pending before the Congress, particularly in those instances where the Federal Government may be called upon to consider support for, or management or regulation of, technological applications."

Functions -- the OTA shall:

"provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress, and;

(1) identify existing or probable impacts of technology or technological programs;

(2) where possible, ascertain cause-and-effect relationships;

(3) identify alternative technological methods of implementing specific programs;

(4) identify alternative programs for achieving requisite goals;

(5) make estimates and comparisons of the impacts of alternative methods and programs;

(6) present findings of completed analyses to the appropriate legislative authorities;

(7) identify areas where additional research or data collection is required to provide adequate support for the assessments and estimates described in paragraphs (1) through (5) of this subsection; and

(8) undertake such additional associated activities as the appropriate authorities specified under subsection (d) may direct."

Assessment activities undertaken by the Office may be initiated upon the request of:

(1) the chairman of any standing, special, or select committee of either House of the Congress, or of any joint committee of the Congress, acting for himself or at the request of the ranking minority member or a majority of the committee members;

(2) the Board; or

(3) the Director, in consultation with the Board.

Technology Assessment Board (13 members)

6 Senators	3 majority from each house.
6 Representatives	3 minority from each house.
Director of OTA (non-voting)	
Board selects Chairman	(From House during even numbered Congresses)
and Vice Chairman	(From the other house)

Director and Staff

Director appointed by TAB (Level III) for term of six years
Deputy Director appointed by Director with TAB approval (Level IV)
Staff selected by Director per TAB policies.

Technology Assessment Advisory Council (12 members, staggered 4 year terms)

Functions: The Council, upon request by the Board, shall--

(1) review and make recommendations to the Board on activities undertaken by the Office or on the initiation thereof in accordance with section 3(d);

(2) review and make recommendations to the Board on the findings of any assessment made by or for the Office; and

(3) undertake such additional related tasks as the Board may direct.

Members

10 public members appointed by TAB

("who shall be persons eminent in one or more fields of the physical, biological, or social sciences or engineering or experienced in the administration of technological activities, or who may be judged qualified on the basis of contributions made to educational or public activities")

the Comptroller General

the Director of the Congressional Research Service of the Library of Congress.

Chairman and Vice Chairman elected by TAAC.

Relationships

OTA to draw on Congressional Research Service and General Accounting Office for all the same services each renders the Congress.

GAO to furnish financial and administrative services.

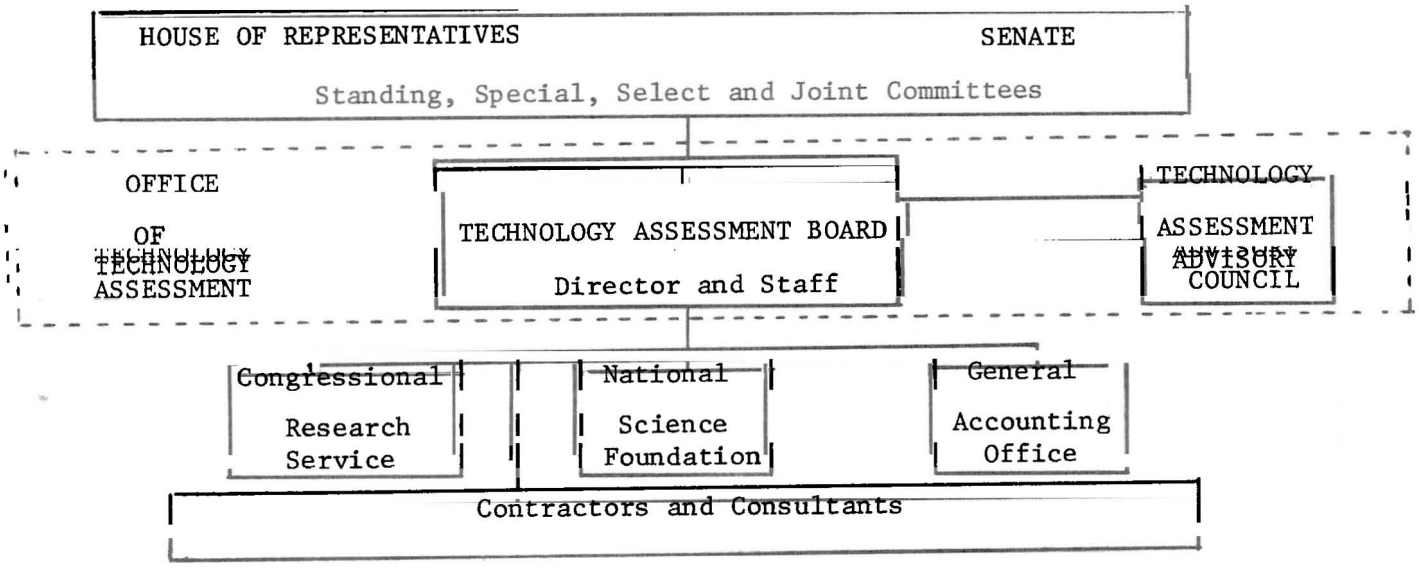
OTA and NSF to maintain "a continuing liaison" on TA research grants and contracts.

Annual Report by March 15.

Authorization

$5 million total through June 30, 1974 "and thereafter such sums as may be necessary."

Organizational Relationships



I. INTRODUCTION

Technology Assessment is the thorough and balanced analysis of all significant primary, secondary, indirect and delayed consequences or impacts, present and foreseen, of a technological innovation on society, the environment or the economy.

Technology Assessment (TA) is not a search for only the adverse effect of a technology; it is not a determination that a technology should or should not be employed; it is not a mechanism to halt or slow the development of technology.

The term "technology" may communicate too limited a notion to many persons who hear the words Technology Assessment. It is important to note that "technology" includes the so-called "soft" or social technological inventions along with the more commonly thought of physical objects and materials. As used in TA:

Technology is the systematic, purposeful application of knowledge, skill, and expertise toward a function or service useful to man. Extended definitions of Technology and Technology Assessment are given in appendix A of the Senate Committee print on the Office of Technology Assessment. 1 /

Many different and sometimes contradictory terms have been used to describe the principal components of the prospective Office of Technology Assessment for the Congress. To maintain consistency, this report uses the terms as listed below:

Office of Technology Assessment (OTA). -- The Office includes both the policy making and operational components: the Technology Assessment Board (TAB), the Director and staff, and a Technology Assessment Advisory Council.

Technology Assessment Board (TAB). -- The Board is the governing body which formulates the policies of the Office. Its thirteen members

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1 / U.S. Congress. Senate. Technology Assessment for the Congress. Committee on Rules and Administration. Subcommittee on Computer Services. 92nd Congress. 2nd session. (Washington: U.S.G.P.O.) November 1, 1972. 105 pages.

include 6 Members from each House with 3 from the majority and 3 from the minority party in each case. The Director is a non-voting member of the Board.

Director and staff. -- The Director and staff form the operational unit of the OTA, and report to the TAB. The usual powers and authorities of a functioning agency of Government are provided for the Office of Technology Assessment, including those of promulgating rules and regulations, making contracts, hiring personnel, fixing compensation, et cetera. The Office would also be authorized to sit and act wherever and whenever necessary. The Office would itself be prohibited from operating laboratories, pilot plants, or test facilities in pursuit of its mission.

Technology Assessment Advisory Council. -- An advisory council to the TAB. Ten of its 12 members are private citizens appointed for fixed terms by the Board; the remaining two are the Director of the Congressional Research Service and the Comptroller General.

The Present Situation in the Congress

The following motivations for creating a congressional technology assessment organization are set forth in the Act:

The Congress hereby finds and declares that:

As technology continues to change and expand rapidly, its applications are --

Large and growing in scale; and

Increasingly extensive, pervasive, and critical in their impact, beneficial and adverse, on the natural and social environment.

Therefore, it is essential that, to the fullest extent possible, the consequences of technological applications be anticipated, understood, and considered in determination of public policy on existing and emerging national problems.

The Congress further finds that:

The Federal agencies presently responsible directly to the Congress are not designed to provide the legislative branch with adequate and timely information, independently developed, relating to the potential impact of technological applications, and

The present mechanisms of the Congress do not and are not designed to provide the legislative branch with such information.

These statements are based upon a number of assumptions and findings of fact upon which there is a growing consensus as revealed by hearings, numerous studies, meetings, discussions, and articles, both within and outside the Government. These assumptions and findings involve: (a) the increased pace and scale of technological innovation and resultant complex social, environmental, and economic impacts; (b) dissatisfaction with negative aspects of technology and concern that TA may be used to inhibit development of needed new technologies; (c) the need for Federal leadership and policy guidance; (d) improved competence in the behavioral and systems sciences to deal with complex, dynamic issues; (e) the need by the Congress for new institutional means to serve its unique interests and responsibilities; and (f) the widespread acceptance of the need for congressional TA activity.

Legislative History

Many legislative proposals have been offered to accomplish the various purposes encompassed by the function of technology assessment. The House bill, H.R. 10243, reported from the Science and Astronautics Committee, August 16, 1971, was the fifth in a series of legislative proposals directed toward meeting this need. This bill was taken up and considered by the House on February 8, 1972, amended by a vote of 29 to 19, and passed on a rollcall vote (yeas -- 256, nays -- 118, not voting -- 57). It, and a companion bill -- S. 2302 -- were considered when the Subcommittee on Computer Services of the Committee on Rules and Administration

held hearings on technology assessment legislation on March 2, 1972. On September 13, 1972, the Senate Committee on Rules and Administration voted unanimously to report H.R. 10243, with an amendment. This legislation passed the Senate on September 14, 1972, for return to the House. On September 18, 1972, the House asked for a conference on the Senate-passed version of H.R. 10243. A conference on this version of the bill, which was an amendment in the nature of a substitute, was agreed to by the Senate on September 19, 1972. Conferees from both Houses met on September 21, 1972, and agreed to the Senate passed version with certain minor and technical amendments to the bill. Both Houses agreed to the conference report on H.R. 10243, the Senate passing the measure on September 25, 1972, with the House giving the bill its final passage on October 4, 1972, thus clearing the Technology Assessment Act of 1972 for signature by the President on October 13, 1972.

The Technology Assessment Movement

The general term technology assessment (TA) is used loosely by sponsors, doers, and users to mean any or all aspects of four "types" of TA: policy-oriented, issue-oriented, technology-oriented, or methodology-oriented.

Regardless of the particular emphasis, however, all groups share a central idea: the identification of "second order" and other indirect effects of technological innovations and the use of this information to improve decisionmaking on the social use of technology.

Extensive time, energy, and money have been devoted to technology assessment in many sectors of our society and in many other countries as evidenced by the growing TA literature in hard cover and periodicals, courses of instruction on TA in public and private academic and operating organizations, and seminars and conferences. However, little systematic data exist at present which might yield information about the positions of different groups or constituencies with respect to technology assessment.

The idea of explicity identifying the social, economic, or environmental impacts of Federal and/or private initiatives is not new to the Congress. Such considerations were raised in considering the National Environmental Policy Act of 1969, the Urban Growth and New Community Act of 1970, the Rivers and Harbors authorization for fiscal year 1971, the Water Quality Act Amendment passed in 1971, and the fiscal year 1971 appropriations for the Environmental Protection Agency. This legislation indicates that Congress has already accepted the principle of assessment activities by requiring a new range of analyses in the social, economic, and environmental effects of selected Federal activities. This application is extended and systematized in the new legislation on technology assessment.

Why a New Organization? Why In Congress?

In the past, technology has been advanced primarily as a result of detailed operational decisions made by the executive branch and industry, often acting in concert and sometimes motivated by military considerations. The congressional contribution to this process has been largely limited to the budgetary and funding decision, which is a powerful but relatively unselective instrument of control. All citizens have been vitally affected by the consequences. But the role of Congress to make decisions for all the people has tended to be overly generalized. The proposition of this Act is that the Congress is the proper national forum for deliberating and deciding upon conflicting goals, values, priorities, resource allocations and the distribution of benefits, risks, and costs, all of which are involved in technology assessment. To carry out these responsibilities, the Congress should be one of the best informed institutions in this country. Technology assessment alone will not achieve this desired state, but it does offer significant improvements to the current system. A summary of possible improvements is included in the discussion of "pros and cons" given in appendix B of the

Senate committee print on the Office of Technology Assessment. 2/

Operational Concepts for Implementing Technology Assessment

There are no good examples which could serve as a model for the operation of the Office of Technology Assessment organization. In general, however, it seems likely that the flow of activity will be as follows:

(1) Requests for assessments would be submitted as provided in the law to the OTA for implementation.

(2) Assessment priorities would be assigned by the OTA in accordance with predetermined criteria and the assessment would be defined and formulated by the staff.

(3) A contractor (or contract agency) would be selected by the OTA.

(4) The assessment would be carried out by the contractor, monitored by the OTA staff, and a report would be written in close liaison with the OTA staff.

(5) The results of the contractor's efforts would be evaluated by the OTA, and a summary report and analysis of the results would be prepared.

(6) The summary report and analysis by OTA would be transmitted to the requesting committee, with or without recommendation, as appropriate.

Smooth functioning of the above process would greatly depend upon the analytical qualifications, communication abilities, and management expertise of the OTA Director and his staff, and upon their ability to establish mutually productive relationships with other organizations providing inputs to the technology assessment process and with the client committee members and staff.

2/ Ibid.

Methodology for TA

There is no question that enough is known about the assessment process to proceed with an OTA, but there is also much to learn. The current legislation for the Technology Assessment organization gives the National Science Foundation a major responsibility for promoting research in technology assessment methodology, extending its horizons and developing new skills to be used in the OTA-sponsored analyses for the Congress.

There are a few examples of major successful technology assessments of the kind expected to be needed for congressional action, but it would be dangerous to expect too much too soon. There are many examples of advances in sociology, anthropology, psychology, mathematics, engineering, ecology, and the policy sciences, which demonstrate man's new power to understand, forecast, and sometimes manipulate those forces which influence his social, economic, and physical environment. The continuing value of traditional adversary processes for supplying information and disclosing truth also will apply to technology assessment.

There is consensus that: (1) Sufficiently powerful concepts and methodologies, and (2) Sufficient qualified personnel are available to perform meaningful technology assessments. If an appropriate policy and organizational framework backed with adequate resources is established, the Congress can have a new and valuable input to its deliberations and actions. This is not to claim too much. The blunt fact remains that in every policy decision there is and always will be incomplete information. The function of technology assessment is to bring to bear the maximum possible of information that is available.

II. SUMMARY OF PROVISIONS

The Technology Assessment Act of 1972 (PL 92-484) establishes an Office of Technology Assessment for the Congress as an aid in the identification and consideration of existing and probable impacts of technological application. The bill also amends the National Science Foundation Act of 1950.

Purpose. The purpose of the legislation is to provide a new and effective means for Congress to secure competent, unbiased information concerning the physical, biological, economic, social, and political effects of the increasingly extensive and larger applications of technology. This information is then to be used as one factor in the decision-making process in the legislative branch, particularly in those areas where Congress must manage or regulate technological applications.

As created by the legislation, the Office of Technology Assessment shall be within and responsible to the legislative branch of the Government. Rep. George Miller notes that this is only the third time that "Congress has set up an independent entity within the legislative branch to serve its own needs." 3/ GAO was the last legislative office created by Congress, and was established in 1921.

The Office shall consist of a Technology Assessment Board (the "Board"), which shall formulate and promulgate the policies of the Office, and a Director who shall carry out such policies and administer the operations of the Office. The basic function of the Office shall be to provide "early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress." Eight specific activities are listed below which are identified in the legislation as the means to carrying out this function. The Office shall:

3/ "Conference Report on H.R. 10243..." Extensions of Remarks. By Hon. George P. Miller. Congressional Record. October 6, 1972.

(1) identify existing or probable impacts of technology or technological programs;

(2) where possible, ascertain cause-and-effect relationships;

(3) identify alternative technological methods of implementing specific programs;

(4) identify alternative programs for achieving requisite goals;

(5) make estimates and comparisons of the impacts of alternative methods and programs;

(6) present findings of completed analyses to the appropriate legislative authorities;

(7) identify areas where additional research or data collection is required to provide adequate support for the assessments and estimates described above; and

(8) undertake such additional associated activities as the appropriate authorities specified below may direct.

Section 3 in the Technology Assessment Act notes that assessments may be undertaken by the Office upon the request initiated by the chairman of any standing, special, select, or joint committee of Congress, acting for himself or at the request of the ranking minority member or a majority of the committee members. The Board itself may initiate requests for assessments, and the Director, in consultation with the Board, also has the authority.

Assessments made by the Office, including all background and supplementary information, shall be made available to the initiating committee or other "appropriate" committees of the Congress. These supporting studies may also be made available to the public except in those instances where to do so would violate security statutes or the exceptions noted in the Freedom of Information Act (U.S.C. Title 5, section 552(b)).

The Board. The Technology Assessment Board, the policy-making component of the Office, consists of thirteen members. Six members are Senators, appointed by the President pro tempore of the Senate, three each from the majority and minority parties. Six members are Representatives, to be appointed by the Speaker of the House, three each from the majority and minority parties. The Director of the Office shall be a non-voting member of the Board. (Appendix B of this report contains a listing of the congressional members).

The Board shall select a Chairman and a Vice Chairman from among its members at the beginning of each Congress. Both these officers shall alternate between the Senate and the House of Representatives with each Congress. During the even-numbered Congresses, the Chairman shall be selected by the members from the House of Representatives on the Board, and during the odd-numbered Congresses by the Senate members of the Board. The Vice Chairman during each session shall be chosen in the same manner, but shall not be from the same House of Congress as the Chairman.

The Board is granted all the powers of a congressional committee, including the right to issue subpenas upon a vote of the majority of its members.

Director and Staff. The officials of the Office of Technology Assessment are defined in Section 5 of the legislation. The Director of the Office shall be the chief executive; he shall be appointed by the Board for a term of six years, unless sooner removed by the Board. He shall receive basic pay at the rate provided for level III of the Executive Schedule (this is comparable to the pay rate for the Solicitor General, Under Secretaries of most Cabinet-level Departments, and the Chairmen of the Federal Power and Federal Trade Commissions.) The Director shall exercise his statutory powers and duties and may exercise such powers and duties as may be delegated to him by the Board. With the approval of the Board the Director may appoint a Deputy Director who shall receive basic pay

at the rate provided for in level IV of the Executive Schedule (this is comparable to thepay rate for most Assistant Secretaries of Cabinet-level Departments, Members of the Civil Aeronautics Board and Council of Economic Advisers). Neither the Director nor the Deputy Director is permitted to be employed in any other position, nor may they hold any office in or officially represent any other organization, agency or institution with which the Office makes any contract or other arrangement under the Technology Assessment Act.

Authority. The Office shall have the authority, within the limits of available appropriations, to do all things necessary to carry out the provisions of this Act. This authority includes the right to seek advice from persons and organizations outside the Office, public or private, and to form special ad hoc task forces or other arrangements when appropriate. The Office may enter into contracts or other arrangements with any agency or instrumentality of the United States, with any State, Territory, or possession or any political subdivision thereof. Contracts may also be arranged with any person, firm, association, corporation, or educational institution. These contracts may be negotiated as necessary for the conduct of the work of the Office.

In carrying out the provisions of this Act, the Office shall not itself operate any laboratories, pilot plants, or test facilities. The Office may request and is authorized to secure directly from any executive department or agency information, suggestions, estimates, statistics, and technical assistance for the purpose of carrying out its functions under this Act.

In accordance with such policies as the Board shall prescribe, the Director shall appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act.

The Council. In order to carry out the functions described above, the Office of Technology Assessment shall establish a Technology Assessment Advisory Council (the "Council"). The Council shall be composed of the following twelve members:

(1) ten members from the public, appointed by the Board; these persons shall be eminent in one or more fields of the physical, biological, or social sciences or engineering or experienced in the administration of technological activities, or who may be judged qualified on the basis of contributions made to educational or public activities;

(2) the Comptroller General; and

(3) the Director of the Congressional Research Service of the Library of Congress.

Upon request by the Board, the Council shall perform several functions. Its members shall review and make recommendations to the Board on activities undertaken by the Office or on the initiation thereof. They shall also review and make recommendations to the Board on the findings of any assessment made by or for the Office. The Council shall further undertake any additional related tasks as the Board may direct.

By majority vote the Council shall elect a Chairman and a Vice Chairman from among its public members, whose terms will be prescribed by the council. The term of each public Council member shall be four years and no such person shall be appointed a member more than twice. Terms of the public members shall be staggered so as to establish a rotating membership according to such method as the Board may devise. The public members of the Council shall be compensated for each day engaged in the actual performance of Council duties at rates of pay not in excess of the basic daily pay rate set forth in the General Schedule of section 5332 (a) of title 5, U.S.C. They shall additionally be reimbursed for travel, subsistence, and other necessary expenses.

CRS, GAO, and NSF. Both the Congressional Research Service (Library of Congress) and the General Accounting Office are authorized by the Technology Assessment Act to provide such services and assistance to the Office of Technology Assessment as may be appropriate and feasible. To carry out these objectives, the Librarian is authorized to establish within the Congressional Research Service such additional divisions or other organizational entities as may be necessary. The assistance of the Congressional Research Service to the Office shall include, but is not limited to, all of the services available to Congress. The Board and the Librarian of Congress will agree to the method of reimbursement for these services.

The General Accounting Office is authorized to provide financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) and such other services as may be appropriate to the Office. This assistance shall include, but is not limited to, all of the services the General Accounting Office provides to Congress. The Board and the Comptroller shall agree to the method of reimbursement for these services.

Section 10 in the Technology Assessment Act directs a specific liaison function between the Office and the National Science Foundation. This continuing liaison shall involve: (1) grants and contracts formulated or activated by NSF which are for the purpose of technology assessment; and (2) the promotion of coordination in areas of technology assessment, and the avoidance of unnecessary duplication or overlapping of research activities in the development of technology assessment techniques and programs.

This section further changes the National Science Foundation Act of 1950, as amended (42 U.S.C. 1862 (b)). Section 3 (b) of the NSF Act is amended to expand the authorization of NSF specific scientific activities into matters relating to the effects of scientific applications upon society.

Furthermore, the amendment allows the Office of Technology Assessment, as well as any Federal department or agency, to request that the NSF undertake such activities.

Report. The Office is directed to submit an annual report to the Congress. This report shall include (but not be limited to) an evaluation of technology assessment techniques and the identification of technological areas and programs requiring future analysis. The annual report shall be submitted not later than March 15 of each year.

Authorization. Finally, the Office of Technology Assessment is authorized appropriations not to exceed $5 million in the aggregate for the two fiscal years ending June 30, 1973 and June 30, 1974, and such sums thereafter as may be necessary.

III. LEGISLATIVE HISTORY

Origins of the Assessment Concept

> "We can no longer blindly adapt technology to our needs with the traditional assumption that there will be ample time to iron out any bugs on a leisurely shakedown cruise." 4/

The members and staff of the House Committee on Science and Astronautics developed an early awareness of the dangerous side effects of technology during the 1960's, as technology came to play an increasingly larger role in the legislation under their consideration. The committee began serious work on the assessment concept in 1965, and on October 17, 1966, the Subcommittee on Science, Research, and Development published a report which examined the consequences and secondary impacts of technical innovations. This report was the first to use the term "technology assessment", and the authors cited technological unemployment, toxic pesticides, pollution, exhaustion of resources, the disposal of radioactive wastes, and invasions of personal liberty by electronic snooping and computer data banks as examples of the potentially dangerous consequences of technology. In view of these unforeseeable impacts, the subcommittee concluded that an "early warning" system for both the good and bad results of technology would be of great use to Congress.

Early in the next year, on March 7, 1967, Rep. Emilio Q. Daddario, the subcommittee chairman, introduced H.R. 6698 as a focus and stimulus for discussion of technology assessment in Congress. His bill proposed that Congress create a "Technology Assessment Board," and during the following summer he submitted a formal statement on the issue to Rep. George Miller, chairman of the House Science and Astronautics Committee. In this statement, Daddario offered the following definition of technology assessment:

4/ U.S. Cong., House. Committee on Science and Astronautics. Inquiries, Legislation, Policy Studies Re: Science and Technology -- Review and Forecast. 2nd Progress Rept. to Subcomm. on Science, Research and Development, 89th Congress, 2nd Sess. (Wash: U.S. G.P.O., 1966): p. 25.

> Technology Assessment is a form of policy research which provides a balanced appraisal to the policymaker. Ideally, it is a system to ask the right questions and obtain correct and timely answers. It identifies policy issues, assesses the impact of alternative courses of action and presents findings. It is a method of analysis that systematically appraises the nature, significance, status, and merit of a technological program. . . [It] is designed to uncover three types of consequences -- desirable, undesirable, and uncertain. ... To assess technology one has to establish cause and effect relationships from the action or project source to the locale of consequences. ...The function of technology assessment is to identify [all impacts and trends] -- both short-term and long range. ...The focus of Technology Assessment will be on those consequences that can be predicted with a useful degree of probability. 5/

Daddario's report developed a number of themes: The urgency of technology assessment had become greater, because of the population explosion and the growing power of technology to effect changes in the human environment. There were dangers in acting and in not acting. Assessment could stifle technological advance; but technologists were often blind to the risks of their own exciting innovations and overly confident that defects could be overcome. Many major impacts of technology were irreversible, so as to deny mankind the freedom of choice for the future. And, finally, science and technology had become a way of life, with $157 billion of public and private funds invested over the past decade.

Daddario concluded that "technical information needed by policymakers is frequently not available, or not in the right form. A policymaker cannot judge the merits or consequences of a technological program within a strictly technical context. He has to consider social,economic, and legal implications of any course of action."

Preparation for Legislation

To explore this new subject of technology assessment, the subcommittee proposed a three-phase approach: a series of hearings and seminars to refine ideas; studies

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5/ U.S. Cong., House. Committee on Science and Astronautics. Technology Assessment, Statement ...of Subcomm. on Science, Research, and Development, 90th Cong., 1st Sess. (Wash.: U.S. G.P.O., 1967): pp. 12-13.

to be prepared by the National Academy of Sciences (NAS) and the National Academy of Engineering (NAE) which would include the conduct of pilot assessment projects; and studies to be prepared by the Legislative Reference Service (LRS,now CRS) under the guidance and consultation of the subcommittee staff. These information-gathering activities resulted in three major reports which have formed the basic framework for later works on technology assessment.

The first of these reports to be completed was the LRS study, titled ~~Technical~~ Information for Congress. 6 / This report was prepared by the Science Policy Research Division within LRS, and the authors examined 14 cases involving technology assessments which had been performed by the Congress in the process of gathering technical information.

In July, 1969, the second report was published. Titled ~~A Study of Technology~~ Assessment, this work was prepared by the Committee on Public Engineering Policy (COPEP) of the NAE. 7/ In his preface to the study, Rep. Miller noted that this was the first contractual arrangement entered into by the Congress and the Academy. The NAE report consisted of three experiments in technology assessment, and outlined a series of observations and conclusions from these case studies which provided possible techniques to be applied in future assessments.

The third report to the House committee was also published in July, 1969. This was ~~Technology:~~ Processes of Assessment and Choice, prepared by the Committee

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6/ U.S. Congress. House. Committee on Science and Astronautics. Technical Information for Congress. Report to the Subcommittee on Science, Research and Development...prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress. 91st Congress, 1st session. (U.S. G.P.O.) April 25, 1969. Revised April 15, 1971.

7/ U.S. Congress. House. Committee on Science and Astronautics. A Study of Technology Assessment. Report of the Committee on Public Engineering Policy, National Academy of Engineering. (Wash.: U.S. G.P.O.) July 1969.

on Sciece and Public Policy (COSPUP) of the NAS. 8/ Their report addressed the underlying philosophic content of technology assessment itself, and concentrated on the structuring of the problem and the design of an organizational framework for the technology assessment function within the Federal Government.

During August, 1969, representatives from the two Academy panels, the LRS, and congressional committee staffs, and engineers and professors -- about 100 altogether -- met in a summer conference on technology assessment, sponsored by the Engineering Research Foundation. Discussions at this conference defined the areas of agreement on the need for an assessment mechanism in Congress, and highlighted the information available on the methodology and organization for this mechanism.

Early Proposals

During November and December of 1969, Daddario's subcommittee held hearings on technology assessment, exploring the need for legislation and the different alternatives proposed for organizing this function in the Congress. In his opening statement, Rep. George Brown indicated that technology assessment "is destined to become one of the major concerns of the Congress for many decades... The time has come to establish an operating assessment organization for the Congress." 9/

At this series of hearings, witnesses for the Library of Congress and the Comptroller General described their readiness to participate in an advisory service to the Congress. Professor Louis Mayo of George Washington University contributed an analysis of the organizational requirements of the technology assessment function.

8/ U.S. Congress. House. Committee on Science and Astronautics. Technology: Processes of Assessment and Choice. Report of the Committee on Science and Public Policy, National Academy of Sciences. (U.S. G.P.O.) July 1969.

9/ U.S. Cong., House. Committee on Science and Astronautics. Technology Assessment. Hearings before Subcomm. on Science, Research, and Development, 1969. 91st Cong., 1st Sess. (Wash.: U.S. G.P.O., 1970): p. 1-2.

Professor Don Kash of the University of Oklahoma called attention to the new skills in interdisciplinary research that would be required for a substantial effort in technology assessment.

Other witnesses, including Dr. Lewis Branscomb, Director of the National Bureau of Standards and Dr. William D. McElroy, Director of the National Science Foundation, outlined the complex and interdisciplinary processes involved in technology assessment.

H.R. 17046 was introduced early in 1970, and provided the basis for hearings (held in California and Missouri) during March and May on a specific proposal for a technology assessment mechanism. 10/ This bill called for an Office of Technology Assessment, consisting of a Technology Assessment Board to formulate policy and a Director to administer the Office. The Board would have thirteen members consisting of two Senators, two Representatives, the Comptroller General, the Director of the Congressional Research Service, and seven public members to be appointed by the President. Following hearings in Washington 11/ and further deliberations, the Committee on Science and Astronautics made several changes in the legislation. On July 15, 1970, H.R. 18469, incorporating these changes, was introduced to replace H.R. 17046, and on the same day Senator Gordon Allott and five cosponsors introduced a Senate companion bill, S. 4085. 12/ The Senate bill

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10/ U.S. Congress. House. Committee on Science and Astronautics. Technology Assessment -- 1970. Hearings before Subcomm. on Science, Research, and Development, on H.R. 17046. Part II. 91st Cong., 2nd sess. (Wash.: U.S. G.P.O.) 1970.

11/ U.S. Cong. House. Committee on Science and Astronautics. Technology Assessment -- 1970. Hearings before the Subcomm. on Science, Research, and Development...on H.R. 17046. 91st Cong., 2nd sess. (Wash.: U.S. G.P.O.) 1970.

12/ "S. 4085 -- Introduction of Technology Assessment Act of 1970." Remarks of the Hon. Gordon Allott on the floor of the Senate. Congressional Record, (July 15, 1970): pp. S11336-340.

was referred to the Committee on Rules and Administration; no action was taken in committee or on the Senate floor on this proposal.

H.R. 18469, now under House consideration, retained the basic philosophy and approach of its predecessor (H.R. 17046), but made the following substantive changes: (1) Public members of the Board were reduced from seven to six; (2) the Director was made a member of the Board; and (3) specific functions were assigned to the National Science Foundation, the General Accounting Office, and the Congressional Research Service.

In September 1970, the Committee on Science and Astronautics unanimously reported and recommended passage of H.R. 18469 to create an Office of Technology Assessment. 13/ The reported bill was the third in this series of legislative proposals related to technology assessment. The committee had revised this version of the bill somewhat, reflecting input from hearings, special advisory group reports, seminars, and "many months of subcommittee and staff labor."

The Office of Technology Assessment provided for in H.R. 18469 would be responsible for providing Congress with an "early warning of the probable impacts, positive and negative, of the applications of technology and to develop other coordinate information which may assist the Congress in determining the relative priorities of programs before it." The bill further outlined specific operational functions of the Office. The committee report emphasized specifically that OTA would provide Congress with an improved source of information to recommend alternative policies for the application of technology, and noted that: "...these are

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13/ U.S. Cong. House. Committee on Science and Astronautics. Establishing the Office of Technology Assessments and Amending the National Science Foundation Act of 1950. H. Report No. 91-1437, 91st Cong., 2nd Sess., September 9, 1970 (Washington: U.S. Government Printing Office. 1970): 26 p.

informational functions --- not functions of control or recommendation. They are designed to supplement existing systems of acquiring information...."

The OTA provided for in the reported bill would consist of a Technology Assessment Board and an operational unit headed by a Director. The Board, which would be composed of public members appointed by the President and legislative branch members, would formulate and promulgate policy; the Director and his staff would be responsible for the day-to-day operations of the Office. The OTA was authorized to conduct or to contract for the conduct of technology assessments, initiated upon the recommendation of the chairman of any committee of Congress, standing, special or joint, or by the Board or the Director. In support of obtaining information for the conduct of assessments, the Office would be authorized to hold hearings and to invoke the power of subpena; it was authorized also to utilize the supportive services of the General Accounting Office, the Congressional Research Service, and the National Science Foundation.

In an attempt to bring the reported House bill to the floor, H.R. 18469 was offered as an amending title to the Legislative Reorganization Act of 1970 on September 16, 1970. It was ruled not germane on a point of order and the House took no further action on it in 1970.

In the new 92nd Congress, Representative John Davis, new chairman of the Subcommittee on Science, Research, and Development, introduced H.R. 3269, identical to H.R. 18469, for himself and 24 other members of the House on February 2, 1971. Subsequently, in order to accommodate other members of the committee and of the House who wished to sponsor the legislation, Representative Hanna submitted on April 26, 1971, a companion bill, H.R. 7728, for himself and nine other members of the committee. The Subcommittee on Science, Research, and Development reported H.R. 3269 to the full committee without change on June 10, 1971. The full committee met to receive the subcommittee's report on July 22, 1971, and approved the

bill, with several minor amendments designed to streamline the Office of Technology Assessment. The clean bill, incorporating these changes, was reported by the committee as H.R. 10243 on August 16, 1971. 14/ (A companion bill, H.R. 10246 was introduced in the House on July 30, 1971, to accommodate additional sponsorship.)

During this same time, Senator Jordan, chairman of the Senate Rules and Administration Committee, introduced S. 2302, for himself and four other Senators. S. 2302 was identical to H.R. 10243 as reported by the House committee, and was referred to the Senate Rules Committee, Subcommittee on Computer Service

House consideration of H.R. 10243

The House Committee on Rules held hearings on H.R. 10243 on February 1, 1972. The bill was then brought to the floor of the House on February 8 and during its consideration several amendments altered the proposed structure of the Office of Technology Assessment. The amended version passed on a roll call vote of 256 to 118. 15/

In their supporting statements for the reported version of H.R. 10243, several Members observed that the technology assessments performed as a result of the passage of the bill would save the taxpayers needless expense in two ways: (1) the assessments would permit a committee to start hearings on a proposed technology

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14/ U.S. Cong., House. Committee on Science and Astronautics. Establishing the Office of Technology Assessment and Amending the National Science Foundation Act of 1950. H. Report No. 92-469, 92nd Cong., 1st Sess., August 16, 1971 (Washington: U.S. Government Printing Office, 1971).

15/ "Establishing the Office of Technology Assessment and Amending the National Science Foundation Act of 1950." Discussion and consideration of H.R. 10243 on the floor of the House. Congressional Record (February 8, 1972): pp. H 865-87.

from a more advanced position, and (2) technology assessments would permit the legislators and the public to foresee harmful consequences of a technology before government money is spent funding it.

Following these supporting arguments, a large portion of the floor debate was devoted to amending the bill. The following functions and provisions for the OTA were amended: (1) The authority of the Director to appoint and compensate professional personnel without regard to existing statutory controls, (Section 6(b)); (2) The authority of the OTA Director to initiate assessments (Section 3 (d)(3)); (3) The composition of the Technology Assessment Board (Section 4); (4) The authority of the Office or the Director to set and initiate hearings, issue subpenas, and report findings. (Section 6 (d)).

The first amendment, introduced by Rep. Henderson, provided that the authority of the Director to appoint and compensate technical and professional personnel without regard to existing statutory controls should be eliminated. His amendment was accepted without objection by Rep. Davis, and was agreed to by the House.

Rep. Jack Brooks, Chairman of the Joint Committee on Congressional Operations, introduced a second amendment which focused on the last three provisions described above. As reported to the floor , the OTA bill provided for an eleven-member Technology Assessment Board (TAB) composed of one Senator from each political party, one Representative from each political party, the Comptroller General, the Director of the Congressional Research Service, four members of the public (to be appointed by the President), and the Director of the OTA. Since few Congressmen are scientists, the committee reasoned that the four public members should be knowledgeable in one or more fields of science or engineering or experienced in the administration of technical activities.

Rep. Brooks objected to this composition of the Technology Assessment Board on the grounds that the bill as reported would not be responsive to legislative

branch guidance. Furthermore, he stated it enabled the President to control the Board by his selection of the private citizen members, the Comptroller General, and his appointee's selection of the CRS Director. Indirectly, Brooks indicated that the Director of the OTA would in effect also be a presidential appointee, elected by a group whose majority are themsleves appointed by the President.

Mr. Brooks proposed that the Technology Assessment Board should solely consist of ten Members of Congress, five Senators and five Representatives. The amendment introduced by Rep. Brooks further proposed that the authority of the Director to initiate assessments, to set and initiate hearings, to issue subpenas, and to report findings be eliminated. Instead, he proposed that this authority be restricted to congressional committees and to the OTA Board. Assessment activities therefore would be initiated only by the chairman of any standing, special, select, or joint committee, acting for himself or at the request of the ranking minority member or a majority of the committee members, or by the Board. The Office also would have no subpena power under his amendment. The amendment was agreed to by a vote of 29-19.

Other amendments of a technical nature were agreed to, and an amendment introduced by Rep. Davis, stating that the funds for the Office ($5 million) would be allocated during fiscal years 1973 and 1974 in the aggregate, in lieu of 1972, was agreed to without opposition.

Senate Consideration of H.R. 10243

Following passage in the House, H.R. 10243 was referred to the Senate Committee on Rules and Administration, which also had S. 2302 under its consideration at this time. S. 2302 had been introduced in July, and closely resembled the unamended version of H.R. 10243. The Subcommittee on Computer Services, also

chaired by Senator Jordan, held hearings on both bills on March 2, 1972. 16 / During these hearings, several witnesses indicated the need for a channel of public information and expertise to the Technology Assessment Board, in view of the fact that the public members had been eliminated in the House-passed version of H.R. 10243. This channel was often structured by the witnesses in the form of an Advisory Council to the OTA Board.

Rep. Davis, in his testimony before the subcommittee, made several recommendations regarding the structure of the Board and Office. These included his recommendation that if the Senate Committee concluded that "the Board should consist solely of Members of Congress, then we urge that there be an equal number of Members from both Houses and from both parties." Furthermore, he stated that "if it is concluded that the Board should be composed exclusively of Members of Congress, then I would also strongly recommend that the Director of the Office be returned to the Board, at least as a non-voting member.... In the event that no public members are included on the Board, itself" he recommended that "an advisory council containing public members be set up to assist the Board...I believe that a workable arrangement would go something like this -- that the advisory council consist of ten members, eight of whom could be drawn from the public, the other two being the Comptroller General and the Director of the Congressional Research Service, ex officio." Rep. Davis' final recommendations emphasized that the role of the Director be strengthened, that his powers in inaugurating assessments be restored, in order that as chief executive of the Office he may have the power to conduct his business, subject, of course, to the limitations of the policies and decisions of the Board.

16/ U.S. Cong., Senate. Committee on Rules and Administration. Office of Technology Assessment for the Congress. Hearings before ths Subcomm. on Computer Services on S. 2302 and H.R. 10243, March 2, 1972, 92nd Congress, 2nd Session (Washington: U.S. G.P.O., 1972): 120 p.

In his testimony to the subcommittee, Rep. Brooks repeated his urging that "the Congress must have complete control, through an all-congressional Board or Committee, over the activities and reports from the Office of Technology Assessment." Senator Kennedy concurred in his statement: "I agree with the intent of the House amendment which limits the Board to congressional members and assures Congressional control over the Office." Senator Gordon Allott told the committee that this proposal was "a sound one."

Mr. Brooks further stated that "the makeup of the Board...must reflect the majority and minority compositions. Those with the responsibility need to have the authority to act." However, a number of Members recommended a nonpartisan or parity composition of the Board. Rep. Charles Mosher, ranking minority member of the House Committee on Science and Astronautics, stated that the Board membership should reflect parity "in order to avoid a Joint Committee type of operation."

With respect to the authority and activities of the Director of the Office, Senators Kennedy and Magnuson, and Rep. Davis, indicated in their statements that the chief executive of the Office should be a man of special prestige, and should therefore have the option to initiate some assessments, and should be a non-voting member of the Technology Assessment Board. Rep. Brooks repeated his recommendation that "the OTA director and all other staff members must be under the control of the Board or Committee. Congress can not allow any staff member to initiate activities or to be beyond congressional authority."

On September 13, 1972, the Senate Committee on Rules and Administration met and unanimously voted to report H.R. 10243, with an amendment in the nature of a substitute.17/ This amended version reconciled several key issues as to alternative organizations and procedures in TA, and the results appear in the act as passed. 18/

17/ U.S. Cong. Senate. Committee on Rules and Administration. Technology Assessment Act of 1972. Report . . .to Accompany H.R. 10243. 92nd Cong., 2nd sess. (Wash.: U.S.G.P.O.) 1972.

18/ U.S. Cong. Senate. Technology Assessment for the Congress. Committee on Rules and Administration. Subcommittee on Computer Services. 92nd Congress. 2nd sess. (Wash.: U.S.G.P.O.) November 1, 1972. p. 43.

The committee report noted that H.R. 10243 as passed by the House, S. 2302 as introduced in the Senate, and the Modified Senate Committee Version being reported were all directed to the purpose of generating the essential analytical and technical information bearing on legislative issues of important public concern. The amended version of H.R. 10243 was presented on the Senate floor on September 14, by Senator Jordan.19/ The amendment was agreed to, and the bill passed without debate. There was no role call on the vote.

Final Actions on H.R. 10243

Four days later, on September 18, Rep. Miller asked unanimous consent on the House floor that H.R. 10243 be taken from the Speaker's table, with Senate amendments thereto, and that the House disagree to the Senate amendments. No objection was made to his request, and the Speaker appointed Reps. Miller, Davis, Cabell, Mosher and Esch (all members of the Science and Astronautics Committee) as House conferees.

The message from the House of Representatives announcing its disagreement to the Senate amendment was brought to the attention of the Senate by Senator Jordan on September 19. He moved that the Senate insist upon its amendment and request conference. The Senate agreed to Senator Jordan's motion, and the Presiding Officer appointed as conferees Senators Cannon, Robert C. Byrd, and Cook.

The conferees met on Thursday, September 21, and on the following day the Senate agreed to the conference report without objection. 20/ The conference report was introduced in the House on September 25, and was agreed to without objection or question on October 4. It was signed by the President on October 13, 1972.

19/ "Technology Assessment Act of 1972." Remarks of the Hon. B. Everett Jordan on the floor of the Senate. Congressional Record. (September 14, 1972) p. 14915 and 14941.

20/ U.S. Cong., House. Committee of Conference. Technology Assessment Act of 1972. Conference Report to Accompany H.R. 10243. Rpt. No. 92-1436. 92nd Cong., 2nd sess. (Wash.: U.S. G.P.O.) 1972.

APPENDIX A.

TECHNOLOGY ASSESSMENT ACT OF 1972

Public Law 92-484
92nd Congress, H. R. 10243
October 13, 1972

An Act

86 STAT. 797

To establish an Office of Technology Assessment for the Congress as an aid in the identification and consideration of existing and probable impacts of technological application; to amend the National Science Foundation Act of 1950; and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Technology Assessment Act of 1972". Technology Assessment Act of 1972.

FINDINGS AND DECLARATION OF PURPOSE

SEC. 2. The Congress hereby finds and declares that:

(a) As technology continues to change and expand rapidly, its applications are—

(1) large and growing in scale; and

(2) increasingly extensive, pervasive, and critical in their impact, beneficial and adverse, on the natural and social environment.

(b) Therefore, it is essential that, to the fullest extent possible, the consequences of technological applications be anticipated, understood, and considered in determination of public policy on existing and emerging national problems.

(c) The Congress further finds that:

(1) the Federal agencies presently responsible directly to the Congress are not designed to provide the legislative branch with adequate and timely information, independently developed, relating to the potential impact of technological applications, and

(2) the present mechanisms of the Congress do not and are not designed to provide the legislative branch with such information.

(d) Accordingly, it is necessary for the Congress to—

(1) equip itself with new and effective means for securing competent, unbiased information concerning the physical, biological, economic, social, and political effects of such applications; and

(2) utilize this information, whenever appropriate, as one factor in the legislative assessment of matters pending before the Congress, particularly in those instances where the Federal Government may be called upon to consider support for, or management or regulation of, technological applications.

ESTABLISHMENT OF THE OFFICE OF TECHNOLOGY ASSESSMENT

SEC. 3. (a) In accordance with the findings and declaration of purpose in section 2, there is hereby created the Office of Technology Assessment (hereinafter referred to as the "Office") which shall be within and responsible to the legislative branch of the Government.

(b) The Office shall consist of a Technology Assessment Board (hereinafter referred to as the "Board") which shall formulate and promulgate the policies of the Office, and a Director who shall carry out such policies and administer the operations of the Office. Technology Assessment Board.

(c) The basic function of the Office shall be to provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress. In carrying out such function, the Office shall: Duties.

(1) identify existing or probable impacts of technology or technological programs;

(2) where possible, ascertain cause-and-effect relationships;
(3) identify alternative technological methods of implementing specific programs;
(4) identify alternative programs for achieving requisite goals;
(5) make estimates and comparisons of the impacts of alternative methods and programs;
(6) present findings of completed analyses to the appropriate legislative authorities;
(7) identify areas where additional research or data collection is required to provide adequate support for the assessments and estimates described in paragraph (1) through (5) of this subsection; and
(8) undertake such additional associated activities as the appropriate authorities specified under subsection (d) may direct.

(d) Assessment activities undertaken by the Office may be initiated upon the request of:
(1) the chairman of any standing, special, or select committee of either House of the Congress, or of any joint committee of the Congress, acting for himself or at the request of the ranking minority member or a majority of the committee members;
(2) the Board; or
(3) the Director, in consultation with the Board.

Information, availability.

(e) Assessments made by the Office, including information, surveys, studies, reports, and findings related thereto, shall be made available to the initiating committee or other appropriate committees of the Congress. In addition, any such information, surveys, studies, reports, and findings produced by the Office may be made available to the public except where—
(1) to do so would violate security statutes; or
(2) the Board considers it necessary or advisable to withhold such information in accordance with one or more of the numbered paragraphs in section 552(b) of title 5, United States Code.

81 Stat. 54.

TECHNOLOGY ASSESSMENT BOARD

Membership.

SEC. 4. (a) The Board shall consist of thirteen members as follows:
(1) six Members of the Senate, appointed by the President pro tempore of the Senate, three from the majority party and three from the minority party;
(2) six Members of the House of Representatives appointed by the Speaker of the House of Representatives, three from the majority party and three from the minority party; and
(3) the Director, who shall not be a voting member.

Vacancies.

(b) Vacancies in the membership of the Board shall not affect the power of the remaining members to execute the functions of the Board and shall be filled in the same manner as in the case of the original appointment.

Chairman and vice chairman.

(c) The Board shall select a chairman and a vice chairman from among its members at the beginning of each Congress. The vice chairman shall act in the place and stead of the chairman in the absence of the chairman. The chairmanship and the vice chairmanship shall alternate between the Senate and the House of Representatives with each Congress. The chairman during each even-numbered Congress shall be selected by the Members of the House of Representatives on the Board from among their number. The vice chairman during each

Congress shall be chosen in the same manner from that House of Congress other than the House of Congress of which the chairman is a Member.

(d) The Board is authorized to sit and act at such places and times during the sessions, recesses, and adjourned periods of Congress, and upon a vote of a majority of its members, to require by subpena or otherwise the attendance of such witnesses and the production of such books, papers, and documents, to administer such oaths and affirmations, to take such testimony, to procure such printing and binding, and to make such expenditures, as it deems advisable. The Board may make such rules respecting its organization and procedures as it deems necessary, except that no recommendation shall be reported from the Board unless a majority of the Board assent. Subpenas may be issued over the signature of the chairman of the Board or of any voting member designated by him or by the Board, and may be served by such person or persons as may be designated by such chairman or member. The chairman of the Board or any voting member thereof may administer oaths or affirmations to witnesses.

Meetings.

Subpena.

DIRECTOR AND DEPUTY DIRECTOR

SEC. 5. (a) The Director of the Office of Technology Assessment shall be appointed by the Board and shall serve for a term of six years unless sooner removed by the Board. He shall receive basic pay at the rate provided for level III of the Executive Schedule under section 5314 of title 5, United States Code.

Appointment.

Compensation.

83 Stat. 863.

(b) In addition to the powers and duties vested in him by this Act, the Director shall exercise such powers and duties as may be delegated to him by the Board.

(c) The Director may appoint with the approval of the Board, a Deputy Director who shall perform such functions as the Director may prescribe and who shall be Acting Director during the absence or incapacity of the Director or in the event of a vacancy in the office of Director. The Deputy Director shall receive basic pay at the rate provided for level IV of the Executive Schedule under section 5315 of title 5, United States Code.

(d) Neither the Director nor the Deputy Director shall engage in any other business, vocation, or employment than that of serving as such Director or Deputy Director, as the case may be; nor shall the Director or Deputy Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Office makes any contract or other arrangement under this Act.

Employment restriction.

AUTHORITY OF THE OFFICE

SEC. 6. (a) The Office shall have the authority, within the limits of available appropriations, to do all things necessary to carry out the provisions of this Act, including, but without being limited to, the authority to—

(1) make full use of competent personnel and organizations outside the Office, public or private, and form special ad hoc task forces or make other arrangements when appropriate;

(2) enter into contracts or other arrangements as may be necessary for the conduct of the work of the Office with any agency or instrumentality of the United States, with any State, territory,

Contracts.

86 STAT. 800

or possession or any political subdivision thereof, or with any person, firm, association, corporation, or educational institution, with or without reimbursement, without performance or other bonds, and without regard to section 3709 of the Revised Statutes (41 U.S.C. 5);

(3) make advance, progress, and other payments which relate to technology assessment without regard to the provisions of section 3648 of the Revised Statutes (31 U.S.C. 529);

(4) accept and utilize the services of voluntary and uncompensated personnel necessary for the conduct of the work of the Office and provide transportation and subsistence as authorized by section 5703 of title 5, United States Code, for persons serving without compensation;

80 Stat. 499; 83 Stat. 190.

(5) acquire by purchase, lease, loan, or gift, and hold and dispose of by sale, lease, or loan, real and personal property of all kinds necessary for or resulting from the exercise of authority granted by this Act; and

(6) prescribe such rules and regulations as it deems necessary governing the operation and organization of the Office.

Recordkeeping.

(b) Contractors and other parties entering into contracts and other arrangements under this section which involve costs to the Government shall maintain such books and related records as will facilitate an effective audit in such detail and in such manner as shall be prescribed by the Office, and such books and records (and related documents and papers) shall be available to the Office and the Comptroller General of the United States, or any of their duly authorized representatives, for the purpose of audit and examination.

(c) The Office, in carrying out the provisions of this Act, shall not, itself, operate any laboratories, pilot plants, or test facilities.

Agency cooperation.

(d) The Office is authorized to secure directly from any executive department or agency information, suggestions, estimates, statistics, and technical assistance for the purpose of carrying out its functions under this Act. Each such executive department or agency shall furnish the information, suggestions, estimates, statistics, and technical assistance directly to the Office upon its request.

Personnel detail.

(e) On request of the Office, the head of any executive department or agency may detail, with or without reimbursement, any of its personnel to assist the Office in carrying out its functions under this Act.

(f) The Director shall, in accordance with such policies as the Board shall prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act.

ESTABLISHMENT OF THE TECHNOLOGY ASSESSMENT ADVISORY COUNCIL

Membership.

SEC. 7. (a) The Office shall establish a Technology Assessment Advisory Council (hereinafter referred to as the "Council"). The Council shall be composed of the following twelve members:

(1) ten members from the public, to be appointed by the Board, who shall be persons eminent in one or more fields of the physical, biological, or social sciences or engineering or experienced in the administration of technological activities, or who may be judged qualified on the basis of contributions made to educational or public activities;

(2) the Comptroller General; and

(3) the Director of the Congressional Research Service of the Library of Congress.

(b) The Council, upon request by the Board, shall— Duties.

(1) review and make recommendations to the Board on activities undertaken by the Office or on the initiation thereof in accordance with section 3(d);

(2) review and make recommendations to the Board on the findings of any assessment made by or for the Office; and

(3) undertake such additional related tasks as the Board may direct.

(c) The Council, by majority vote, shall elect from its members appointed under subsection (a)(1) of this section a Chairman and a Vice Chairman, who shall serve for such time and under such conditions as the Council may prescribe. In the absence of the Chairman, or in the event of his incapacity, the Vice Chairman shall act as Chairman. Chairman and Vice Chairman.

(d) The term of office of each member of the Council appointed under subsection (a)(1) shall be four years except that any such member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term. No person shall be appointed a member of the Council under subsection (a)(1) more than twice. Terms of the members appointed under subsection (a)(1) shall be staggered so as to establish a rotating membership according to such method as the Board may devise. Term of office.

(e)(1) The members of the Council other than those appointed under subsection (a)(1) shall receive no pay for their services as members of the Council, but shall be allowed necessary travel expenses (or, in the alternative, mileage for use of privately owned vehicles and a per diem in lieu of subsistence at not to exceed the rate prescribed in sections 5702 and 5704 of title 5, United States Code), and other necessary expenses incurred by them in the performance of duties vested in the Council, without regard to the provisions of subchapter 1 of chapter 57 and section 5731 of title 5, United States Code, and regulations promulgated thereunder. Travel expenses. 80 Stat. 498; 83 Stat. 190. 5 USC 5701.

(2) The members of the Council appointed under subsection (a)(1) shall receive compensation for each day engaged in the actual performance of duties vested in the Council at rates of pay not in excess of the daily equivalent of the highest rate of basic pay set forth in the General Schedule of section 5332(a) of title 5, United States Code, and in addition shall be reimbursed for travel, subsistence, and other necessary expenses in the manner provided for other members of the Council under paragraph (1) of this subsection. Compensation.

UTILIZATION OF THE LIBRARY OF CONGRESS

SEC. 8. (a) To carry out the objectives of this Act, the Librarian of Congress is authorized to make available to the Office such services and assistance of the Congressional Research Service as may be appropriate and feasible.

(b) Such services and assistance made available to the Office shall include, but not be limited to, all of the services and assistance which the Congressional Research Service is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities, other than those performed for the Office, which the Congressional Research Service under law performs for or on behalf

of the Congress. The Librarian is, however, authorized to establish within the Congressional Research Service such additional divisions, groups, or other organizational entities as may be necessary to carry out the purpose of this Act.

(d) Services and assistance made available to the Office by the Congressional Research Service in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Librarian of Congress.

UTILIZATION OF THE GENERAL ACCOUNTING OFFICE

SEC. 9. (a) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) and such other services as may be appropriate shall be provided the Office by the General Accounting Office.

(b) Such services and assistance to the Office shall include, but not be limited to, all of the services and assistance which the General Accounting Office is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities, other than those performed for the Office, which the General Accounting Office under law performs for or on behalf of the Congress.

(d) Services and assistance made available to the Office by the General Accounting Office in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Comptroller General.

COORDINATION WITH THE NATIONAL SCIENCE FOUNDATION

SEC. 10. (a) The Office shall maintain a continuing liaison with the National Science Foundation with respect to—

(1) grants and contracts formulated or activated by the Foundation which are for purposes of technology assessment; and

(2) the promotion of coordination in areas of technology assessment, and the avoidance of unnecessary duplication or overlapping of research activities in the development of technology assessment techniques and programs.

Scientific programs, financing. 92 Stat. 360.

(b) Section 3(b) of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1862(b)), is amended to read as follows:

"(b) The Foundation is authorized to initiate and support specific scientific activities in connection with matters relating to international cooperation, national security, and the effects of scientific applications upon society by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such activities. When initiated or supported pursuant to requests made by any other Federal department or agency, including the Office of Technology Assessment, such activities shall be financed whenever feasible from funds transferred to the Foundation by the requesting official as provided in section 14(g), and any such activities shall be unclassified and shall be identified by the Foundation as being undertaken at the request of the appropriate official."

64 Stat. 156; 82 Stat. 365. 42 USC 1873.

ANNUAL REPORT

SEC. 11. The Office shall submit to the Congress an annual report which shall include, but not be limited to, an evaluation of technology assessment techniques and identification, insofar as may be feasible, of technological areas and programs requiring future analysis. Such report shall be submitted not later than March 15 of each year.

APPROPRIATIONS

SEC. 12. (a) To enable the Office to carry out its powers and duties, there is hereby authorized to be appropriated to the Office, out of any money in the Treasury not otherwise appropriated, not to exceed $5,000,000 in the aggregate for the two fiscal years ending June 30, 1973, and June 30, 1974, and thereafter such sums as may be necessary.

(b) Appropriations made pursuant to the authority provided in subsection (a) shall remain available for obligation, for expenditure, or for obligation and expenditure for such period or periods as may be specified in the Act making such appropriations.

Approved October 13, 1972.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 92-469 (Comm. on Science and Astronautics) and
No. 92-1436 (Comm. of Conference).
SENATE REPORT No. 92-1123 (Comm. on Rules and Administration).
CONGRESSIONAL RECORD, Vol. 118 (1972):
Feb. 8, considered and passed House.
Sept.14, considered and passed Senate, amended.
Sept.22, Senate agreed to conference report.
Oct. 4, House agreed to conference report.

GPO 83-139

Technology Assessment Board

	Republicans	Democrats
Senate	*ALLOTT (Col.)	HOLLINGS (S. Car.)
	DOMINICK (Col.)	HUMPHREY (Minn.)
	SCHWEIKER (Penn.)	KENNEDY (Mass.)
House	GUBSER (Calif.)	*~~CABELL (Texas)~~ Teague
	HARVEY (Mich.)	DAVIS (Ga.)
	MOSHER (Ohio)	MCCORMACK (Wash.)

Members of the Technology Assessment Board

SENATORS:

GORDON LLEWELLYN ALLOTT, Republican, of Lamar, Colo.; born in Pueblo, Colo., January 2, 1907; graduated from the University of Colorado, B.A. 1927 and LL.B. 1929; honorary degrees: LL.D., Colorado College, 1964; D. Eng., Colorado School of Mines, 1967; LL.D., Colorado State University, 1968; LL.D., University of Colorado, June 1969; lawyer; county attorney of Prowers County in 1934 and 1940-46; district attorney 1946-48; Lieutenant Governor, two terms, 1950-54; member of Legislative Council; member State Board Bar Examiners, 1949-50; president, Lamar Rotary Club, 1937; secretary, Southeast Colorado Livestock Association, 1933-35; director and attorney, First Federal Savings & Loan Association; commissioned in U.S. Army Air Force, served 1942-46, South Pacific Theater with 339th Fighter Squadron; member, American Legion and Veterans of Foreign Wars; first chairman, Young Republican League of Colorado, 1935-38; chairman, Young Republican National Federation, 1941-46; Executive Committee, Young Republican National Federation, 1946-49; married to the former Welda O. Hall, May 15, 1934; elected chairman of Republican Policy Committee, January 1969, for 2-year term; reelected January 1971, for 2-year term; two children: Roger H., and Gordon L., Jr.; Episcopalian; Mason; United States Congressional Representative to the 17th General Assembly of the United Nations 1962; elected to the United States Senate November 2, 1954, for the term commencing January 3, 1955; reelected in 1960 for the term ending January 3, 1967, and again in 1966 for the term ending January 3, 1973

(Senator from Colorado)
Committee assignments: Appropriations
Interior and Insular Affairs
Joint Committee on Reduction of Federal Expenditures

PETER H. DOMINICK, Republican, of Englewood, Colo.; born July 7, 1915, in Stamford, Conn., son of Gayer G. and Eleanor Hoyt Dominick; graduated from Yale University in 1937 and Yale Law School, LL.B., in 1940; married the former Nancy Parks in 1940; four children, Peter, Jr., Michael, Lynne, and Sandy; during World War II served in the Army Air Corps as a pilot; awarded Air Medal and Cluster and Distinguished Flying Cross; partner of law firm of Holland & Hart, 500 Equitable Building, Denver 2, Colo., 1946 to January 1, 1961, and resigned to enter Congress; member of State House of Representatives 1957-61; elected to the 87th Congress November 8, 1960; elected to the United States Senate November 6, 1962, for the term ending January 3, 1969; reelected November 5, 1968.

(Senator from Colorado)
Committee assignments: Armed Services
Labor and Public Welfare
Joint Committee on Atomic Energy
Select Committee on Equal Educational Opportunity
Select Committee on Small Business
Select Committee on Nutrition and Human Needs

* These two Members were not re-elected to the 93rd Congress. The Speaker will appoint one Representative (Democrat) and the President pro tempore will appoint one Senator (Republican) to fill these vacancies.

ERNEST F. HOLLINGS, Democrat, of Charleston, S.C.; born in Charleston, S.C., January 1, 1922; son of Wilhelmine Meyer and Adolph G. Hollings; attended public schools, Charleston, S.C.; graduated, The Citadel, B.A., 1942; the University of South Carolina, LL.B., 1947; LL.D. conferred by The Citadel, June 1959; lawyer, member of Charleston County, South Carolina, and American Bar Associations; admitted to practice before South Carolina Supreme Court, U.S. District Court; U.S. Circuit Court of Appeals; U.S. Tax Court, U.S. Customs Court and U.S. Supreme Court; member, St. John's Lutheran Church; member, Court of Adjudication, Lutheran Church in America; Armed Forces, 1942–45, served overseas from Africa to Austria, 33 months; 353d Antiaircraft Artillery; 3d, 36th, and 45th Divisions, captain; member, highest honor society at The Citadel—The Round Table; president of the alumni (the Association of Citadel Men), 1954; at the University of South Carolina Law School—member, Honor Society, Wig and Robe, South Carolina Law Review, and president of Law Federation; honorary doctor of letters degree, Benedict College, Columbia, S.C., 1971; Charleston Junior Chamber of Commerce Distinguished Service Award as Young Man of the Year, 1953; U.S. Junior Chamber of Commerce, one of Ten Outstanding Young Men of the United States, 1954; South Carolina Veteran of the Year, 1957; member, Hibernian Society, Arion Society, Sertoma Club; Charleston Rifle Club: Mason. LeCandeur No. 36, A.F.M.; Shriner, Omar Temple; B.P.O.E. Lodge No. 242; American Legion, Post No. 10; Charleston Chamber of Commerce; Veterans of Foreign Wars; Capt. John L. Weeks Post No. 3142; elected to South Carolina General Assembly from Charleston County, 1948, 1950, and 1952; chairman, Charleston County legislative delegation; speaker pro tempore, South Carolina House of Representatives; elected twice by unanimous vote, 1951, 1953; elected Lieutenant Governor, November 2, 1954; elected Governor, November 4, 1958; served as Governor, 1959–63; appointed to Hoover Commission May 15, 1955; appointed by President Eisenhower to Advisory Commission on Intergovernmental Relations, December 1959; reappointed by President Kennedy February 1962; chairman, Regional Advisory Council on Nuclear Energy; instituted technical training program in South Carolina, Nuclear Space Commission, and Commission on Higher Education; four children: Michael Milhous, October 1, 1950; Helen Hayne, June 24, 1952; Patricia Salley, February 8, 1957; and Ernest Frederick Hollings III, March 8, 1959; author of The Case Against Hunger—A Demand for a National Policy, 1970; elected November 8, 1966, to complete the unexpired term of the late Senator Olin D. Johnston; reelected to full 6-year term November 5, 1968.

(Senator from South Carolina)
Committee Assignments: Appropriations (Legislative subcommittee)
Commerce
Post Office and Civil Service

HUBERT H. HUMPHREY, Democrat-Farmer-Labor, of Waverly, Minn.; born in Wallace, S. Dak., May 27, 1911; educated in South Dakota schools; graduated with degree from Denver College of Pharmacy; University of Minnesota with A.B. degree (Phi Beta Kappa); University of Louisiana with M.A. degree; honorary doctorate degrees from 39 colleges and universities; State Director, War Production, Training, 1942; assistant director, War Manpower Commission, 1943; professor in political science, Macalester College, 1943 and 1944; married Muriel Buck; four children; elected mayor of Minneapolis in 1945 and 1947; member of First Congregational Church of Minnesota; elected to the United States Senate on November 2, 1948, for the term commencing January 3, 1949; reelected in 1954 and again in 1960 for term ending January 3, 1967; Senate Majority Whip, 1961-64; served until his resignation December 29, 1964, having been elected Vice President November 3, 1964, for term beginning January 20, 1965; Democratic nominee for President of the United States in 1968; professor of political science and international affairs, Macalester College, 1969–70; professor in the social science program, University of Minnesota; chairman, board of consultants, and member, board of directors, Encyclopaedia Britannica Educational Corp.; member, board of directors, Encyclopaedia Britannica, Inc.; chairman, board of trustees, Woodrow Wilson International Center for Scholars; elected to the United States Senate November 3, 1970, for the 6-year term beginning January 3, 1971.

(Senator from Minnesota)
Committee Assignments: Agriculture and Forestry
Government Operations
Joint Economic Committee

REPRESENTATIVES:

EARLE CABELL, Democrat, of Dallas, Tex.; born on a farm south of the Trinity River in Dallas County, October 27, 1906, a son and grandson of former mayors of the city of Dallas; graduated from North Dallas High School in 1925; attended Texas A. & M. and Southern Methodist University; with two brothers organized in 1932 Cabell's, Inc. (dairies and drive-in food stores) and served as secretary-treasurer, executive vice president, president, and chairman of the board; married the former Elizabeth Holder of Little Rock, Ark., in 1932; two children, Elizabeth Lee (Mrs. William Pulley) and Earle, Jr.; member and officer of various professional, civic, and philanthropic organizations; formerly director and member of executive committee of Grand Avenue Bank & Trust Co., Dallas, Tex.; member of Dallas Country Club, Dallas Athletic Club, McKinney Club Lake, and City Club; mayor of Dallas from May 1, 1961, until his resignation February 3, 1964, to be candidate for Congress; elected to the 89th Congress November 3, 1964; reelected to the 90th Congress November 8, 1966; reelected to the 91st Congress November 5, 1968; reelected to the 92d Congress November 3, 1970.

(Representative from Texas)
Committee Assignments: District of Columbia
Science and Astronautics
Committee on the House Restaurant

JOHN WILLIAM DAVIS, Democrat, of Summerville, Ga., born September 12, 1916, in Rome, Ga.; attended the public schools; graduated from the University of Georgia, A.B. degree in 1937 and LL.B. degree in 1939; practiced law in Rome 1939-42; during World War II served 3½ years in the U.S. Army, assigned to the Counter Intelligence Corps, serving for a time in South America; in 1946 moved to Summerville, Ga., and continued the practice of law; solicitor general of the Rome Circuit, December 27, 1950, to January 1, 1953; judge of Lookout Mountain Judicial Circuit for six years, January 1, 1955, until his resignation December 31, 1960; married the former Vivian Hawkins of Walker County, Ga. (deceased); three children—Katherine DeLay, John W., Jr., and Mary Ellen; married Mrs. Bridget O'Sullivan Chrisman on June 26, 1971; Mrs. Davis has two children by a former marriage, Norman and Paul; elected to the 87th Congress November 8, 1960; reelected to the 88th, 89th, 90th, 91st, and 92d Congresses.

(Representative from Georgia)
Committee Assignments: Foreign Affairs
Science and Astronautics

CHARLES S. GUBSER, Republican, of Gilroy, Calif.; born February 1, 1916, in Gilroy, Calif.; graduate of Gilroy Union High School, San Jose State Junior College, and University of California (A.B. 1937); 2 years' graduate work at University of California; taught in California secondary schools; elected as assemblyman to California State Legislature in 1950; elected to the 83d Congress November 4, 1952; reelected to the 84th, 85th, 86th, 87th, 88th, 89th, 90th, 91st, and 92d Congresses.

(Representatives from California)
Committee Assignments: Armed Services

JAMES HARVEY, Republican, of Saginaw, Mich.; born July 4, 1922, in Iron Mountain, Mich.; enrolled in the University of Michigan in 1940 but studies were interrupted by 3 years of service in the U.S. Air Force; in 1946 enrolled in the University of Michigan Law School and graduated in 1948, LL.B. degree; commenced the practice of law in Saginaw in 1949; served as assistant city attorney 1949-53, city councilman, 1955-57, county supervisor 1955-57, and mayor 1957-59; Saginaw Junior Chamber of Commerce Distinguished Service Award 1957; one of Five Outstanding Young Men of Michigan 1957; married the former June Collins of Detroit, Mich.; two children, Diane and Thomas; elected to the 87th Congress, November 8, 1960; reelected to the 88th, 89th, 90th, 91st, and 92d Congresses.

(Representative from Michigan)
Committee Assignments: House Administration
Interstate and Foreign Commerce
Joint Committee on the Library

MIKE McCORMACK, Democrat, of Richland, Wash.; born in Basil, Ohio, December 14, 1921; educated at University of Toledo and Washington State University, B.S., M.S., in chemistry; attended Gonzaga University Law School; entered military service, 1943, as infantry rifleman; attended OCS and commissioned as second lieutenant, parachute infantry; occupation duty in Germany until 1946; honorable discharge as first lieutenant; instructor, University of Puget Sound, 1940-50; research scientist, Hanford Project, 1950-70; elected to Washington State House of Representatives, 1956; reelected 1958; elected to Washington State Senate, 1960; reelected 1964 and 1968; sponsor of all of State's nuclear energy legislation; coauthor and prime sponsor of 1970 Thermal Power Plant Siting Act; chairman, Americanism Committee, American Legion Post No. 71; member, V.F.W., Masons, Shrine, Grange, American Nuclear Society, Bonneville Power Administration Advisory Council, Washington Environmental Council, Richland Rod and Gun Club, and National Rivers and Harbors Conference; married Margaret Higgins of Toledo, 1947; three children, Mark, Steven, and Tim; elected to 92d Congress November 3, 1970.

(Representative from Washington)
Committee Assignments: Public Works
Science and Astronautics

CHARLES ADAMS MOSHER, Republican, of Oberlin, Ohio; born at Sandwich, Ill., May 7, 1906; graduated from Oberlin College, A.B., cum laude, 1928; married Harriet Johnson, 1929; son, Frederic A., and daughter, Mary Jane; employed on daily newspapers in Aurora, Ill. (1929-38) and Janesville, Wis. (1938-40); president of Oberlin Printing Co., and editor-publisher of Oberlin News-Tribune, 1940-62; member of Oberlin City Council, 1945-50; member of Ohio Senate five terms, 1951-60; member, Oberlin College Board of Trustees, 1964-1970; elected to the 87th Congress November 8, 1960; reelected to the 88th, 89th, 90th, 91st, and 92d Congresses.

(Representative from Ohio)
Committee Assignments: Merchant Marine and Fisheries
Science and Astronautics

APPENDIX C.

Chapter V. OPERATIONAL CONCEPTS FOR IMPLEMENTING TECHNOLOGY ASSESSMENT *

There are no good examples which could serve as a model for the operation of the Office of Technology Assessment organization. But enough is known about the process and approach of Technology Assessment to describe in brief what OTA will most likely be facing in simultaneously conducting a series of assessments. Several assumptions are made to simplify discussion: a Technology Assessment Board/joint committee would be the policy body providing direction to the Director and staff with both groups having access to the advice of the Technology Assessment Advisory Council. The particular form and specific relationships among these three elements are not critical to describing the Technology Assessment process.

There is a wide range of alternatives at each stage of the process of Technology Assessment and to treat all these possibilities is beyond the scope of this initial example. Only one general approach has been selected for development here (among many) and naturally other assumptions and approaches could be equally valid. But selecting one example and tracing this process will illustrate the basic concepts. It is believed this example will give a reasonable picture of Technology Assessment as we know it today. The objective of this presentation is to give to those deciding upon the legislative base, policy, organization, and resource structure for congressional Technology Assessment activities a view of what these concepts might look like in implementation.

This section outlines several functions involved in any assessment activity, including the establishment of the criteria for selecting subjects for assessments, the sequential flow of activities through the Office, and the criteria for selecting a Director and staff for the Office. The two closing sections describe in condensed form some of the functions of the staff and expected relationships between OTA and other organizations.

Selection Criteria for Assessment Subjects

There are many congressional committees with an interest in the actual or potential impacts of technology. There are at any time perhaps 200 major issues and many more lesser issues that might be offered as candidates for assessment. (See appendix C for a list of over 100 specific topics mentioned in recent congressional documents relating to technology assessment.) On what basis would the TAB decide which issues to undertake, and with what priority? A formal and well-understood set of criteria might be divided into three categories, with examples of specific criteria under each as follows:

(1) Intrinsic to the issue:

* U.S. Congress. Senate. Technology Assessment for the Congress. Committee on Rules and Administration. Subcommittee on Computer Services of the.... 92nd Congress. 2nd session. Wash.: U.S. G.P.O. November 1, 1972. pp. 51-60.

(*a*) Scope of impacts;

(*b*) Irreversibility of consequences (denying society future freedom of choice);

(*c*) Severity of impacts;

(*d*) Feasibility of congressional action.

(2) The way the issue is regarded:

(*a*) Evidence of prospective public concern—importance and urgency likely to be attached by the public;

(*b*) Estimated importance and urgency as judged by a requesting congressional committee;

(*c*) Relationship of the subject to ongoing investigations by congressional committees;

(*d*) Relationship of the subject to studies being conducted by or for the executive branch.

(3) The compatibility of a proposed assessment with resources available:

(*a*) Availability of an organization (or several organizations) competent to perform assessment functions in the subject;

(*b*) Dollars available;

(*c*) Ability of OTA staff to process the assignment by preparing a work statement, terms of reference, and other elements of a Request for Proposal (RFP);

(*d*) Availability of information sufficient to make the assessment; that is, do we know enough to make a judgment?

The Sequence of Assessment Actions

The purpose of this section is to describe how the preceding lists of criteria and functions could be implemented. The flow of events would include recognition of a problem or opportunity for assessment by a committee or other source, acceptance or rejection of the proposed assessment by the Board, project initiation and monitoring, evaluation of results, and finally translation of these findings into alternative considerations for the requestors.

Several points should be made in preamble. First, technology assessments is an open-ended process, so that additional participants and contributions will always be entering into it, posing additional questions. Second, two broad classes of items will need assessment: one set of issues estimated to have high future impact but which are not yet of significant public concern; and the other of issues already the subject of wide and intense public concern and controversy. These two classes of items are likely to follow somewhat different paths of processing. Third, many variations in functional flow, and many additional loops can be added to the system described here; it is intended to be illustrative rather than definitive.

Step one: Submitting requests to the Office of Technology Assessment.

Two kinds of issues are likely to be of major interest to the OTA: (1) issues already of congressional concern and probably the subject of pending legislation; and (2) long-range issues of potentially great future impact. Requests for assessments in either case would originate from some concerned congressional committee. In the first case, the request would relate to generating information bearing on pending

legislation before the committee, or (in the case of select, special, or joint committees) issues under study.

In the second case, the request could evolve from an extended sequence involving the interested committees, CRS, GAO, and possibly nonlegislative organizations.

Step two: OTA selects assessment issues.

One of the most difficult tasks to face the OTA is the choice among candidate issues of technology to be assessed, and the scope and intensity of the assessment effort.

Philosophically, the problem is a simple one. If one assumes that a typical assessment will cost in the range of $100,000 to $1 million and the OTA has $3 million to invest in assessments, it has the choice of performing three major ones or 30 smaller ones, or something in between. The probability is that issues raising the most intense controversy will be the most urgent candidates, but they will also be the most costly to assess. They are also likely to yield the least acceptable results because of their controversial nature. Conversely, technologies having a long-range future impact can be assessed over a longer time frame, at a lower total cost, and could be expected to provide more credible and politically acceptable results. Judged on the basis of cost-benefit criteria alone, these latter kinds of assessments would be the most efficient use of resources.

Developing an accepted set of criteria for securing candidate assessments is more than an abstract exercise. Strong forces within and outside the OTA would be brought to bear on initiating or inhibiting specific assessments and for shaping the directions of those chosen for action. An explicit and clear set of criteria developed in advance of authorizing the first assessment would seem to be a wise priority action for the OTA.

One consideration within these criteria is the availability of a study team having competence to conduct an assessment study to the depth and breadth required. A function of the OTA staff, presumably, would be to assemble a roster of such teams, with an evaluation of their competence in this new field of research, and to maintain this roster up to date. This is a considerable task, in view of the characteristic mobility of the kinds of people involved.

Another task in which the OTA staff might usefully serve would be to analyze the leading candidate issues as to the kinds of analytical methodologies of assessment that might be appropriate, and to prepare descriptions of the required analytical steps and kinds of information the assessment would require. Methodological requirements would provide one source of guidance in determining whether the issue could feasibly be assessed and which teams were best equipped to do the work. This information would also be useful in drafting requests for proposal to be sent, later, to a selected number of prospective contract bidders, both public and private.

Another problem involves scheduling. Technology issues should be selected for assessment so that they will not all be completed at the same time and overload the analytical capacity of the OTA staff. A hump in assessment deliveries would also impose a heavy burden on the evaluation functions of the OTA. Other practical considerations are the time available to the Congress and its standing committees to consider

OTA reports, and the question of how to make public the large amounts of OTA information that are certain to be generated.

Step three: Selecting the organization to perform the study.

Study contracts are among the most difficult to design and negotiate because quality of work is virtually impossible to write into specifications. In developing contracts for Technology Assessments, this difficulty is compounded because (*a*) the process has not been adequately developed, (*b*) specific methodologies are only currently being developed, primarily in university and nonprofit organizations, and (*c*) there has been little demonstration of proficiency in the process to enable selection of contractors on the basis of past performance. Cost, although important, should be secondary to assure competence and integrity of the performing team in a study contract. Experience with past performance and knowledge about team leadership are important selection criteria. It is likely, therefore, that in the contract placement phase of its work, the OTA would have to learn by experience for the first 3 or 4 years.

For some assessment tasks no one organization will exist with the full range of capabilities required for a priority assessment task. At the same time, units at several institutions may possess parts of the required expertise, and could be combined into an organizational team possessing all the needed competence. In such cases, the OTA operational staff would be faced with a decision as to whether (*a*) negotiate with one prime contractor to assemble a team, or (*b*) announce its request for proposal (RFP) with a long enough lead time for several potential contractors to try to bid jointly offering the full capabilities required. Both approaches are used in private industry's negotiations on aerospace contracts.

An additional point to be stressed is that in the negotiation of study contracts, unless there is approximately equal expertise on both sides of the bargaining table, the product is unlikely to be worth the cost. Work statements need to be written with care, discussed with the project leader, and every effort made to assure complete mutual understanding of what the contract entails.

Step four: Contract Management.

Once a contract has been placed for an assessment by an outside contracting organization, the OTA staff would have the continuing responsibility for managing the contract. This phase also requires equal expertise on the part of the contractor and contracting agency. The sponsoring organization should maintain contact through frequent progress reports and briefings. On large tasks, a resident (with the contractor) monitor would be the best solution. Study contracts are almost always amended in process. To anticipate all questions in the original design of the work statement would require a rare talent in foreseeing the unexpected. Findings turned up in the course of the study usually alter the requirements of the assessment. Sometimes, research under phase I of a study produces information that makes parts of phase II or phase III unnecessary or irrelevant. Only by close and continuing working relations between the contractor and the sponsoring institution can a research contract be properly managed to produce the expected results. There is a rather generally accepted rule that proper monitoring of a contract costs the contracting agency

in in-house resources an amount equal to 10 percent of the size of the contract.

An important function of the OTA staff in contract monitoring would be to keep the Director and the Board informed of progress, and to serve as intermediary to insure that the wishes of the OTA regarding the contractor's research design and completeness of the investigation are registered in contract modifications or otherwise communicated to the contractor's research team. A key question that would arise here is the degree to which interaction between the requesting committee and the contractor will be arranged.

Step five: Analyzing reports from contractors.

Results of study contracts could be delivered in several ways: Progress reports, comprehensive final reports suitable for publication, a series of briefings accompanied by a report, or a succinct statement of findings accompanied by voluminous appendices that are intended only for reference and documentation.

The obligation of the contractor should not be ended with the submission of the final report. Clarification of meanings, amplification of incompletely developed themes, further substantiation of weak arguments, and strengthened documentation may be required.

The delivered product from the contractor would require further analysis and evaluation by the OTA staff. The methodologies used may require explanation in lay terms. The essential meaning of findings may need to be extracted and put in the context of the larger issues under consideration by the sponsoring committee. In some cases, a single assessment would involve work by two or more contractors whose products would need to be combined into a united set of findings by the OTA staff. As now visualized the report on the assessment that goes to the initiating committee would not contain recommendations for action or legislation. However, it should be action oriented in that it should provide evidence to help in the congressional decision making process, and documentation to support the decision of Congress. Normally, one would expect the report to be prepared by the OTA staff, approved by the OTA Director, reviewed by the board/committee, and, if satisfactory, then transmitted to the requesting committee. A possible issue between the board/committee and sponsoring committee will be access to the "raw" reports of the contract without or together with board/committee review.

One almost invariable element of final reports of study contracts is a section titled "recommendations for future research." The usual purpose of such an entry is in hope of continuing the contract relationship for another assignment. (The team has been assembled, has learned to work together, has completed its job, and prefers not to disband. And, in general, as a practical matter, if there is another job it could do, it is cheaper to use a going concern than to start from scratch to build a new one.) However, in Technology Assessment studies, the section on "recommendations for further research" has special meaning. Examination of this section can be instructive in making a determination as to whether the scope of the assessment has been sufficiently broad, and whether serious uncertainties remain to be resolved.

Step six: Transmitting findings to the requesting committee.

Another unresolved issue is the relationship of the OTA staff and the TAB to the requesting committee. Would the staff be available for

consultation and assistance in interpreting the report? Would it be proper for them to assist in framing legislation? Should they serve as expert witnesses? Their knowledge would undoubtedly make them useful but to participate in a program of legislative action might compromise their objectivity. It is suggested that the relationship between the OTA staff and congressional committees and their staffs needs to be given close attention.

The original concept of an OTA was of a technical organization somewhat insulated from the political decision process. It would provide the technical input to that process but no more. The conversion of the Board to an all congressional organization changes the original situation.

Conceptually, at least, this could be an area for contribution by the Advisory Council. But here also, policies and procedures will need to be developed to create both the reality and appearance of objectivity and openness.

In conclusion, it might be noted that this discussion raises one of the really basic issues in Technology Assessment. By definition, TA is to be as objective, scientific, and explicit a process as possible. Also by definition, TA must take into account the values, goals, desires, and rights, of all participants and those affected by the decisions. Creating one coherent process to accommodate these conflicting requirements is the challenge facing the policymakers framing the TA legislation and Office. If an act is passed, this challenge will then be the responsibility of the OTA, and possibly the Advisory Council of the Technology Assessment organization.

Director and Staff Selection Criteria

It has been suggested that the proposed Office of Technology Assessment will only be as good as the people recruited to staff it. The most critical position is, of course, that of the first Director. What follows are some selections from testimony and comments on the qualifications of both the Director and the other staff members.

Both special advisory group reports and congressional testimony have addressed the need for high-level professional competence for both Director and staff of the OTA. For example, in describing the qualifications for director and staff of a Congresswide technology assessment mechanism, the National Academy of Sciences reported:

> Both the director and his staff should be compensated at sufficiently high rates to make it possible to attract first-rate men. The staff should include representation from a variety of scientific and nonscientific disciplines. * * *[1]

Mr. Elmer Staats, Comptroller General, was even more specific with respect to the high-level professional qualifications the Director would need, putting him on a par with the Directors of the National Science Foundation, Office of Science and Technology, and the Administrator of the Environmental Protection Agency:

> We would suggest that the Director be compensated at the level II rate, under the Executive salary schedule, and the Deputy Director at level III. This would then place them on the same levels as the Director of the National Science Foundation and the Deputy Director. This is also the rate which is provided for

[1] U.S. Congress. House. Committee on Science and Astronautics. *Technology: Processes of Assessment and Choice*. Report of the National Academy of Sciences (Washington: U.S. Government Printing Office, 1969), p. 106.

in the newly established Office of Environmental Quality. [Finally called EPA.] The Director of the Office of Science and Technology is also level II. So here are three positions that we see roughly comparable in terms of type of background required, in terms of level of responsibility. Therefore we believe it would be well to have the Director equated with the status of the three posts which I have just indicated.[2]

"* * * The role of the OTA Director," according to testimony before the House Committee on Science and Astronautics, "is that of chief expert in the management of technology assessments." Furthermore, "it will be of the utmost importance that the Director * * * preserve an absolutely unbiased posture." [3]

The need for an especially well qualified professional and politically neutral Director derives from the wide-ranging functions he will be required to perform. For instance, suggestions for the conduct of pilot technology assessments would be made by a number of different Members of Congress. The Director would be responsible for coordinating these suggestions and would assist in the selection of assessments to be performed. He would oversee research designed to develop and refine the methodology of technology assessment. He would coordinate staff activities in awarding and monitoring contracts for pilot assessments and would administer utilization of new systematic information gathering procedures to provide the Congress with up-to-date early warning information. Similarly he would need to command the respect of his peers in order to solicit the expertise of a number of individuals familiar with technologies of possible interest to all Members of Congress. And especially important are his responsibilities in support of overseeing the evaluation of assessments and the positing of alternatives to Congress relating to the implementation of technologies.

The National Academy of Sciences outlined specific staff functions for the congressional technology assessment mechanism in the report it prepared for the House Committee. It is readily apparent that a high quality staff with requisite professional competence would be required to support these responsibilities, which include:

To enlist the aid of outside organizations . . . in obtaining specific assessments and developing new assessment tools and criteria;

To utilize the information-management systems (of the executive branch) or conceivably, to establish a second such system;

To obtain on request from executive agencies data bearing critically on technologies supported or regulated by them;

To organize congressional hearings upon, and assist in the formulation of recommendations with respect to, assessment activities conducted in various parts of the Government;

To review and comment upon all technology-assessment studies, policy papers, and reports released * * *;

To file reports on their own initiative; and

To equip Congress with a mechanism for generating conclusions of its own bearing on technology-assessment issues and priorities, supported by a systematic search of current professional literature and by continuing contacts with professional groups.[4]

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[2] U.S. Congress. House. Committee on Science and Astronautics. *Technology Assessment—1970.* Hearings before the Subcommittee on Science, Research, and Development on H.R. 17046. May and June 1970. 91st Cong., first sess. (Washington: U.S. Government Printing Office, 1970), p. 11.

[3] Ibid., p. 69.

[4] *Technology: Processes of Assessment and Choice,* op. cit., pp. 103–104.

A related issue that arises in connection with staffing is that of the term of office for the Director and the nature of the employment contract with the staff.

OTA Staff Functions

It is not suggested in any of the proposed drafts of technology assessment legislation that the staff of the Office of Technology Assessment would itself perform the assessments of technological impacts. The prospective demands of this open-ended process would be so great that no adequate staff could reasonably be recruited and maintained to perform all the required functions, in all the disciplines that a variety of concurrent assessments call for. Nevertheless, preparation of request for proposals, and negotiating and monitoring contracts for studies and assessments would require skilled professionals on the staff of OTA, as well as administrators and generalists to process contractual and fiscal information. The functions this staff might be expected to perform would perhaps include the following five general categories, with illustrative items under each:

1. Marshall the resources to conduct assessments, including:

   Establish a panel of expert consultants to be available on call, with qualifications suited to assessment activities in prospect;

   Develop and maintain a roster of available research organizations, with notations as to their special competences as contractors in particular fields of technology assessment;

   Upon OTA determination that a particular technology assessment should be undertaken, prepare formal requests for proposal, including description of the issue, terms of reference, proposed work statements, illustrative questions, cost estimates, contractor selection criteria, and the like; and

   With OTA approval and direction, negotiate with proposing institutions and make recommendations as to selection of a contractor (or group of contractors), and as to contract scope, terms and conditions.

2. Prepare proposals, develop and maintain materials for consideration and use by OTA, including:

   Prepare suggested criteria for selection of candidate issues for assessment;

   Develop and maintain files of data relating to candidate issues;

   Maintain surveillance on all candidate issues to detect changes in their importance and urgency;

   Analyze candidate issues for assessment: (a) develop preliminary cost estimates, (b) identify important impacts requiring particular attention, and (c) identify assessment, approaches, and methodologies required; and

   Prepare draft material for any required reports.

3. Monitor all contracts, including:

   With the assistance of consultants engaged for specific contract services, maintain close surveillance over the conduct of contracted assessments;

   Report periodically to OTA on progress, the need for contract modification, and on possible need or opportunities for other studies;

Maintain files of contractor interim reports and findings and inputs from other sources to be a part of the public disclosure of the completed assessment;

Arrange, as appropriate, interim briefings for TAB and sponsoring committee, and introduce into the assessment process changing information and requirements; and

Maintain liaison with the National Science Foundation and other research organizations as to the "state of the art" in technology assessment methodologies.

4. Convey assessments to initiating committees, including:

Upon completion of contract assessment studies, analyze these and prepare evaluations on the findings for TAB consideration;

Consult with contractor and obtain briefings on all aspects of the completed work;

With Board approval, prepare a report for public release to disclose findings and their substantiation; and

On assignment by the Board, at the request of the initiating committee, give briefings and assist in the preparation of the hearings on the technology issue when it becomes the subject of proposed legislation.

5. Management leadership and administrative support, including:

Develop policies, plans, organization structure, and procedure for the conduct of the affairs of the Board/Committee, Advisory Board and Office; and

Arrange for logistics, personnel, fiscal and contract administration services.

Just as the legislative proposals for OTA do not specify that the assessments shall be conducted by the in-house staff, they do not prohibit the practice. It is probable that on selected occasions either the urgency or the sensitivity of an issue might be such that a portion of the office technical staff would be selected to perform the assessment. Some advisers suggest that a small fraction of the in-house staff should be continuously devoted to the conduct of actual assessments. The rationale for a partial do-it-yourself operation is for the maintenance of skills of the technical staff and for an improved basis for comparative quality with the contracted efforts.

OTA Relationships With Other Organizations

Of considerable interest and importance is the relationship between the proposed Office of Technology Assessment and those public and private groups, agencies, and organizations which may provide its primary inputs. Some of these inputs are made explicit by statutory provisions of the proposed legislation, whereas others remain implied and somewhat indeterminate.

In view of the growing interest in technology assessment, primary inputs from the public sector can be anticipated from all levels of government, including Federal, State, and local. On the Federal level, many executive departments and agencies are already actually engaging in assessments within their fields of responsibility. The Office of Science and Technology (OST) and the National Science Foundation (NSF) have been active in this field and growth of NSF activities can be anticipated. It is not clear what role, if any, the OST will continue

to play with respect to technology assessment. (The statutory responsibilities assigned to the NSF by the OTA legislation will be discussed later.)

On the State level, many research and advisory bodies already have been established, some by statute and others on an ad hoc basis, to advise State officials on matters relating to technology assessment. The rapid growth of this trend can be anticipated, as well as the growth of local groups specifically concerned with technical and scientific issues of local interest. As the primary national body responsible for technology assessment, the OTA might serve as a focus for such activities, receiving inputs, offering broad policy guidance, and providing feedback to other programs.

The NSF would be unique among these activities in its statutory responsibilities for maintaining continuous liaison with the OTA, letting contracts and grants "for purposes of technology assessment," and coordinating various activities to minimize duplication of efforts. The details of this liaison are not yet clear, but it is evident that if OTA is to guide the direction of NSF technology assessment research, and is to derive full benefits from it, then close and continuing contact would seem to be required.

In the private sector, many inputs could be anticipated from industry as well as from educational and nonprofit institutions. Although little technology assessment activity has been undertaken thus far by industry, other than that stimulated by requirements of the Environmental Protection Agency, growth in such activities is probable. At least one of the largest U.S. corporations is reported to have taken administrative action to build a TA capability in-house. Likewise, the historic interest and concern displayed by educational and nonprofit institutions on issues relating to the common welfare assure their continued and increased participation. Again, these diverse activities could provide important inputs to the central role of the OTA.

The foregoing activities primarily represent OTA inputs from outside the congressional organizational sphere. Other inputs include those provided by the General Accounting Office (GAO) and the Congressional Research Service (CRS). Like the NSF, GAO and CRS are given statutory responsibilities by the Technology Assessment Act of 1972, including authorization for the CRS to establish within its present structure any organizational entities necessary to furnish services to the OTA.

In sum, many inputs would impact upon the proposed OTA from outside sectors in a highly unstructured way and from within the Congress itself. The primary task of the Office would be to establish a successful match between these forces so as to achieve what the Congress desires.

Appendix D.

(Note: This listing represents a selection of documents which the authors believe represent a thorough and current background for Members and staff on both the Office of Technology Assessment and the broader TA movement.)

Background Studies

Technology: Process of Assessment and Choice. Prepared by an ad hoc panel of the National Academy of Sciences Committee on Science and Public Policy, under the direction of Dr. Harvey Brooks. Considered one of the earliest and best expositions on the theory and practice of technology assessment. (1969).

A Study of Technology Assessment. Prepared by an ad hoc panel of the Committee on Public Engineering Policy, National Academy of Engineering. Presented recommendations on the methodology, feasibility and policy implications of technology assessment. (1969).

Technical Information for Congress. Prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress. Series of 14 case studies describing and assessing resolution of legislative issues with a technical content. Printed first as a Committee Print (1969), then as a House Document; was reissued in revised form in 1971.

Toward Balanced Growth: Quantity With Quality. Report of the National Goals Research Staff. Chapter Six details the growth of the technology assessment movement and describes major policy problems with the prospect of doing technology assessment in a formal fashion. (1970).

Recent Articles

Joseph F. Coates. "Technology Assessment: The Benefits...the Costs...the Consequences". The Futurist. December 1971. Lists several trends which make it mandatory that society develop early warning techniques, and offers different views on decision-making functions of technology assessment. Includes cost and necessary team skills criteria, and notes the unresolved issues in technology assessment methodology.

David M. Kiefer. "Assessing Technology Assessment". The Futurist. December 1971. Survey of current assessment activity and comments on how such planning methods might be implemented into decision-making mechanisms.

Richard A. Carpenter. "The Scope and Limits of Technology Assessment." Organization for Economic Cooperation and Development. January 26, 1972. Description of technology assessment as a policy analysis tool, and study of the difficulties and limitations apparent with current assessment activities.

Technology Assessment. A quarterly journal of the International Society for Technology Assessment (ISTA) which contains general and in-depth articles on the methodology, organization and activities involving technology assessment. The Society's Washington office is located at 1015 Eighteenth Street, N.W. Washington, D.C. 20036. Telephone (202) 293-7750.

Books and Reports

Technology Assessment: Understanding the Social Consequences of Technological Applications. Edited by Raphael G. Kasper (1972). Proceedings from a series of seminars on the processes and mechanisms of technology assessment held at the Program of Policy Studies in Science and Technology at The George Washington University. Includes the ten papers presented during the series as well as summaries of the major points raised in the discussion sections.

Technology and Public Policy. The Process of Technology Assessment in the Federal Government. Prepared by Vary T. Coates, George Washington University Program of Policy Studies, under NSF Research Grants (1972). 3-Volume report which includes extensive survey and analysis of technology assessment activity within the Executive Branch. Summary volume presents the conclusions drawn from the research, with a series of recommendations for the improvement of the technology assessment process in Federal agencies.

A Technology Assessment Methodology. Prepared by Martin V. Jones, MITRE Corporation, under contract to the Office of Science and Technology (1971). Exploratory technology assessment project which developed an analytical framework and structured procedure through five pilot studies that could be used for anticipating the societal impacts of major technologies. Detailed findings are reported in six volumes; summary volume presents conclusions and primary findings of each pilot study involved in the project.

Technology Assessment in a Dynamic Environment. Forthcoming publication prepared by Marvin Cetron, Bodo Bartocha and Christine Ralph. Anthology of scholarly articles of where technology assessment has been, is, and where it may be going. Contributors include American and European academics and TA practitioners.

Recent Congressional Documents

House. Committee on Science and Astronautics. Establishing the Office of Technology Assessment and Amending the National Science Foundation Act of 1950. House Report No. 92-469, 92nd Congress, 1st Session. August 16, 1971. Washington, U.S.G.P.O.

Senate. Committee on Rules and Administration. Office of Technology Assessment for the Congress. Hearings before the Subcommittee on Computer Services. March 2, 1972. 92nd Congress, 2nd Session. Washington, U.S.G.P.O.

Senate. Committee on Rules and Administration. Technology Assessment Act of 1972. Senate Report No. 92-1123, 92nd Congress, 2nd Session. September 13, 1972. Washington, U.S.G.P.O.

House. Committee of Conference. Technology Assessment Act of 1972. Conference Report No. 92-1436, 92nd Congress, 2nd Session. September 25, 1972. Washington, U.S.G.P.O.

Senate. Committee on Rules and Administration. Technology Assessment for the Congress. Staff study of the Subcommittee on Computer Services. November 1, 1972. 92nd Congress, 2nd Session. Washington, U.S.G.P.O.: This study

contains definitions of the terms used in the Technology Assessment Act, a detailed history of proposals for an Office of Technology Assessment, and outlines some activities in Government and industry which are part of the technology assessment movement. The operational concepts for implementing the Office and a methodology for technology assessment are also included.

Bibliographic Reviews

Technology Assessment: Annotated Bibliography and Inventory of Congressional Organization for Science and Technology. Prepared for the Subcommittee on Science Research and Development, Committee on Science and Astronautics, U.S. House of Representatives. 91st Congress, 2nd Session. Washington, U.S.G.P.O. July 15, 1970. The articles, books, papers and congressional publications included in the first part of this committee print deal with the concept of technology assessment, proposals made for the organization of technology assessment mechanisms in government, and examples of technology assessments completed or in process.

"Bibliographic Review of Technology Assessment". Prepared by Genevieve J. Knezo for Technology Assessment, Vol. 1, No. 1 (1972). Extensive review of technology assessment materials current to March 1972. The author includes legislative history; popular, professional and scholarly critique; methodology; implications for public policy; cases of illustrative pilot technology assessments; international technology assessment activities; and forthcoming literature. This review was reprinted as an appendix to the Senate Committee Staff Study cited above (Technology Assessment for the Congress).