[JOINT COMMITTEE PRINT]

APPLICATION OF TECHNOLOGY TO HANDICAPPED INDIVIDUALS: PROCESS, PROBLEMS AND PROGRESS

A JOINT REPORT

PREPARED FOR THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

AND THE

SUBCOMMITTEE ON THE HANDICAPPED

OF THE

COMMITTEE ON
LABOR AND HUMAN RESOURCES
UNITED STATES SENATE

NINETY-SIXTH CONGRESS

SECOND SESSION

BY THE

SCIENCE POLICY RESEARCH DIVISION
CONGRESSIONAL RESEARCH SERVICE
LIBRARY OF CONGRESS

Serial HH



APRIL 1980

Printed for the use of the Committee on Science and Technology and the Committee on Labor and Human Resources, U.S. Senate

---

U.S. GOVERNMENT PRINTING OFFICE
60-319 O WASHINGTON : 1980

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

COMMITTEE ON LABOR AND HUMAN RESOURCES

HARRISON A. WILLIAMS, JR., New Jersey, *Chairman*

JENNINGS RANDOLPH, West Virginia
CLAIBORNE PELL, Rhode Island
EDWARD M. KENNEDY, Massachusetts
GAYLORD NELSON, Wisconsin
THOMAS F. EAGLETON, Missouri
ALAN CRANSTON, California
DONALD W. RIEGLE, JR., Michigan
HOWARD M. METZENBAUM, Ohio

RICHARD S. SCHWEIKER, Pennsylvania
JACOB K. JAVITS, New York
ROBERT T. STAFFORD, Vermont
ORRIN G. HATCH, Utah
WILLIAM L. ARMSTRONG, Colorado
GORDON J. HUMPHREY, New Hampshire

STEPHEN J. PARADISE, *General Counsel and Staff Director*
MARJORIE M. WHITTAKER, *Chief Clerk*
DAVID A. WINSTON, *Minority Staff Director*

SUBCOMMITTEE ON THE HANDICAPPED

JENNINGS RANDOLPH, West Virginia, *Chairman*

THOMAS F. EAGLETON, Missouri
DONALD W. RIEGLE, JR., Michigan

ROBERT T. STAFFORD, Vermont
RICHARD S. SCHWEIKER, Pennsylvania

PATRIA FORSYTHE, *Subcommittee Staff Director*

DON FUQUA, FLA., CHAIRMAN

ROBERT A. ROE, N.J.
MIKE McCORMACK, WASH.
GEORGE P. KRUEGER, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
JIM LLOYD, CALIF.
JEROME A. AMBRO, N.Y.
MARILYN LLOYD BOUQUARD, TENN.
JAMES J. BLANCHARD, MICH.
DOUG WALGREN, PA.
ROBERT G. FLIPPO, ALA.
DAN GLICKMAN, KANS.
ALBERT GORE, JR., TENN.
WES WATKINS, OKLA.
ROBERT A. YOUNG, MO.
RICHARD C. WHITE, TEX.
HAROLD L. VOLKMER, MO.
DONALD J. PEASE, OHIO
HOWARD WOLPE, MICH.
NICHOLAS MAVROULES, MASS.
BILL NELSON, FLA.
BERYL ANTHONY, JR., ARK.
STANLEY N. LUNDINE, N.Y.
ALLEN E. ERTEL, PA.
KENT HANCE, TEX.

JOHN W. WYDLER, N.Y.
LARRY WINN, JR., KANS.
BARRY M. GOLDWATER, JR., CALIF.
HAMILTON FISH, JR., N.Y.
MANUEL LUJAN, JR., N. MEX.
HAROLD C. HOLLENBECK, N.J.
ROBERT K. DORNAN, CALIF.
ROBERT S. WALKER, PA.
EDWIN B. FORSYTHE, N.J.
KEN KRAMER, COLO.
WILLIAM CARNEY, N.Y.
ROBERT W. DAVIS, MICH.
TOBY ROTH, WIS.
DONALD LAWRENCE RITTER, PA.
BILL ROYER, CALIF.

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515

HAROLD A. GOULD
EXECUTIVE DIRECTOR

PHILIP M. TRADER
REGINA A. DAVIS
RALPH H. READ
JERRY STAUB
DARRELL R. SHANNONHOUSE
JAMES W. SPENSLEY
STEPHEN LANES
JAN W. MARCEAU
THOMAS N. MOSS

PAUL A. VANDER HYDE
MINORITY STAFF DIRECTOR

April 3, 1980

LETTER OF TRANSMITTAL

Hon. Don Fuqua, Chairman
Committee on Science and Technology
U. S. House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

In order to adequately explore the diversity of existing emerging and conceptual developments aimed at helping persons with disabilities and to identify issues relating to the application of these technological developments in this area, three panel/workshops were planned and held at the Library of Congress in November, 1979. These workshops were sponsored by us and the Congressional Research Service.

This report contains materials which will be useful to the Congress and will aid its future review of this vital area. The participants in the panel/workshops explored several developments in the area of technology for the disabled, and discussed issues relative to the accessibility of such technology. We believe that the Congress will use this document in order to effectively respond to current and future needs of this most unique population. In addition, this report may be of interest to many persons in Government, industry, academia, and the general public. To insure their general availability, we have asked that this document be published as a Committee print.

We wish to thank Gilbert Gude, Director of the Congressional Research Service, and his staff for their fine actions in responding to our request.

Very truly yours,

GEORGE E. BROWN, JR.
Chairman
Subcommittee on Science,
Research and Technology
U. S. House of Representatives

JENNINGS RANDOLPH
Chairman
Subcommittee on the
Handicapped
U. S. Senate

DON FUQUA, FLA., CHAIRMAN
ROBERT A. ROE, N.J.
MIKE MC CORMACK, WASH.
GEORGE E. BROWN, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
JIM LLOYD, CALIF.
JEROME A. AMBRO, N.Y.
MARILYN LLOYD BOUQUARD, TENN.
JAMES J. BLANCHARD, MICH.
DOUG WALGREN, PA.
RONNIE G. FLIPPO, ALA.
DAN GLICKMAN, KANS.
ALBERT GORE, JR., TENN.
WES WATKINS, OKLA.
ROBERT A. YOUNG, MO.
RICHARD C. WHITE, TEX.
HAROLD L. VOLKMER, MO.
DONALD J. PEASE, OHIO
HOWARD WOLPE, MICH.
NICHOLAS MAVROULES, MASS.
BILL NELSON, FLA.
BERYL ANTHONY, JR., ARK.
STANLEY N. LUNDINE, N.Y.
ALLEN E. ERTEL, PA.
KENT HANCE, TEX.
JOHN W. WYDLER, N.Y.
LARRY WINN, JR., KANS.
BARRY M. GOLDWATER, JR., CALIF.
HAMILTON FISH, JR., N.Y.
MANUEL LUJAN, JR., N. MEX.
HAROLD C. HOLLENBECK, N.J.
ROBERT K. DORNAN, CALIF.
ROBERT S. WALKER, PA.
EDWIN B. FORSYTHE, N.J.
KEN KRAMER, COLO.
WILLIAM CARNEY, N.Y.
ROBERT W. DAVIS, MICH.
TOBY ROTH, WIS.
DONALD LAWRENCE RITTER, PA.
BILL ROYER, CALIF.

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515

HAROLD A. GOULD
EXECUTIVE DIRECTOR
PHILIP B. YEAGER
REGINA A. DAVIS
RALPH N. READ
JERRY STAUB
DARRELL R. BRANSCOME
JAMES W. SPENSLEY
STEPHEN LANKS
IAN W. MARCEAU
THOMAS H. MOSS
PAUL A. VANDEN HYDE
MINORITY STAFF DIRECTOR

April 3, 1980

LETTER OF TRANSMITTAL

Hon. Harrison A. Williams, Chairman
Committee on Labor and Human Resources
U. S. Senate
Washington, D. C. 20510

Dear Mr. Chairman:

In order to adequately explore the diversity of existing emerging and conceptual developments aimed at helping persons with disabilities and to identify issues relating to the application of these technological developments in this area, three panel/workshops were planned and held at the Library of Congress in November, 1979. These workshops were sponsored by us and the Congressional Research Service.

This report contains materials which will be useful to the Congress and will aid its future review of this vital area. The participants in the panel/workshops explored several developments in the area of technology for the disabled, and discussed issues relative to the accessibility of such technology. We believe that the Congress will use this document in order to effectively respond to current and future needs of this most unique population. In addition, this report may be of interest to many persons in Government, industry, academia, and the general public. To insure their general availability, we have aksed that this document be published as a Committee print.

We wish to thank Gilbert Gude, Director of the Congressional Research Service, and his staff for their fine actions in responding to our request.

Very truly yours,

GEORGE E. BROWN, JR.
Chairman
Subcommittee on Science,
Research and Technology
U. S. House of Representatives

JENNINGS RANDOLPH
Chairman
Subcommittee on the
Handicapped
U. S. Senate

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

LETTER OF SUBMITTAL

February 25, 1980

Honorable Jennings Randolph
Chairman, Subcommittee on the Handicapped
U. S. Senate
Washington, D.C. 20515

Dear Mr. Chairman:

I am pleased to submit this transcript of three panel/workshops plus original materials dealing with "The Application of Technology to Handicapped Individuals." The panel/workshops were organized and materials prepared at the request of the Subcommittee on Science, Research, and Technology, U.S. House of Representatives, Science and Technology Committee and the Subcommittee on the Handicapped, U.S. Senate, Labor and Human Resources Committee.

The major purposes of the workshops were to explore the diversity of existing, emerging and conceptual developments in technology aimed at helping persons with disabilities participate more fully in the community in which they live and to identify and discuss relevant issues relating to the proper applications of technology developments in this area.

Featured in this publication is an overview introduction entitled, "Application of Technology to Handicapped Individuals: The Need and the Legislative Background," presentations and discussions concerning five technologies (information resources, educational, rehabilitation, communications, and environmental facilities) and brief synopses of potential issues for discussion along with transcripts of the actual discussions of some of these issues. The publication concludes with a set of relevant and basic references.

The organization and implementation of the three panel/workshops --including selection of topics and speakers--and the preparation of the manuscript for publication--including preparation of introductory materials for the entire effort as well as for the specific panel/workshops--was the responsibility of Marvin Kornbluh, Specialist in Information Science and Futures Research, Science Policy Research Division. In addition, Pamela Smith, Analyst in Life Sciences, Science Policy Research Division made many valuable suggestions with respect to organization and elaboration of the workshop topics and contributed to the formulation and implementation of the logistics arrangements.

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

LETTER OF SUBMITTAL

February 25, 1980

Honorable George E. Brown, Jr.,
Chairman, Subcommittee on Science, Research and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am pleased to submit this transcript of three panel/workshops plus original materials dealing with "The Application of Technology to Handicapped Individuals." The panel/workshops were organized and materials prepared at the request of the Subcommittee on Science, Research, and Technology, U.S. House of Representatives, Science and Technology Committee and the Subcommittee on the Handicapped, U.S. Senate, Labor and Human Resources Committee.

The major purposes of the workshops were to explore the diversity of existing, emerging and conceptual developments in technology aimed at helping persons with disabilities participate more fully in the community in which they live and to identify and discuss relevant issues relating to the proper applications of technology developments in this area.

Featured in this publication is an overview introduction entitled, "Application of Technology to Handicapped Individuals: The Need and the Legislative Background," presentations and discussions concerning five technologies (information resources, educational, rehabilitation, communications, and environmental facilities) and brief synopses of potential issues for discussion along with transcripts of the actual discussions of some of these issues. The publication concludes with a set of relevant and basic references.

The organization and implementation of the three panel/workshops --including selection of topics and speakers--and the preparation of the manuscript for publication--including preparation of introductory materials for the entire effort as well as for the specific panel/workshops--was the responsibility of Marvin Kornbluh, Specialist in Information Science and Futures Research, Science Policy Research Division. In addition, Pamela Smith, Analyst in Life Sciences, Science Policy Research Division made many valuable suggestions with respect to organization and elaboration of the workshop topics and contributed to the formulation and implementation of the logistics arrangements.

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

96th Congress
1st Session

COMMITTEE PRINT

APPLICATION OF TECHNOLOGY TO HANDICAPPED INDIVIDUALS: PROCESS, PROBLEMS AND PROGRESS

Results of 3 Panel/Workshops Plus Original Materials

Organized and Prepared at the Request of

Subcommittee on Science, Research, and Technology,
U.S. House of Representatives and

Subcommittee on the Handicapped, U.S. Senate

November 1979

Contents

Page

APPLICATION OF TECHNOLOGY TO HANDICAPPED INDIVIDUALS: THE NEED AND THE LEGISLATIVE BACKGROUND

Scope of the Problem 1
Solutions Through Technology 3
Objectives of the Panel/Workshops 4
Legislative Initiatives 5
Need for Cooperative Effort 10

SESSION # 1. NOVEMBER 1, 1979:
AGENDA AND ESSENTIAL DEFINITIONS AND DISTINCTIONS

Agenda 14
Essential Definitions and Distinctions 15
Panel/Workshop Proceedings
Introductory Remarks 20
Welcoming Addresses 21
Contributions of the Congressional Research Service 34
The Perspective 39
Information Resources Technology 49
Educational Technology 67
Audience Questions 86

SESSION # 2. NOVEMBER 6, 1979:
AGENDA AND ESSENTIAL DEFINITIONS AND DISTINCTIONS

Agenda 101
Essential Definitions and Distinctions 102
Panel/Workshop Proceedings
Introductory Remarks 105
Rehabilitation Technology 108
Communications Technology 130
Environmental Facilities Technology 178
Audience Questions 197

SESSION # 3. NOVEMBER 16, 1979:
AGENDA AND ISSUES FOR POTENTIAL DISCUSSION

Agenda 223
Issues for Potential Discussion 224
Panel/Workshop Proceedings 230
Discussion of Issues 241

REFERENCES 316

APPLICATION OF TECHNOLOGY TO HANDICAPPED INDIVIDUALS: THE NEED AND THE LEGISLATIVE BACKGROUND

SCOPE OF THE PROBLEM

Disease, accidents, and congenital defects leave many persons disabled--either permanently or for temporary periods of time. Disability can happen to anyone. While there is currently a lack of "count of heads" statistics regarding the number of handicapped persons, the President of the United States stated to the White House Conference on Handicapped Individuals on November 22, 1975, that there were more than 7 million children and at least 28 million adults in America with physical and mental handicaps. 1/ When the immediate families of such disabled people are included, the later figure more than doubles. Further, and perhaps more significantly, the number of disabled are increasing and likely will continue to do so. This phenomenon may occur because medical science is saving more infants with birth defects and more adults with serious diseases and injuries. Also, the increase in longevity has associated with it an increase of those dysfunctions inevitably associated with aging. Finally, the Nation's industrial society is exposing the

---

1/ Ford, G. Statement by the President. Fact Sheet. White House Conference on Handicapped Individuals, Nov. 22, 1975. As stated in "The Application of Technology to Handicapping Conditions and for Handicapped Individuals: Part A." William R. Ayers. The White House Conference on Handicapped Individuals. Vol. One, Awareness Papers. Washington, D.C., Nov. 23-27. p. 21.

60-319 O - 80 - 2

SOLUTIONS THROUGH TECHNOLOGY

The application of technology--both of the conventional types and the emerging, exotic varieties--has shown promise in alleviating and preventing some specific problems of handicapped persons. Technological advances over the decade of the 1970s appeared to have modified the total environment of those individuals with handicaps sufficiently for a number to function better in their daily living at home and in their educational, transportational, employment, and recreational settings. Through improvements in equipment, systems, training, and information handling, many handicapped persons have been brought to the point where they are actively and meaningfully participating as members of their communities.

The utilization of visual communications technology for diagnostic activities in rural areas, the employment of new types of materials and electronics for prosthetic devices for the physically handicapped, and the use of computer-based instruction systems for the mentally disabled are but a few examples of the full spectrum of technological developments and applications that have taken place since 1970.

Although there appear to be countless examples where disabled individuals are receiving outstanding assistance through technology, it is difficult to be definitive about the "state-of-the-art" of that technology applied to persons who are handicapped. There are two major reasons for this:

more independent, that is, helping such persons achieve their personal and vocational goals. The six predominate, specific objectives of the panel/workshops were:

1. To discuss the concepts and tools for focusing American technology and the creative energies of its scientific community, especially the National Institute for Handicapped Research, towards resolving problems of handicapped persons;

2. To identify critical issues with respect to the application of technology to handicapped persons and to obtain insights and information for resolving these issues, including where the expertise lies;

3. To understand the perspectives of various technologies that have demonstrated capability in helping handicapped individuals and the extent to which they are progressing from pure and applied research through prototype development and testing to final implementation and use;

4. To provide a clearer basis for evaluating and selecting competing devices, systems, and technologies for handicapped persons and to compare their likely costs and potential benefits;

5. To determine if and how technologies aimed at helping those who are disabled could modify or partly replace current social programs which assist them; and

6. To understand the nature and the possibilities for "overkill" in the development and application of technology for handicapped persons.

LEGISLATIVE INITIATIVES

Congress has demonstrated its intent to be responsive to individuals who have substantial limitations in one or more major life activities by several legislative measures and other actions over the last decade. Two successive advisory panels

Science, Research, and Technology of the U.S. House of Representatives put it this way:

> It is envisioned as a focal point to expand the scientific base of rehabilitation, improve the skills and knowledge of rehabilitation professionals in the most modern technology available, contribute to better analysis and planning in the rehabilitation field, and place research and development in the field of the handicapped on a more equitable standing with the best of research and development in the fields of medicine and education. 1/

The NIHR is also charged with marshalling people with necessary and diverse backgrounds and ensuring that they apply their expertise in new ways to problems of handicapped individuals.

Public Law 95-602 also contained provisions for an Interagency Committee on Handicapped Research (ICHR) and a National Council on the Handicapped (NCH). Over and above its cooperative efforts with the NIHR, the ICHR was created to:

> 1. Promote coordination and cooperation among Federal departments and agencies conducting rehabilitation research programs by its interagency structure composed of the National Institute of Handicapped Research; Rehabilitation Services Administration; Office of Education; National Institutes of Health; Veterans Administration; National Aeronautics and Space Administration; Department of Transportation; National Science Foundation and such other members as the President may designate;
>
> 2. Identify, assess, and seek to coordinate all Federal programs, activities, and projects, and plans for such programs, actities, and projects with respect to the conduct of research related to rehabilitation of handicapped individuals; and

---

1/ Clements, John G., and Sherman Roodzant. Congress Emphasizes Rehabilitation Research. Bulletin of Prosthetics Research, Dept. of Medicine and Surgery, Veterans' Administration. Washington, D.C, BPR 10-31, Spring 1979. p. 6.

5. Operators - Members of companies that provide transportation, hotels, restaurants, recreation facilities that are accessible to persons with disabilities.

6. Authorizers and Providers - Health agencies (e.g. Medicare) and insurance companies that must authorize purchase of equipment and services and provide third part payment.

7. Inventors and Designers - Rehabilitation engineers and others who design and develop implants, assistive equipment, vehicles and housing to meet the needs of persons with disabilities.

8. Researchers - Medical, Engineering, Allied Health, Social, Psychological, Vocational, and other professionals who conduct research activities, the results of which lead to better understanding of the needs of persons with disabilities and how better to solve their problems.

9. Educators - University and college professionals who train rehabilitation engineers, allied health persons, designers, architects and technicians, for service to the disabled.

10. Legislators - Politicians and staff personnel at federal, state, and local levels who pass and oversee legislation that concerns the application technology to persons with disabilities. 1/

The NCH links the NIHR and other Federal agency programs and is the primary vehicle for adequately communicating the needs of disabled persons to the highest levels of Government.

The National Science Foundation (NSF) Authorization Act for Fiscal Year 1979 (P.L. 95-434) authorized $2 million for a handicapped research program in the Applied Sciences Research Applications

---

1/ This list was prepared by the Rehabilitation Engineering Society of North America as an attachment to their application for membership form.

full citizenship for such individuals. Detractors of such development and application cite the cost of producing individualized technological support for relatively small subsets of the population. It appears that the public sector and the private sector will have to actively cooperate and work together. Neither section alone likely could marshal the full range of efforts required for effective and efficient development and application of technology to benefit handicapped persons. Each sector has specialized competences to contribute. The public sector is probably best able to conceive a national sense of mission; establish national priorities with respect to handicapped technology; set consistent funding policies based on such priorities; and formulate construction, testing, safety, and perhaps even marketing and other standards. It is probable that the private sector is better able to provide specialized expertise, conduct much basic research, perform field testing, produce techniques and instruments, and educate specially targeted consumers of the conventional and emerging technology. Two experts on the problems of handicapped persons expressed the essential characteristics of the problem and proposed a solution as follows:

> Development and market introduction costs range from ten to one hundred times the research feasibility investment. Since only a small proportion of research projects lead to marketable products, the cost ratio of development to research is very high. Developmental efforts cannot compete in total cost with the many diversified research proposals. Support of research is easier, safer, and cheaper. . . . The route from early feasibility studies into widescale deployment is often blocked by the frequently insuperable obstacles represented by product and market development. . . .

SESSION # 1

NOVEMBER 1, 1979

While technology for the handicapped person can be very beneficial in many and diverse situations, the products and systems stemming from such technology also may have limitations. These usually concern:

- Reliability or failure rate with continuous use;
- Performance at extreme temperatures and under adverse weather conditions;
- Cost to develop, manufacture, test, and distribute the products;
- Size and weight; and
- Consumer acceptability.

Technology for the handicapped person should not be considered in isolation. There is a need to consider how such technology impacts social, political, environmental, and economic factors as well as factors which reflect other technologies.

Information Resources Technology for Handicapped Individuals

Information resources technology concerns the acquisition, storage, manipulation, and exchange of information about handicapped individuals and regarding handicapping conditions via such methods and media as:

- Hotlines;
- Clearinghouses;
- Data banks;
- Referral services;
- Libraries;
- Public inquiry offices;
- Information networks;

These methods and media provide, or conceivably could provide, information on inquiries relating to handicap services, conditions, and technologies to the "handicap community" consisting of:

- Proposed and enacted legislation relative to handicapped individuals;
- Research and development projects aimed at handicapped individuals;
- Available recreation, camps, and artistic endeavors for handicapped individuals;
- Available sensory, mobility, communications, and other technological aids for handicapped individuals;
- Manufacturers, suppliers, and repairers of products for handicapped individuals;
- Consultants and prevocational assistance for independent living; and
- Communications assistance, such as interpreters for the deaf and readers for the blind.

Information resources technology may also encompass the analysis and design of information systems, incorporating both hardware (equipment) and software (manual procedures, computer programs, and human factors considerations) components.

Educational Technology for Handicapped Individuals

Educational technology involves processes for developing and utilizing educational products and systems and for delivering educational services of all types to handicapped children and adults via such products, systems, and services as:

- Various computer assisted instruction systems;
- Computer managed instruction systems;
- Specific devices and aids to facilitate learning such as reading machines and training devices to teach arithmetic and spelling;
- Cable and interactive television;
- Tele-conferencing;
- Tele-book services and voice indexing systems;
- Videodisk systems;
- Electronic mail systems;
- Learning aids including electronic games; and
- Vocational aids.

SENATOR JENNINGS RANDOLPH: A pleasant morning to all of you. I hope that you will not feel that I am presumptuous when I tell you that for a long, long time--and when you look at me you know I've been around a long, long time--I have never failed in the last 20 years to follow through a certain plan. Each morning I look out of the window, whether it is sun shining or raining, or snowing, or what not, and I say the words so I may hear them: This is not just another day, this is a new day. I believe that the positive program for individuals is best illustrated by the cooperative positive thinking and acting of men and women who have been intensely interested in and have been on the front lines of the effort to secure for the handicapped of this country not privileges, but their inalienable rights.

It is an honor to join Chairman George Brown in welcoming you all here this morning. As Chairman of the House Subcommittee on Science, Research and Technology, he has continued the work which was begun by the former Chairman, Olin Teague, of gathering and disseminating information about the application of technology in alleviating and preventing many problems of handicapped persons. There is another Brown in California, but this is where the action is--with George.

I am also delighted to be with another long-time friend, former Representative Gilbert Gude, and to express my appreciation for the many, many times that we have had the opportunity to work together. I am genuinely honored to join as a cosponsor of these workshops

problems with handicapped programs through the years, but we have also been able to solve some of them.

I want to tell you about a program that began over 40 years ago; a program to give blind individuals the opportunity to be entrepreneurs in the marketplace. Efforts to establish such a program had been made over quite a period of years, particularly by two members of the Congress who were themselves blind, Senator Thomas David Schall of Minnesota and Representative Matthew Anthony Dunn of Pennsylvania. When I came to the House, in 1933, I joined in this effort and we worked together. At that time it was said by many, many people that it could not be done; that while everyone wanted to help blind individuals they did not believe they could do these jobs. But we said, in essence, let's see if they can do it, let's give them the opportunity. And finally, a bill introduced by myself and the former Senator from Texas, Mr. Sheppard, was passed and signed into law in 1936 by President Franklin Roosevelt. This law provided not only opportunity, but also training programs and other incentives for blind persons to have a place in our business and commercial life.

Today, as I talk with you, there are approximately 3,900 blind men and women who are operating the facilities, selling the items and articles about which you know. These facilities are not only in Federal buildings; they are in State and regional buildings, in county and city buildings, and in commercial buildings as well--3,900 of them. The average annual earning is

do not know of the development of a "plastic palate" by a researcher at the University of Alabama, which holds the possibility of greatly improving the speech of the hearing impaired. Some of you may be aware of a recent scientific breakthrough in surgery for the deaf which holds forth great promise to those individuals suffering from nerve deafness, a hearing loss which strikes one out of ten people in this country and 90 percent of those over 65. When the surgery, called a stapendectomy, was performed on my good friend, Nanette Fabray, the hearing in her right ear was completely restored. These are just a few of the recent scientific developments that are presently improving or promise to improve the lives of handicapped Americans. To quote Dr. Seuss, "This is very big news. It's important to know."

As Chairman of the Senate Subcommittee on the Handicapped, I am confident that the work of the National Institute for Handicapped Research will be of incalculable benefit not only to handicapped individuals but to our society as a whole. I believe that the opportunities and challenges are very great and that the application of technology is something that must not be cast aside as we continue our commitment of not only helping the handicapped help themselves, but to the building of a better world.

I am gratified that so many persons are here this morning to learn more about these matters, and that I can be with you for these few minutes.

GEORGE E. BROWN, JR.: It is very generous of you to assume that any of us can provide fundamental wisdom, but we will play whatever role is appropriate. Sometimes I think the appropriate role for opening addresses like this at these conferences is to help overcome the early morning inertia that we all have and to provide a little breathing space until the group can be fully assembled and ready to move forward with the more important activities of the day. Whatever the role, I am very pleased and happy to be here to contribute to this workshop this morning. I think it is important.

We have an unfortunate tendency in our thinking, and there are many reasons for it, to think in terms of categories. Science has taught us that by dividing things into categories and attacking them piecemeal we can frequently be more productive. It's a way of life in terms of accumulating knowledge, and performing work in our culture; but it sometimes can lead to excesses. We categorize the handicapped and the nonhandicapped; the sick and the well. This is sometimes appropriate but sometimes conceals as much as it reveals. We are all afflicted with the same terminal illness; we are alive. We all are handicapped to one degree or another.

I found this morning when I temporarily misplaced my glasses that I was really handicapped. I couldn't read the morning paper. But there are no questions but that these categories are a matter of degree. They are not matters of absolute distinction and I think we need to bear that in mind. From my standpoint, what I think

include everyone in the caucus, although they could all qualify. But we should limit it in some fashion. I'm sure you know that we have some individuals who have lost their limbs; we have many who have pacemakers; there are also those who rely upon various kinds of machines for their existence in one way or another. I would be at a loss myself to determine just how we would go about defining the Handicapped Caucus on the Hill.

Let me pay a word of tribute to Senator Randolph and to Gilbert Gude for their leadership in this area. I think it's clear that we have all benefited from the deep concern which Senator Randolph has demonstrated over the years. He referred to, and I also want to refer to my very good friend and mentor, Tiger Teague, who himself is handicapped in various ways which sometimes are not too obvious. I think you know that in his latter period, he had a limb amputated, and that he always had a built-up shoe to replace a portion of his foot. I thought that would be handicapping; but my first experience with him, 16 or 17 years ago in the House gymnasium, I found that he was not nearly as handicapped as I was in many ways, particularly in playing paddleball.

He has made a great contributions. First in the Veterans Affairs Committee, which he chaired for many years, he demonstrated concern for handicapped; then in the Science Committee which he also chaired. In both capacities he was deeply concerned. I have learned from him to share that concern, especially with regards to

intentions. Yet we have not yet fully exploited the impact of all of these advances in technology for the benefit of all of those who need it. We are still, I would think, groping toward an adequate system for providing appropriate state-of-the-art technology to that large group of handicapped individuals who have need for these resources.

I am convinced that there is an urgent need for new procedures to forge stronger and more dynamic linkages between the performers of scientific and technological efforts and the potential users of such work. It is not enough merely to expect R&D; there must also be widespread utilization of its results through an effective process of technology transfer which can help overcome the handicapping conditions which so many of us have.

Certainly technology can do much to improve the quality of life and productivity of our Nation's 30 to 40 million disabled people. We have recognized that there is a marked increase in partial disability during our life cycles--traumatic injury to our young and deterioration in our elderly. The human race is now living so long on the average that engineering systems of the body--the pumps, filters, fluid flow channels, structures, motor bearings, information paths, and control centers--deteriorate. This timebase to handicapping conditions should not be ignored; the earlier technology can intervene in the life cycle, the more impact there is likely to be on preventing undue consequences.

Let me just conclude by emphasizing again the point that I've been trying to make. We have a tremendous opportunity here to push forward in a dramatic way opportunities for, not just the categories of people we call handicapped, but for all members of our society, using as a tool and as a handle, the special needs of certain groups of our people.

I want to emphasize that I don't want to have the handicapped (I don't even like to use the word) feel that they are a narrow class of human beings receiving special attention. I want them to feel instead that they are pioneers and leaders, helping to create opportunities in science and technology activities which will benefit the whole of our society; in this way they will be making an invaluable contribution.

Social change is extremely difficult. As a politician I can tell you that. We have to have handles. We have to have a crisis or a special urgency. And this is the kind of a situation that I think we have. We don't have a crisis exactly, but we have a group that has a special urgency and a special need; they can be a vehicle for social change. I would like to see them thinking in these terms and doing their best to create the kinds of changes that will lead the whole of our society to the advances which are possible in the new world of science and technology that has developed in our generation.

60-319 O - 80 - 4

in the application of technology to the problems of today and is in an extremely good position in the House to do so. We're fortunate to have his leadership there in a role that interfaces, in a role that will help to better interface technology and politics in government. We're moving into an era where, indeed, handicapped people that were not able to participate in the social, political, and economic walks of life as are the great majority of our citizens, will be better enabled to do so.

Partly through their own efforts, handicapped individuals are becoming more visible; they are becoming more a part of society. I hope that, as Congressman Brown has stated, they will become less visible and they will become more of the natural scene. We are all one people and there are not two categories, the handicapped and the nonhandicapped.

We're witnessing more vigorous and effective action by them and also action on their behalf by individuals, organizations, and institutions. One manifestation of this increased activity is in the concerted effort to apply technological devices, systems, and materials spawned by the national space programs, and other advanced technologies for the benefit of the handicapped. Furthermore, we have the recommendations of two successive panels on research programs to aid the handicapped.

First, the White House Conference on Handicapped Individuals and then a National Academy of Science study of Science and Technology in the Service of the Physically Handicapped.

The studies of the American Law Division of CRS have focused on the many and varied legal issues surrounding the rights of the handicapped as well as the legal requriements of Federal laws and programs designed to aid the handicapped. The recent landmark Supreme Court decision in the case of Southeastern Community College v. Davis has generated for this division a diversity of legal questions concerning current and future programs to make handicapped persons a more viable and independent group in our society.

Our Science Policy Research Division has organized this series of workshops. In addition, they have prepared materials which identified secondary applications of space technology including those benefiting handicapped individuals, analyzed legislative options for increasing NASA's spin-off and technology transfer activities for the aging and the handicapped, and reviewed the problems of commercializing federally-developed technologies. They have also answered numerous inquiries dealing with the latest developments in spinal cord injury, visual and hearing disorders and other conditions that may handicap a person in his or her life's activities. Further, they have provided Congress with policy analysis and other support on the subject of medical device regulation.

Our educational and public welfare division has done work in quite a number of areas of interest to the handicapped community. These include vocational rehabilitation, employment, affimative action, nondiscrimination, architectural accessibility, information on specific impairments, education and income maintenance. They have

with respect to where handicapped individuals and parents can go for help in education, housing, transportation, independent living and so forth.

Now having been introduced by our moderator, I am going to introduce him, who will be the first speaker on your program. That's Marvin Kornbluh. Marvin is a Specialist in Information Science and Futures Research in our Science Policy Research Division. He came, almost five years ago, from private industry and we are very pleased when we have people from private industry come into CRS. He was president of a management consulting firm, specializing in planning and systems. He worked as a systems engineer and educator for the IBM Corporation, and also did a stint with the Massachusetts Institute of Technology in the area of operations research. Marvin is going to play three roles in your workshops.

First, he is going to lay out the perspective by which we can best view this area of technology for handicapped individuals. He'll also serve as moderator for the workshops. Finally he will introduce all of the guest panelists. Marvin, thank you again for your work and dedication to this project.

KORNBLUH: Thank you, sir.

I'll try to keep it relatively short and incidentally, I would like to emphasize that I'm proud to be associated with the fine work of CRS.

person to engage and participate to a maximum extent within his or her social environment. As was stated by one of our introductory speakers, a handicap is sort of a part of one's life cycle. Sometimes we get a handicap through heredity--then it's a congenital, permanent thing; other times we may have a severe trauma, an accident, disease, and then it's only a temporary thing.

And to those of us who live a little longer, we find, as I have found last winter, that we may be somewhat more permanently handicapped as you walk the streets and the snow comes down, the eyes start to tear and you wear a hat, not to look good, but to protect the top of your head.

So as I said, handicaps may be temporary and they may be permanent. If we live long enough, unfortunately, they tend to be, for most of us, reasonably permanent. There are many kinds of impairments and I'm not going to bore you with all the different lists. Certainly there are sensory impairments and there are motor impairments. There are neurological disorders, spinal cord conditions, loss of agility, slow reaction time, impairment of hearing and of sight. There also is a sensory loss which some people have where they don't experience pain or heat, or cold, or touch--that could be very severe. In fact, some people might include such things as obesity and diabetes as part of a handicap. It's open to question.

The number of handicapped that are in the United States remains somewhere between 30 and 40 million. Roughly these are one-sixth or

I'd like to say a little about technology because this meeting is about the application of technology to handicapped individuals. What is technology? I'm sure there'll be a number of experts in the house who will agree or disagree with me no matter how I define it. To me, technology signifies the results of processes like research, development and production. The results of these kinds of research, development and production may be hard products that people make to feed and clothe and house and transport, communicate among and defend themselves. These are devices and instruments and equipments and materials and contrivances and machinery, and so forth.

The results, however, may also be manifested as an interacting system of hard products and human beings. There is a symbiotic relationship between person and machine. In my mind, the word technology also denotes soft intangible arrangements and services like social and institutional arrangements and infrastructures of systems which helped to apply and distribute the technology.

Now there are essentially two ways that technology can be employed to aid handicapped individuals. One, of course, is by technology transfer. In other words, we apply our knowledge gained from one discipline to work in another area to help the handicapped person. The second way is, not only technology transfer which is large, through NASA and the military area, but also through brand new and innovative applications and products.

voice or sound can start a device. A push on a magnet by a body part will create a magnetic field which can activate various devices. Close proximity can activate various devices through use of photoelectric cells. Recently I saw a wonderful piece of equipment in the office of the Subcommittee on Science, Research, and Technology which made use of eye movements to communicate. You put on a pair of eyeglasses and the inside surface of the glasses was treated in a certain way so as to reflect infrared light into the eye and by moving your eye, you caused a printout of symbols to be shown on a screen. Also a typewriter could type out these words. Eye movements and reflection of infrared light by specially treated eyeglasses allowed a severely handicappped person to communicate.

In a few years this will be commonplace. Things like that. Very impressive. Some of you may not have realized how far technology has advanced. At the same time, this sort of thing was possible ten years ago. We knew about this capability then.

I saw articles in 1970 reflecting this kind of thing. So technology known ten years ago can be very beneficial to handicapped people in many and diverse situations--providing we utilize it.

I would like to end my part of this first workshop so we can have a ten minute break and get back to our two illustrious speakers by saying just a few things. One, that the applications

was told--and this impresses me very much--that we should have an interpreter anyway for public awareness. I had never thought of that simple idea, public awareness. I said I didn't know how many of you here have ever seen signing. I suspected most of you had, but I was't sure.

It's that kind of thing that I think is very important--public awareness. These workshops can make a contribution, I believe, to becoming aware of the new devices and the hard and soft technologies for handicapped persons. I'd like to feel we are making an important contribution. Maybe we are now lighting some matches that need to be lit to illuminate some of the dark spots that have been present in the past and need not be present in the decade of the 1980s.

With this introduction, why don't we all now take a ten-minute break and have a cup of coffee; there is some juice, plenty of danish pastry, and maybe about 10:30 we will reconvene to hear our two speakers.

(BREAK)

We have what I consider to be two well qualified speakers who will address two technologies for the handicapped. First, we will start with Information Resources Technology and then Education Technology, both of which have contributed and will continue to contribute to technology for helping handicapped individuals. Our first speaker is a wonderful person I recently got to know quite well.

Elizabeth Pan is our first speaker on information resources technology. She is currently President of the Institute for Information Studies. This is a nonprofit firm dealing with information sciences and technologies and also technology transfer in a variety of settings. She is also the coadjunct professor at Catholic University where she teaches in the Department of Library Science, at the graduate school. She has been Chief Librarian for the U.S. Patent and Trademark Office and she has been a principal investigator for the Department of Health, Education, and Welfare with respect to literature reviews on topics of urgent concern to the Rehabilitation Services Administration. She has four or five pages of solid accomplishments in her resume.

One of the accomplishments I would like to especially mention is that she was one of the 15 Department of Commerce, Science and Technology Fellows for 1977-78 and she participated in a year-long training program which combined on-the-job experience with briefings by high level officials in the executive and legislative branches of the Federal Government as well as social scientists. So I think that we have a wonderful person who has a Ph.D. in information science, a masters degree in library sciences, and a combination of private entrepreneurship experience and public experience. I'm very pleased and proud to give you Elizabeth Pan.

of technology to assist handicapped individuals, I believe, can be directed and enhanced in at least four ways, and to the degree that any of us can contribute in one of these four ways, I think it incumbent upon us to think seriously about doing so.

Obviously, you can have administrative actions such as executive orders, priority changes, new regulations, and implementation through programs. Also, we can have congressional and legislative actions such as increase of funds, new programs, amendments to existing programs, new legislation, and amendments to existing legislation. Third, and very important in my opinion, is action by the private sector especially to manufacture and distribute something that is important to handicapped persons in our economy. Also, making venture capital available, supplying specialized expertise, conducting basic research, and providing needed techniques and implementation can also be performed by the private sector.

Of course, they have to work with the public and public institutions. Do we have a symbiotic relationship here? I'd like to feel that we should have. And finally, let us never forget the actions of the consumer and the provider interest groups. They can provide input into technological development. And I'd like to put the emphasis not on the provider interest groups, but more upon an awareness of the general consuming public. For example, I'd like to say I did not know how many people would be here today who would be hard of hearing. I said there may not be any. Then I

I have for purposes of the discussion divided technology for the handicapped into five areas. Today we have two speakers who will treat two of them, Information Resources Technology and Educational Technology. On November 6, we are going to talk about Rehabilitation Technology, Communications Technology and Environment Facilities Technology.

Now this is not the only way to categorize the field of technology relating to the handicapped. I'm sure some of you may quibble with the way it was done. However, I feel that while there is some overlap among these technologies, there are also some reasonable distinctions among them.

One of the things that always impresses me with respect to this field of technology for handicapped individuals is what I would call the person-machine interrelationship--a symbiotic relationship. You all know what symbiosis is, don't you? Symbiosis is a wonderful word that says that two dissimilar organisms need each other to surive. Man-woman--symbiosis. Teacher-student--symbiosis. Plant-parasite--symbiosis. Interdependency if you will. There is a symbiotic relationship, I believe, in the field of rehabilitation and similar kinds of work directed towards the handicapped—namely, the various kinds of switches by which the devices reflecting the hard technology can be activated and used.

For example, a slight pressure or squeezing by a body part such as the chin or mouth can activate a device. You can contract your muscles and by making use of electrodes you can activate a device. You can blow or suck on a tube and start a device. Human

one-seventh of the U.S. population. But I think that what's most important, ladies and gentlemen, is that somewhere in the vicinity of six to eight million of the handicapped are children. Again, the uncertainty of these estimates, as many of you know, is due to inadequate statistics and the use of different definitions. However, we are happy to say we are doing something about it. If any of you here have seen a copy of the forthcoming census questionnaire, you know that there is a question about handicaps on that questionnaire. I'd like to read it to you, for those of you who are not aware of it. It's in the 22 percent sample. It goes like this: does this person have a physical, mental, or other health condition which has lasted for six or more months and which (yes or no) (a) limits the kind and the amount of work this person can do in a job, (b) prevents this person from working at the job, and (c) limits or prevents this person from using public transportation. Now I'll assume there are some good statistical sampling techniques used so we may indeed get a reasonably good estimate on these kinds of figures which I think we need.

Some of you may not realize that the totally disabled spent three times more per person for medical care than the non-disabled person. Some of you may not realize that disability rates are higher in the south and lowest in the northeast. And some of you may not realize that about one-fourth of handicapped men 20 to 64 and about one-fifth of adult handicapped women 20 to 64 are totally disabled and depend on others to meet their daily needs. So we have a formidable task before us.

I believe the audience is of two types: I think there is a group of you which is quite sophisticated in the area of technology applied to handicapped persons. There is another group here which perhaps has less knowledge about this field of handicapped individuals and technology for the handicapped. With the indulgence of the first group, I would like to start out by just very briefly and very broadly making some distinctions which I think are essential. The distinctions and definitions I'll make, needless to say, are subject to multiple values and interpretations. So I would like to say right at the beginning that the definitions that I'm going to give for the next three or five minutes should be regarded more as illustrative, rather than comprehensive.

To me, the terms "handicapped" or "disability" relate to the inability to perform the roles or tasks that are expected of an individual in a normal social environment which includes home, work, community, recreation, education, and similar activities. A severe handicap is a difficult thing to define. The very same impairment in one individual need not be severe to that individual, while to another individual it could be very severe.

To me, someone with a severe handicap has a disability that requires multiple services over time and results in a substantial handicapped participation in society. That leads to the definition of independent living, which is also a difficult one. Let us say, for the purposes of these series of workshops, that it concerns the rehabilitation of a person with the purpose of encouraging that

analyzed issues relating to Federal policy for the education of the handicapped and issues involved in "mainstreaming" or integrating both handicapped and non-handicapped students in regular classrooms. The Disability Insurance Amendments of 1979 is currently very active legislation related to the needs of the handicapped. They have looked into the impact of this legislation on vocational rehabilitation services and on employment.

Our Economics Division has also contributed to CRS research on the handicapped. They have summarized the hearings on the applications of the Fair Labor Standards Act to Blind and Handicapped Workers. They have analyzed the manner in which transportation operators intend to comply with section 504 of the Rehabilitation Act of 1973 which prohibits discrimination of the handicapped in programs supported by Federal funds. Also with respect to transportation, they have examined the issue of the transit bus of the future. Finally, they have summarized Federal tax provisions applicable to the handicapped.

Let me not forget our Congressional Reference Division which has assembled a large amount of information that has proven useful in answering congressional inquiries on behalf of handicapped constituents, parents of handicapped children, and organizations of and for the disabled. Examples of topics generating many requests include the Education for all Handicapped Children Act of 1975, the civil rights and non-discrimination provisions of section 504 of the Rehabilitation Act of 1973, and the regulations on accessibility of public buildings and removal of architectural barriers. They also answer many inquiries

These recommendations are reflected in the Comprehensive Rehabilitation amendments of 1978 and in other legislation currently before Congress. A principal thrust of these activities resulted in the establishment of the National Institute for Handicapped Research. The mandate of this institute is to coordinate the Federal policy on handicapped research, to establish and support rehabilitation research through grants and contracts, and to educate the public and health professionals about rehabilitation.

The intention of our workshop today and the ones to follow, from the perspective of Congressional Research Service, is not to propose particular programs or to support particular appropriations, but rather, we see these workshops as a form to explore the technology aimed at helping handicapped persons and to help and meld the relevant issues pertinent to Congress and the rehabilitational professionals. The National Institute for Handicapped Research, Congress, and others may then review and reflect upon the workshop dialogues. The hope is that they will find some concepts and tools for focusing America's technology and the creative energies of its scientific communities towards resolution of the problems of handicapped persons.

Most of us would agree that joining together a diversity of perpectives in a planned and consistent manner is a prerequisite to good research. I'm proud to say, as Marvin has mentioned, that CRS has been making its contribution to good research on handicapped persons and conditions. We proliferate research here.

KORNBLUH: Thank you very much for participating in this workshop, Congressman. Your remarks will be incorporated into a committee print which, with a little luck, will be published at the beginning of a new decade in this century. Those are a few flowery words to add to the wisdom of your remarks.

I am very pleased now to introduce the third cosponsor of this workshop, the Director of Congressional Research Service, the Honorable Gilbert Gude. Mr. Gude was formerly a representative from the district that I live in, Maryland, for quite a number of years. I did not have the pleasure of knowing Mr. Gude then. I'm proud and pleased to present Mr. Gude who will, I believe, discuss some of the contributions that CRS has already made and hopefully will continue to make for the benefit of handicapped individuals. Mr. Gude.

GILBERT GUDE: Thank you, Marvin. On behalf of the Librarian of Congress, Dan Boorstin, I want to welcome you along with myself to the Whittall Pavilion. This is what we term the neutral ground where thoughtful people, legislators, people from the agencies, staff, can come to discuss and ponder the problems of today and it was never put to better use than it is this morning.

This is of course going to be the first of three workshops dealing with the technology for handicapped individuals and the leadership of Senator Jennings Randolph and Congressman George Brown in this area I think has been well demonstrated to you. We're fortunate to have thoughtful people like this in leadership roles on the Hill. Congressman Brown has taken a great deal of interest

The idea of prevention is a central one. It appears to me that the benefits of science and technolgy can be brought to bear to prevent handicapping conditions at least as much as to rehabilitate and treat handicapped persons. For example:

- Developing materials, clothing and pressure sensing techniques for reducing the likelihood of bedsores;
- Developing environmental facilities standards for maximizing accessibility and productivity in employment, housing, recreation, and educational situations;
- Developing electronic and materials components that are lightweight, strong, compact, and efficient;
- Developing proper training aids and programs which will provide easy access of technological advances for handicapped people by professionals, paraprofessionals, and the general public; and
- Developing health care technology which is cost effective and facilitates early diagnostic techniques and less patient downtime.

Today our damaged hearts are run by pacemakers, and our ailments diagnosed by computer. Tomorrow, research in transplantation, regeneration, prosthetics, cybernetics, and nutrition may hasten the day when individuals with disabilities participate completely in our society with full enjoyment of its rights and benefits. When a handicapped person gets the benefit of a full education, a meaningful job, and a purposeful life, we all will share in the benefits of that education, that job, and that purposeful life.

effectively utilizing science and technology to meet the needs of those with some special disabling situation.

I hope that we can continue to strengthen the work that has been done. The Committee on Science and Technology is very much interested in utilizing its resources--in terms of its access to the scientific and technological community, its concern with legislation in this field and its oversight responsibilities in this field--to push forward with its contining role.

We have had on the staff of the full committee, and now on my subcommittee, individuals whose primary efforts have been, and still are, devoted to this problem of utilizing science and technology more effectively. We assisted in pulling together panels of experts to deal with this subject and I feel that these workshops are a continuation of these efforts. We were very much concerned with the passage of the legislation establishing a National Institute for Handicapped Research in which Senator Randolph and my colleague John Brademas in the House played leadership roles. In addition, as the Senator mentioned, we have been impressed by the vast advances that have been taking place in biomedicine and communications, computing, and materials.

Technology is the knowledge that technical know-how, properly employed by society, will produce things that will improve the quality of our lives. It is transferrable. It can be applied to many different things, that may be widely different from original

we can accomplish here, even though it is aimed at that category that we call handicapped, will be of benefit to every human being.

I am particularly interested at this time in determining if we can't better utilize the contributions of science and technology in the field of information systems. There are many problems. We're not doing as well as we should in making available the marvels of science to human beings. One gross example is reflected in the kinds of stories about our failure to include sufficient children's programming on television. We have a tremendous capability to educate the young and to make available, at the appropriate level, all human knowledge to the young through the medium of television and to do it globally and to everyone, regardless of language and understanding. The young are a special category of handicapped; they are not fully developed yet, shall we say.

So that the work that we do here, in connection with making knowledge and intellectual resources more fully available to the handicapped could easily have implications for the improvement of our information systems for all people. I hope we will keep this in mind. In thinking of the handicapped we should not neglect the wider community which is also handicapped and which needs help.

Incidentally, there has been occasional discussion in this rush toward establishing caucuses on the Hill to establish a handicapped caucus. I think some of you are aware of this. The only problem really has been in drawing the limits. We didn't want to

KORNBLUH: Sir, I want to thank you. I think the participants on both sides of this table wish to thank you both for your down-to-earth wisdom, your humor, your encouragement, and the inspirational note that you have injected into the beginning of this program. The Senator mentioned some technology and the next workshop on November 6 we will indeed discuss, I'm sure, the Kurzweil Reading Machine and the Palatometer--which is a plastic palate--when our speakers on rehabilitation technology and communications technology make their presentations.

I would like to say, Senator, that I was told a few days ago that there is a Kurzweil Reading Machine in the library in Rehab Services. I'm not sure it is operating at this moment, but we do have one.

RANDOLPH: We have one in West Virginia, is that wrong?

KORNBLUH: I'm sure you have at least two in West Virginia.

RANDOLPH: I didn't want to say two. You'll forgive me now for going over to the Cannon Building. And by the way, George, that's where my office was in 1933 in the Cannon Building.

KORNBLUH: You set the right tone and I thank you.

Our next distinguished speaker and cosponsor of this program is the Honorable George E. Brown, Jr., of the great State of California. He is chairman of the Subcommittee on Science, Research, and Technology of the U.S. House of Representatives, and he has kindly consented also to give us some fundamental wisdom and I'm sure some encouragement. Congressman.

between $11,000 and $12,000, some making more and some making less. And I believe in the last fiscal year they sold approximately a total of $150 million worth of goods. Remember that at the time the program was started it was said it could not be done, that these people could not step into the marketplace.

I use that as just one of the instances of a breakthrough which has taken place.

We can all use increased knowledge on the subject of Federal legislation, as well as legislation at other levels of Government, which is addressed to matters relating to the handicapped. We also need to be fully informed on the implementation of laws. I think we on the Hill need to have continued oversight, not to find fault but to see if the law that was passed is being carried out as Congress intended. I'll not speak on it today, but many times I have seen regulations published by an agency for the implementation of a law which does not express the intent of the Congress.

If we are to be successful in our efforts with regard to handicapped individuals, we need to know all we can about existing technological developments. We need to know more about what is going on not just in rehabilitation, but in rehabilitation engineering. We need to know about the plans and activities of the National Institute for Handicapped Research.

Many people, for example, do not know of the existence of the Kurzweil Reading Machine, or of the Optacon, both of which make printed materal accessible to blind individuals. Many people

and to work with all of you toward our mutual goal of equal opportunities for handicapped individuals.

In this age of rapid progress in science and technology we are overwhelmed with the evidence of major accomplishments. We are familiar with progress in the accelerated services in travel, food, and communications industries. Less attention is given to the advancements in science and research which impact on handicapped persons. In these panel/workshops our goal is to provide to the members of Congress and to their staffs three things:

(1) An increased awareness of handicapped individuals and conditions;

(2) Increased knowledge about Federal legislation relating to the handicapped, and its implementation; and

(3) Information about existing technological developments that can benefit the handicapped, as well as possibilities for the future.

We must have, first of all, an increased awareness; but awareness is not enough. We must have an increased eagerness to understand the handicapped--their problems, their abilities, and their need for productive life.

My grandfather often told me that the Bible des not say, deliver me from problems; the Bible says, "Deliver me from evil." My grandfather would always say, you should be happy with problems because you have an opportunity to solve them. Well, we've had

PANEL/WORKSHOP PROCEEDINGS

MARVIN KORNBLUH: I'm glad it's such good weather today. It would be pretty hard to tell one umbrella from another if we had 70 umbrellas out there, so I'm grateful for that and for the good attendance. I'd like to say good morning to all of you. My name is Marvin Kornbluh, I'm with the Congressional Research Service and I would like to add my welcome to ones that will follow from our distinguished guests. You should have a copy of the background materials and a copy of the agenda, which was on the table as you came in. If you don't have these now, perhaps during the break you can pick them up. I would appreciate it if you would register with the receptionist at some time during the break, if you have not already done so.

Ten after nine isn't too bad to begin a 9:00 meeting in these parts. So without further ado--Let me say, we have a number of distinguished guests who have agreed to open up the program. I won't say anything more, except to introduce our first guest. I'm very pleased to introduce one of the sponsors of this workshop, the Honorable Jennings Randolph, the senior Senator from West Virginia who is Chairman of the Subcommittee on the Handicapped, United States Senate. To those of you who have worked with handicapped individuals, I only need to say that Senator Randolph has been a sponsor and has been involved in a great deal of legislation with respect to improving the potential of and independent living for handicapped individuals. Senator, if you would please.

- Handicapped individuals and their families;
- Service providers such a physicians including physiatrists; psychiatrists; prosthetists; rehabilitation, clinical and biomedical engineers; educators of both the special and regular type, practitioners of various therapies including speech, physical, and occupational; vocational counselors; psychologists; and social workers;
- Inventors, researchers, and scientists working in the handicapped field;
- Government administrators in service programs;
- Manufacturers, suppliers, repairers and distributors in the private sector;
- Legislators and social planners in Government;
- Ombudsmen and consumer advocates; and
- Third party payees such as insurance agents in the private sector and at all levels of Government.

Inquiries could relate to information dealing with:

- Vocational rehabilitation;
- Education and training;
- Medical assistance;
- Employment assistance;
- Financial assistance;
- Housing assistance;
- Tax benefits;
- Civil rights and legal assistance;
- Transportation assistance;
- Government policies and procedures relative to handicapped individuals;

Technology for Handicapped Individuals

Technology signifies the results of processes like research, development, and production. These results may be "hard" products that people make to feed, clothe, house, transport, communicate among, and defend themselves such as devices, instruments, equipment, materials, tools, contrivances, machinery, and structures of widely diverse types. The results may also be manifested as interacting systems of hard products and human beings. Technology may also denote "soft" intangible arrangements and services like social and institutional arrangements and infrastructures of systems and organizations which assist in applying and distributing technology.

There are essentially two ways in which technology can be employed to aid the handicapped person:

1. Through technology transfer or by applying knowledge gained from one discipline or area of work to aid handicapped individuals; and

2. Through innovative or brand new applications and products which partially compensate for and/or accommodate to specific handicapping conditions.

Technology for handicapped people tends to focus on preventing or minimizing the effects of a disability and on maximizing the handicapped person's capacity to perform.

All categories of handicapped technology can interact with handicapped individuals in some manner. Various types of switches, for example, can serve as the interface or essential link between particular devices utilizing and manifesting a technology and a handicapped person. These switches must be sensitive enough to be activated quite easily and must be strong enough to resist damage from reflexive movements. The residual physical capability of a handicapped individual may be used to activate the switches including:

- Slight pressures or squeezing by a body part such as the chin, mouth, nose, hands, or feet;
- Blowing or sucking on a tube;
- Muscle contractions making use of electrodes;
- Sound produced by the human voice;
- Push on magnets by a body part creating a magnetic field;
- Close proximity making use of photoelectric cells;
- Eye movement or positioning making use of corneal reflection of an infrared source; and
- Pointing or positioning a source of ordinary light.

> A possible resolution to these difficulties might be the formation of a private-public corporation charged with the development and market introduction of really promising rehabilitation engineering products. The central problem is the lack of venture capital. A combination of government, industry, and organizational funding could provide adequate resources to start the process with the most promising candidates. Choosing particular products is difficult, but a separate corporation with its own organization free of direct influence from the network of federal and private agencies that support and do research, would ensure objective choices. 1/

The picture of the development and application of technology to aid handicapped persons--from the point of view of the handicapped individuals themselves and the researchers who work closely with them--seems to be one of both pessimism and optimism. There appear to be many unsolved problems, unmet needs, and large gaps in technological knowledge. At the same time, however, there seem to be many creative and dedicated individuals and organizations determined to solve these problems, satisfy the needs and fill in the gaps. Actual and potential application of technology has shown considerable progress in preventing, curing, and ameliorating handicaps which afflict the Nation's citizens. Perhaps the central question to pose is one of value. Is the cost of developing and applying technology for handicapped individuals worth it--in terms of the single person whose mobility, productivity, and communication is improved (the micro perspective) and of society as a whole whose lost earning capacity and welfare payments may be decreased (the macro perspective)?

1/ Parsons, Margaret C., and Miriam W. Rappaport. Application of Technology and Rehabilitation Engineering: Part B. Rehabilitation Engineering. The White House Conference on Handicapped Individuals. Vol. One. Awareness Papers, Washington, D.C., Nov. 23-27, 1977. p. 36.

Directorate of the Foundation. Many types of innovations aimed at helping handicapped persons require a multidisciplinary research approach including not only the physical sciences and engineering but also the social and medical sciences. The National Science Foundation is using its coordinating mechanisms and its other Directorates to establish a program that carries the research for disabled individuals through to implementation and that works in a cooperative mode with other Federal agencies.

Congress has also increased the responsibility of the National Aeronautics and Space Administration (NASA) by amending the statutory NASA charter to include bioengineering for the handicapped. In P.L. 95-401, Congress declared that

> the general welfare of the United States requires that the unique competence of NASA in science and engineering systems be directed to assisting in bioengineering research, development, and demonstration programs designed to alleviate and minimize the effects of disability.

In May 1976, Public Law 94-295, the Medical Device Amendments Act, was signed. Since then, the Bureau of Medical Devices of the Food and Drug Administration has been in the process of promulgating regulations for the medical device industries. These regulations provide for the categorical regulation of the design, manufacture, and dissemination of any device used for medical purposes, including those devices used by the handicapped.

NEED FOR COOPERATIVE EFFORT

Advocates for the development and application of technolgy for handicapped individuals point to the vast, largely untapped manpower resource represented by disabled persons and the justifiable goal of

3. Submit a report to the President and to the appropriate committees of the Congress making recommendations as the Committee deems appropriate with respect to coordination of policy and development of objectives and priorities for all Federal programs relating to the conduct of research related to rehabilitation of handicapped individuals. 1/

In order to establish a close liaison and continuity of effort, both Houses of Congress agreed that the Director of the NIHR also would be the chairperson of the Interagency Committee. This appears to stress congressional intent to promote cooperation among the two research entities.

The NCH embodies the concept of a government-consumer-professional-industry partnership. The credentials, activities, and interests of those involved in making the benefits of technology available to disabled persons vary widely. This amply is illustrated by the following listing of those involved with the rehabilitation of handicapped people.

1. Consumers - Persons with disabilities and their families who need the benefits of technology.

2. Practitioners - Physicians and allied health professionals including counselors who recognize the potential of a disabled person and who prescribe the specific Rehabilitation Engineering devices, provide service, and/or arrange for home and work modifications.

3. Administrators - Directors and staff of federal, state and and local agencies (public and private) that have health, social, and vocational responsibilities for persons with disabilities.

4. Manufacturers and Distributors - Members of firms and institutions that make equipment and services available to the handicapped, including builders.

1/ Ibid., p. 8-9.

have emphasized the need for new technology, including applications of systems and devices spawned by the national space program, the military, and other areas of advanced technolgy. 1/ These panels were comprised of direct consumers, clinicians, engineers, representatives from consumer organizations, and Government research and development executives. One of their principal recommendations was to focus research and development on human rehabilitation in a new entity, modeled on, but not in, the National Institutes of Health. This helped lead to the creation of the National Institute for Handicapped Research.

The passage of H.R. 12467 (P.L. 95-602), sometimes known as the Rehabilitation, Comprehensive Services, and Developmental Disabilities Amendment, on November 16, 1978, created the National Institute for Handicapped Research (NIHR). The mission of this institute is to promote leadership and resources for research and its utilization to improve the lives of people of all ages with physical and mental handicaps, especially the severely disabled. 2/ Two staff members of the Subcommittee on

---

1/ These panels were the House Committee on Science and Technology's "Panels on Research Programs to Aid the Handicapped."

2/ For a more complete description of the nature and purpose of the National Institute for Handicapped Research, see Federal Register, v. 44, no. 82, Thursday, April 26, 1979.

1. The field is widely diverse--from wheelchairs to spinal monitoring and from building modifications to reading machines for the blind.

2. Different amounts of experience in applying different types of technology to handicapped people. Some applications of technology are quite mature and have served handicapped persons for years; some applications of technology are just now being applied to handicapped people and situations; other technological applications aimed at handicapped individuals are still concepts in the minds of physicians, rehabilitation engineers, educators, and other concerned parties.

In order to adequately explore the diversity of existing, emerging, and conceptual developments aimed at helping persons with disabilities and to identify and explore relevant issues relating to proper application of technological developments in this area, three panel/workshops were planned and held at the Library of Congress in Washington, D.C., on November 1, November 6, and November 16, 1979. These workshops were entitled "Application of Technology to Handicapped Individuals." They were jointly sponsored by the Subcommittee on the Handicapped, U.S. Senate (Honorable Jennings Randolph, West Virginia, Chairman), the Subcommittee on Science, Research, and Technology, U.S. House of Representatives (Honorable George E. Brown, Jr., California, Chairman) and by the Congressional Research Service, Library of Congress (Gilbert Gude, Director).

OBJECTIVES OF THE PANEL/WORKSHOPS

The major mission of the panel/workshops was to assist Members of Congress and their staffs in understanding how various technologies are contributing in making handicapped persons

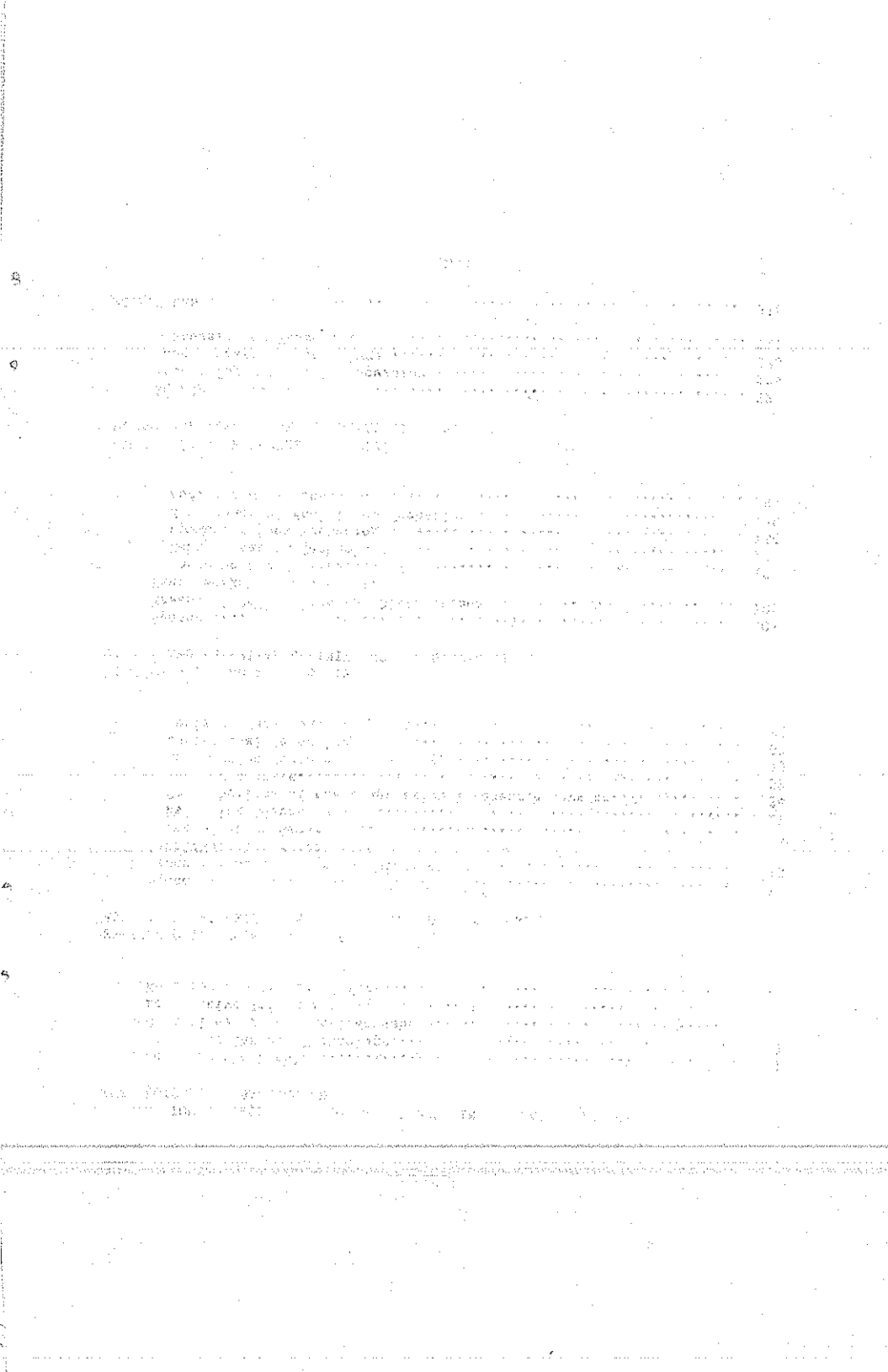
environment to a number of potential hazards which stem from energy, food, and industrial production. Such a situation is unlikely to forebode a decrease in the incidence of disability; if anything, we may expect the opposite.

Within society as a whole, disabled persons represent one of many groups or special constituencies. Like most other special interest groups, disabled persons look for goods and services that will fulfill their needs. Their major needs appear to revolve around sharing fully in the responsibilities and the joys of our American society. Unfortunately, handicapped individuals frequently declare, on a one-to-one basis and at conferences, that they are unable to participate fully in the community in which they live and to obtain the benefits and the rights taken for granted by most non-handicapped persons.

There are probably two opposing views of handicapped persons that a majority of those without handicaps hold:

1. That of a person dependent upon others to perform such basic life activities as traveling, working, eating out, socializing, attending events, and so on.
2. That of a person, who through extraordinary effort, rises above all the economic, cultural, educational and other barriers confronting him or her.

As some may suspect, both views are the exception rather than the rule among handicapped individuals. Some degree of dependency is inevitably present; however, some of the most severely and profoundly handicapped individuals can learn to become more independent--especially if they receive proper and sufficient help.



I would also like to acknowledge the assistance of John Clements, technical consultant to the Subcommittee on Science, Research and Technology, U.S. House of Representatives, and Patria Forsythe, Staff Director of the Subcommittee on the Handicapped in the U.S. Senate.

On behalf of the Congressional Research Service, may I express appreciation for the opportunity to undertake this timely and challenging assignment.

Sincerely,

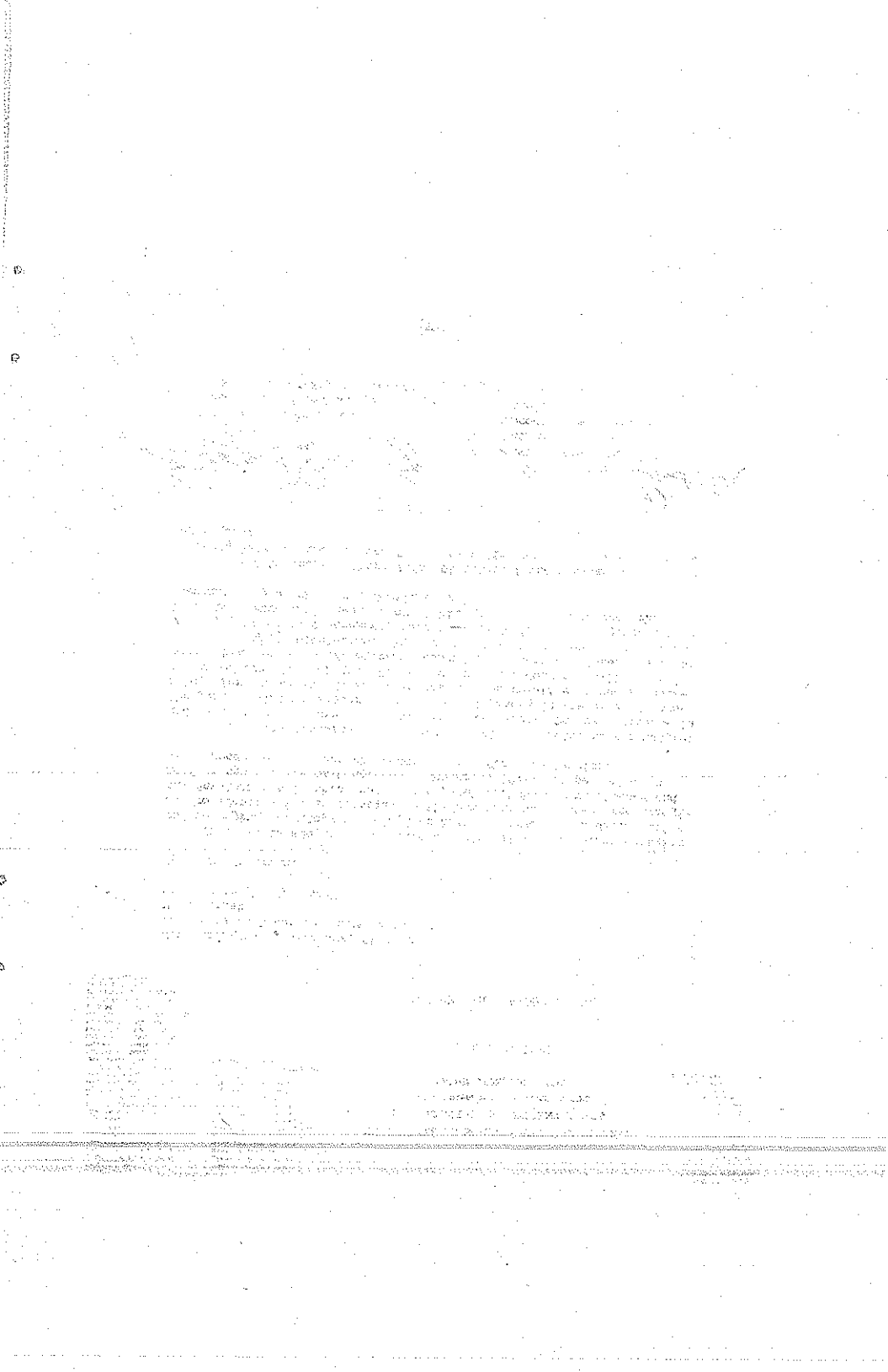
Gilbert Gude
Director

I would also like to acknowledge the assistance of John Clements, technical consultant to the Subcommittee on Science, Research and Technology, U.S. House of Representatives, and Patria Forsythe, Staff Director of the Subcommittee on the Handicapped in the U.S. Senate.

On behalf of the Congressional Research Service, may I express appreciation for the opportunity to undertake this timely and challenging assignment.

Sincerely,

Gilbert Gude
Director





COMMITTEE ON SCIENCE AND TECHNOLOGY

DON FUQUA, Florida, *Chairman*

ROBERT A. ROE, New Jersey
MIKE McCORMACK, Washington
GEORGE E. BROWN, JR., California
JAMES H. SCHEUER, New York
RICHARD L. OTTINGER, New York
TOM HARKIN, Iowa
JIM LLOYD, California
JEROME A. AMBRO, New York
MARILYN LLOYD BOUQUARD, Tennessee
JAMES J. BLANCHARD, Michigan
DOUG WALGREN, Pennsylvania
RONNIE G. FLIPPO, Alabama
DAN GLICKMAN, Kansas
ALBERT GORE, JR., Tennessee
WES WATKINS, Oklahoma
ROBERT A. YOUNG, Missouri
RICHARD C. WHITE, Texas
HAROLD L. VOLKMER, Missouri
DONALD J. PEASE, Ohio
HOWARD WOLPE, Michigan
NICHOLAS MAVROULES, Massachusetts
BILL NELSON, Florida
BERYL ANTHONY, JR., Arkansas
STANLEY N. LUNDINE, New York
ALLEN E. ERTEL, Pennsylvania
KENT HANCE, Texas

JOHN W. WYDLER, New York
LARRY WINN, JR., Kansas
BARRY M. GOLDWATER, JR., California
HAMILTON FISH, JR., New York
MANUEL LUJAN, JR., New Mexico
HAROLD C. HOLLENBECK, New Jersey
ROBERT K. DORNAN, California
ROBERT S. WALKER, Pennsylvania
EDWIN B. FORSYTHE, New Jersey
KEN KRAMER, Colorado
WILLIAM CARNEY, New York
ROBERT W. DAVIS, Michigan
TOBY ROTH, Wisconsin
DONALD LAWRENCE RITTER, Pennsylvania
BILL ROYER, California

HAROLD P. HANSON, *Executive Director*
PHILIP B. YEAGER, *General Counsel*
REGINA A. DAVIS, *Administrator*
PAUL A. VANDER MYDE, *Minority Staff Director*

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

GEORGE E. BROWN, JR., *Chairman*

JAMES H. SCHEUER, New York
DONALD J. PEASE, Ohio
TOM HARKIN, Iowa
ALLEN E. ERTEL, Pennsylvania
KENT HANCE, Texas
WES WATKINS, Oklahoma

HAROLD C. HOLLENBECK, New Jersey
ROBERT W. DAVIS, Michigan
DONALD LAWRENCE RITTER, Pennsylvania

THOMAS MOSS, *Staff Director*
JOHN CLEMENTS, *Technical Consultant*