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AAAS [American Association for the Advancement of Science] Meeting '78

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TECHNOLOGY TRANSFER FOR THE HANDICAPPED

By Lex Frieden*

Texas Institute for Rehabilitation and Research
Houston, Texas
January 3, 1978

There are many scientific and technologic developments in the world today which may have great benefits for handicapped individuals. Space program discoveries, electronic and communication advances, and medical research promise significant contributions towards meeting the needs of handicapped individuals. Practical applications of these developments will have direct bearing on diagnostic and therapeutic treatments, and on the vocational, educational, recreational, and mobility needs of the disabled. Further applications will have indirect impact on the social and economic well being of many handicapped people.

Within the past decade, the field of electronic circuitry has been revolutionized by microminuterization techniques primarily developed by the space industry (Ayers, 1977). Alternative power sources to replace standard batteries, some using nuclear energy, are already commercially available. As a result, many prosthetic devices can be reduced in size and weight. They will last longer and work more efficiently. Sophisticated microcircuits have already reduced computer

*The author served on the Committee on Science and Technology's Panel on Programs to Aid the Handicapped during 1976 and 1977.

processor size to a degree where intricate mobility prosthetics can be entirely preprogrammed (Engen, 1977).

Another example of space age technology benefitting the handicapped is the Pacer (NASA, 1974). This is an implanted pacemaker that is rechargeable from outside the body for a period of 10 to 20 years. It eliminates the need for persons to undergo frequent operations for battery replacement. It can be recharged in 90 minutes, and stores enough energy to last eight months.

The Optacon is an often cited example of a successful effort by a team of advanced technologists working in a university research environment. The Optacon is a book sized electronic device with a movable camera the size of a pocketknife and a tactile screen the size of a fingertip. By presenting a tactile image on an array of vibertory pins, the Optacon allows blind persons to read ordinary printed matter directly and independently. The reader simply passes the camera over printed material with one hand while using the other hand to feel the image the camera sees. Optacon users can read as fast as 90 words per minute. A simpler and more rugged Optacon of cigarette pack size which requires only one hand for use is currently being developed (Linvill, 1973).

At Texas Institute for Rehabilitation and Research, minature electronic components first used in spacecraft are implanted in the nerve ways of spinal cord injured individuals to relieve spas-

ticity and facilitate voluntary motor control of residual muscle and nerve groups. This procedure allows some persons who would otherwise be unable to walk due to spasticity caused by nerve damage to do so (Dimitrivich, 1977). In another project, advanced mathematical and computer techniques have been used in the process of stereometric measurement to predict and measure changes in body geometry relative to scoliotic conditions. This method may improve the rate of detection from screening by as much as 400% (Herron, 1977).

These are impressive examples of what can be done by the transfer of technology from one field to another, and many more could be described. However, the need for a greater effort is even more dramatic than all the examples which could be cited. The Rehabilitation Services Administration (RSA) estimates that between 20 and 25 million individuals in the United States having neuromuscular, musculoskeletal or sensory disabilities could benefit from rehabilitation engineering services designed to transfer technology to the handicapped (RSA, 1977).

A recent series of workshops sponsored by the Veterans Administration and RSA made several significant findings:

1. There are approximately 700,000 wheelchair users living in the United States utilizing less than adequate and often unsafe wheelchairs.

2. There are approximately 125,000 handicapped individuals using hand controlled vehicles in the United States, with approximately twice that number of potential users, who are using vehicles which

frequently have unsafe controls or which have difficult and inappropriate accessibility.

3. Four million Americans have walking disorders which can be remedied or at least partially alleviated with appropriate orthotic prescription, fitting, and training.

4. Four hundred thousand amputees and four million persons who wear limb braces could be aided by the application of new information on prostheses and orthoses.

5. More than 120,000 individuals have implanted artificial joints, but the number of failures or rejections have been much higher than desirable.

6. An estimated 400,000,000 dollars is spent on the treatment of tissue pressure sores which could be avoided by the application of advanced research techniques.

7. Approximately 500,000 blind persons could benefit from further development of speech output information processing and reading machines currently in prototype form.

8. The development of a high speed, quite and economical braille writer and display device would benefit 60,000 braille users.

9. Fourteen and five-tenths million hearing impaired individuals could benefit from improvements in the state of the art of hearing aid production, prescription, and distribution.

10. A major need for the 1.8 million deaf individuals in the United States is a standardized system of tele-communications.

Perhaps the most significant finding of all those made during this exhaustive series of state of the art workshops is that "There is an inadequate method of taking techniques and devices from the laboratory and moving them into production and use." This finding has been corroborated by a number of sources (Ayers, 1977; NAS, 1976; Panel, 1977).

In 1976, the U.S. House of Representatives Committee on Science and Technology began a study on research programs to aid the handicapped. According to Congressman Teague, Chairman of the Committee, this investigation was initiated in an effort to identify the needs and the problems of the handicapped, and to determine how the vast scientific and technological resources in the United States might be better directed toward addressing these needs and problems. The Teague Panel concluded in its report dated April, 1977 that the present research and development efforts on the part of the government and private enterprise are minuscule and too fragmented. Compounding this problem is the fact that the results of such research are often unavailable to the handicapped public. Among other things, the panel found limited needs assessment, imbalances in research emphasis, severe limiting factors in research efforts, insufficient sharing of information and knowledge and incoordination of research efforts, and many barriers impeding utilization of R&D results by handicapped persons.

There is no doubt but what the present and projected needs justify a far greater effort to transfer technology for the handicapped. In other words, technology must be moved or transferred from fields where it is well developed, such as space exploration or weapons development, into the field of handicapping conditions at a far greater rate than is now the case.

There are many barriers to the effective transfer of technology generally, and specifically where it involves transfer of technology to aid the handicapped. In an awareness paper prepared for the White House Conference on Handicapped Individuals, the following are said to hamper the development of new technology and the adaptation of existing technology for the handicapped (Ayers, 1977): (1) inattention to the definition of discreet, project oriented tasks; (2) a lack of suitable basic science to support the managerial decision processes required; (3) a scarcity of people trained and educated in the application of engineering principles to the handicapped; (4) the high cost of technical failures induced by non-perception of real needs; and (5) the need to develop techniques of problem definition and program management.

Given the natural barriers to technology transfer which exist in all fields, many recommendations to improve technology transfer for the handicapped have been made. Among them, the following two are probably the most significant: First, adequate and stable funding for research and development (R&D) must be provided. With

respect to economic investment in R&D for the handicapped, the scope is far too small considering the potential benefits and needs. Of the approximately 21 billion dollars which is either spent annually in the form of services and financial assistance, or lost in productivity by the handicapped, approximately 31 million is allocated from federal sources for R&D. This is a ratio of 0.15%. Among the civilian population, all government R&D expenditures, including not only devices and systems but all research in the rehabilitation field, amounted to only \$2.92 per disabled person in 1976.

In 1975, 3.7% of the national health care budget was spent on research and development. Only 0.7% of that research and development budget was spent on rehabilitation research. In other words, of the 118.5 billion dollars spent on health care in 1975, only 0.026% of that amount was spent on rehabilitation research and development. When one considers that rehabilitation in general and rehabilitation research and development in particular may eventually reduce the total health care cost, the magnitude of these efforts seems to be extraordinarily and disproportionately low.

The second major recommendation is to establish a system for setting National priorities and coordinating new and existing efforts. This recommendation is significant from the standpoint that there are no less than 103 federal authorities bearing directly or indirectly on R&D for the handicapped. In addition to these federal authorities

are countless state, local, and private authorities. Presently there are no means to coordinate or systemize efforts between or across these various authorities.

Perceiving the relationship between all of the barriers and recommendations made above, the House of Representatives Panel on Programs to Aid the Handicapped recommended that a major national commitment of high visability, credibility and authority be made to enhance and insure the effective transfer of science and technology to the handicapped (Panel, 1977). The Committee on Science and Technology requested the Panel to make its recommendations more specific. In response to that request, the Panel met through the Fall and Winter of 1977 and made the following additional recommendations (Panel, 1978):

1. That the National Aeronautics and Space Administration (NASA) be designated as the principal government agency to coordinate and participate in the U.S. effort to use science and technology in aiding handicapped persons.

2. That legislation be drafted, if necessary to add to the NASA mission the requisite authority and responsibility for this program.

3. That the NASA authorizations for funding and staff be increased immediately, progressively, and substantially to accomplish this vital program.

4. That the national importance of this program and its need for top level direction be recognized by Presidential appointment of a NASA associate administrator or other appropriate official to manage it.

5. That there be established a Science and Technology Board for Handicapped Persons whose members will serve staggered five-year terms.

6. That the Science and Technology Board report at least annually to the Administrator of NASA, the President, and the Congress on the status, accomplishments, and problems encountered of the National Program.

7. That Presidential appointments to the Board be drawn from nominations submitted by consumers, researchers, professional associations, practitioners, government officials, and other concerned public and private individuals and groups.

8. That the capability of NASA for contracting and codeveloping with industry be expanded so that new programs ensure that industry research and development efforts are responsive to the needs of handicapped persons.

9. That other agencies' existing programs for handicapped people, together with their authorizations and appropriations, not be affected adversely in normal growth and development as a result of this action.

These recommendations clearly reflect the Panel's belief that a greater national scientific and technologic effort benefitting handicapped individuals is in the best interest of our country.

The recommendation to assign NASA lead agency responsibility in this projected effort was made only after careful study and extensive deliberation. The Panel reviewed various models by which

a program might be undertaken. The Rehabilitation Services Administration, National Institutes of Health, Veterans Administration, National Science Foundation, and NASA are a few of the possible models which were considered. Each possibility was analyzed in light of its potential impact. The panel actually rated possible lead agencies in terms of program success criteria. By this systematic selection process, the National Aeronautics and Space Administration was considered the most feasible host agency for the proposed entity and the National Science and Technology Board for Handicapped Persons.

There is no doubt that the problems involved in the effective transfer of technology to benefit handicapped individuals are complex. NASA has earned a worldwide reputation for the systematic management of complex problems. It has an extensive communication network in place and an active information exchange process for data collection and dissemination which can be expanded to incorporate communication needs identified for a comprehensive, national, coordinated research effort for handicapped persons. Additionally, NASA has existing technology utilization and life science programs to supplement its recognized technological capacity. These existing programs would certainly compliment those which have been proposed.

There is bound to be much discussion about the pros and cons of placing the responsibility for an effort of this nature and scope in the hands of NASA. Much of this discussion will relate to issues

of great importance and consequence. However, more of it may result from petty jealousies between agencies and vested interests in turf protection. It is crucial that those who judge the merits of the proposed plan distinguish those objections which are based on reason from those which are based on selfish interests.

Technology transfer does not occur in a vacuum. Unless the proper mix of resources and program management is achieved, the impact of future scientific discoveries may go unrealized. The handicapped people of this country, and the country itself, cannot afford to let this happen. The proposed initiative would be a positive and far reaching step in making certain that the great scientific and technologic wellspring of the world today is used more effectively to benefit the people of the world.



American Association for the Advancement of Science

1776 Massachusetts Avenue, N.W., Washington, D.C. 20036

Meetings and Publications • 202/467- 4486

27 October 1978

Dr. Lex Frieden
9667 Meadowvale
Houston, Texas 77063

Dear Dr. Frieden:

Attached is our check in the amount of \$298.00 for expenses incurred by you in conjunction with your participation at the past AAAS Annual Meeting in Washington, D.C.

My apologies in the serious delay of this reimbursement; we thank you for your contribution to a most successful meeting and hope to work with you in the future.

Sincerely,

Barbara Grey
Meetings Office

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOORSUND AVENUE
HOUSTON, TEXAS 77030

P. O. Box 20095
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Telephone
Area Code 713, 797-1440

March 10, 1978

Dr. Martha Redden
Project on the Handicapped in Science
American Association for the Advancement
of Science
1776 Massachusetts Avenue, NW
Washington, D.C. 20036

Dear Martha,

Thank you for involving me in the recent AAAS meeting. The accommodations in D.C. were superb. I hope my paper justified your efforts in my behalf. As you know, my employer agreed to pay half of my expenses. In case you have the resources to assist me with the remaining expenses, I am enclosing receipts. Thanks again for your help and please do not hesitate to call on me at any time. I would be particularly glad to assist with any arrangements for the forthcoming meeting in Houston.

Yours truly,

Lex Frieden
New Options Research Director

enclosure

LF/asm

*American Association
for the Advancement of Science*

1776 MASSACHUSETTS AVENUE, NW, WASHINGTON, D. C., 20036

Phone: 467-4400 (Area Code 202)

Cable Address: Advancesci, Washington, D. C.

28 June 1978

Lex Frieden
T. I. R. R. Independent Living Project
Texas Medical Center
P. O. Box 20095
Houston, TX 77025

Dear Lex:

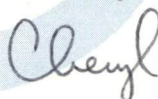
The question of what happened to your money has been resolved - finally. When we reached Wayne, who is no longer with us, we learned that he had not put in for your reimbursement because of a lack of funds. Somehow this was not made clear to us earlier.

We will be happy to straighten this out now, if you will fill out the enclosed form. Under "Destination and purpose of trip," write: "To participate in and speak at Symposium at Annual Meeting in Washington, D.C. Also, remember to note your social security number and sign the form!"

Since we were going 50-50 on this, just cite expenses that make it come out right. Don't forget any relevant non-receipted small expenses. We cannot take all receipts and then divide by two. Accounts Payable would have an apoplectic fit! Return the form to Karen Ehrlich, AAAS, OOS, 1776 Massachusetts Avenue, NW., Washington, DC 20036.

I'm sorry that we have inconvenienced you regarding this matter.

Sincerely,



Cheryl A. Davis
Senior Program Associate
Project on the Handicapped in Science
Office of Opportunities in Science

CD:ls

Enclosure

16

Policy

Development



National Archives

Department of Commerce Medallion (1935) by J. E. Fraser and R. Aitken, located at the National Archives. [National Archives and J. M. Goode]

Assessment of Technological Risk

Arranged by RICHARD A. SCRIBNER (*Mgr., Special Progs., AAAS*) and WILLIAM A. THOMAS (*Res. Attorney, Amer. Bar Foundation, Chicago, Ill.*)

Mon., 13 Feb. / Sheraton-Park / Franklin

9:00 a.m. Presiding: W. BROWN MORTON, JR. (*Sr. Partner, Morton and Roberts, Washington, D.C.; Co-Chm., AAAS-ABA Natl. Conference of Lawyers and Scientists*)

Welcome and Purpose of Symposium
EMILIO Q. DADDARIO (*Pres., AAAS; Co-Chm., AAAS-ABA Natl. Conference of Lawyers and Scientists*)

On Measuring Risk and Judging Safety
WILLIAM W. LOWRANCE (*Special Asst. to the Undersec. for Security Assistance, Science, and Technol., U.S. Dept. of State*)

Assessment of Risks in Pharmaceuticals: A Regulatory Agency Perspective
DONALD KENNEDY (*Comm. of Food and Drugs, FDA*)

Comments on Technological Risk Assessment by the Judiciary

HOWARD T. MARKEY (*Chief Judge, US Court of Customs and Patent Appeals*)

Discussants:

HAROLD P. GREEN (*Prof. of Law, Natl. Law Ctr., George Washington Univ.*), RICHARD H. BOLT (*Visiting Scientist, Mass. State Legislature*), and W. BROWN MORTON, JR.

The assessment of risk associated, for example, with the introduction of new chemicals or drugs is increasingly recognized as an area in need of further study and understanding. The problem of deciding whether some-

thing is safe goes beyond any objective probabilistic assessment, however. The determination of what, in a particular situation, is an acceptable risk is ultimately a personal and social value judgment. The effective use of such assessments in reaching judgments requires better understanding of and perhaps changes in existing procedures. The results and uncertainties of assessments must be accurately and clearly conveyed to other sectors, including the administrative and judicial.

Scientists, technologists, lawyers, jurists, and administrators deal with aspects of assessing technological risk and helping to decide what is safe. Each can contribute to the resolution of the social value questions through a better understanding and more effective use of careful assessments.

The speakers and discussants in this symposium will bring some of these various perspectives to bear on the problem. The discussion may suggest areas for study, research, and action by governmental and other organizations.

[Sponsored by the AAAS-ABA National Conference of Lawyers and Scientists]

The Technical Basis for Regulatory Decision-Making

Arranged by JOHN M. LOGSDON (*Dir., Grad. Prog. in Science, Technol., and Public Policy, George Washington Univ.*)

Mon., 13 Feb. / Sheraton-Park / Franklin

3:00 p.m. Presiding: JOHN M. LOGSDON

Panel:

MICHAEL BARAM (*Partner, Bracken, Selig, and Baram, Boston*), RAPHAEL KASPER (*Exec. Secy., Environ. Studies Bd., NAS*), ALBERT H. TEICH (*Grad.*

science education. At the elementary school level, there is often little or no attention given to science instruction. Major emphasis, however, is placed on the development of language skills. The deaf student often is at a double disadvantage. High school courses must be taught at a more elementary level due to science education deficiencies and poor communication skills. The deaf student enters college with continued deficiencies in science and communication. That at each successive level of higher education the problem is compounded is reflected by the relatively small number of deaf persons holding graduate degrees in science.

In spite of these problems in science education for deaf students, there are some outstanding programs in a variety of school settings and at all levels from elementary through graduate school. A sampling of exemplary programs will be presented in this symposium.

[Sponsored by the AAAS Offices of Opportunities in Science and Science Education]

Science and the Needs of the Handicapped

Arranged by E. C. KELLER, JR. (*Prof. of Biol., Biol. Dept., West Va. Univ., Morgantown*)

Fri., 17 Feb. / Sheraton-Park / Arlington-Alexandria

9:00 a.m. **Research, Education, and Counseling Needs for the Handicapped in Science**
Presiding: E. C. KELLER, JR.

Research Needs of the Handicapped
ROBERT W. MANN (*Whitaker Prof. of Biomed. Eng., MIT*)

Science Education Needs for the Handicapped
ROBERT LARSEN (*Argonne Natl. Lab.*)

College Counseling for the Handicapped
RICHARD H. JOHNSON (*Counselor, Southern Ill. Univ., Carbondale*)

Discussants:

JOHN GAVIN (*Dir. of Molecular Biol., Miles Labs., Elkhart, Ind.*), DORIS E. HADARY (*Prof. of Chem., Amer. Univ.*), PHYLLIS STEARNER (*Argonne Natl. Lab.*), and KENNETH RICKER (*Prof. of Science Educ., Univ. of Ga., Athens*)

3:00 p.m. **Technology Needs and the Handicapped**
Presiding: E. C. KELLER, JR.

Technology Assessment of Rehabilitation Techniques
R. A. DUDEK (*Horn Prof. of Ind. Eng., Dept. of Ind. Eng., Texas Tech Univ., Lubbock*)

Technology Diffusion and Service Delivery for the Handicapped
JERRY TUREN (*Prog. Dir., Social Service Res., The Urban Inst., Washington, D.C.*)

Technology Transfer for the Handicapped
LEX FRIEDEN (*Tex. Inst. of Rehab. and Res., Houston, Tex.*)

Discussants:

RALF HOTCHKISS (*Dir., Ctr. for Concerned Eng., Washington, D.C.*), HADI MADJID (*Arthur D. Little Co., Cambridge, Mass.*), and H. MYRON WEINBERGER (*Prof. of Med., Sch. of Med., Ind. Univ., Indianapolis*)

The basic objective of this symposium is to provide a forum to facilitate information transfer for the implementation of many of the needs, recommendations, and problems in science identified at the White House Conference on the Handicapped. In order for the science implementation to take place as rapidly as possible the general science community must become aware of the various outcomes of the Conference in regard to the science and research needs of the handicapped; science education of

and for the handicapped; counseling in science for the handicapped; and technology needs, transfer, assessment, and delivery with regard to the handicapped.

[Sponsored by AAAS Sections Q and X, and the AAAS Office of Opportunities in Science]

Models of Learning and Their Implications for Science Education

Arranged by JOSEPH I. LIPSON (*Vice Pres. for Acad. Affairs, Univ. of Mid-Amer., Lincoln, Neb.*)

Fri., 17 Feb. / Sheraton-Park / Franklin

9:00 a.m. Presiding: F. JAMES RUTHERFORD (*Asst. Dir. for Science Educ., NSF*)

The Object-Person Dichotomy in Information Acquisition and Its Implication for Science Education
KARL H. PRIBRAM (*Prof. of Psychol., Dept. of Psychol., Stanford Univ.*) and DIANE MCGUINNESS (*Lecturer in Psychol., Psychol. Bd. of Studies, Univ. of Cal., Santa Cruz*)

Information Processing Models and Science Instruction
JILL H. LARKIN (*Res. Assoc. and Lecturer, Dept. of Phys. and Group in Science and Math. Educ., Univ. of Cal., Berkeley*)

Social Factors in Science Education
HARRY C. TRIANDIS (*Prof. of Psychol., Dept. of Psychol., Univ. of Ill., Champaign*)

Mass Media and Science Education
JOSEPH I. LIPSON

3:00 p.m. Presiding: F. JAMES RUTHERFORD

Technologies for Information Processing, Knowledge, and Learning: Some Potentials for Radical Impact on Science Education
ALLEN NEWELL (*Univ. Prof., Dept. of Computer Science, Carnegie-Mellon Univ.*)

Potential for Future Environments in Science Education
GREGG EDWARDS (*Prog. Mgr. for Materials Devel. Prog., Science Educ. Directorate, NSF*)

Limits on Knowledge About Learning
KENNETH E. BOULDING (*Prof. of Econ., Inst. of Behavioral Sciences, Univ. of Colo., Boulder*)

As technology and scientific knowledge interact ever more powerfully with society and with individuals, it becomes more and more important to have effective science functioning as an educated person and as a citizen. There is considerable evidence that people at all levels need a greater understanding of science and greater scientific knowledge if we are to maintain and perhaps increase our ability to keep our civilization functioning.

Recent advances in the social, behavioral, psychological, and physiological sciences have resulted in models of learning that have implications for science education. It is the purpose of this symposium to review some of the important models, to trace their implications for practical science instruction, and to project future developments and limitations.

In the morning session physiologic, information processing, and social models will be introduced and their implications discussed. The effects and role of the mass media in science education will be analyzed. In the afternoon session possible novel developments based upon present models and developing technologies will be introduced. Finally a note of caution concerning our ability to develop knowledge of learning will be sounded. The number of afternoon speakers has been limited so that there can be extended comment and discussion with the audience.

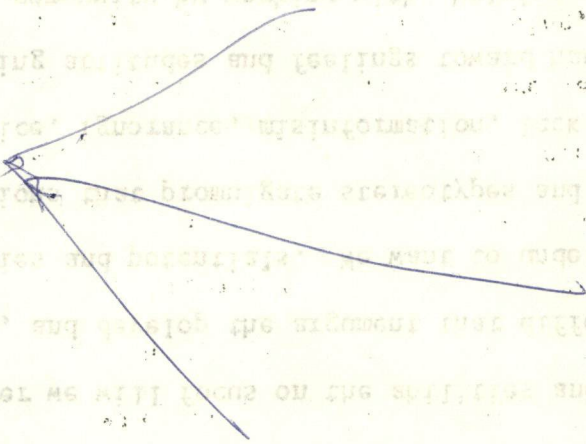
[Sponsored by AAAS Section Q and the AAAS Office of Science Education]

HELGA ROTH
CHIEF, CLEARINGHOUSE
ON THE HANDICAPPED
DHEW

H. H. Humphrey Bldg
Room 339 D

Wash, D. C. 20201

NOV 17 1964
U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF THE ASSISTANT SECRETARY FOR PUBLIC AFFAIRS



4. HANDICAPPED CITIZENS: HUMAN SERVICES AND HUMAN RELATIONS is an introductory lecture, discussion, fieldwork, three credit course with no prerequisites concerned with experientially understanding and cooperatively working with citizens who have physical, mental, emotional, vocational, social, economic, or cultural disabilities, disadvantages or deprivations.

The focus of human services is to understand the structure of HUMAN SERVICES delivery systems and services available to handicapped citizens in the County and metropolitan area so they can lead productive independent lives. Why HUMAN SERVICES are not available for everyone and why particular groups are excluded or isolated is important. The class will meet with representatives of agencies and handicapped citizens organizations. We will study specific disabling conditions so that students will have basic information about various handicaps including developmental disabilities, physical handicaps, deafness, etc. The implementation of public laws 94-142, 503, and 504 about overcoming physical, institutional, and attitudinal barriers, mainstreaming, normalization, institutionalization and deinstitutionalization will be discussed. The class will discuss volunteer and paid positions in the HUMAN SERVICES working with handicapped citizens and children.

During the second half of the semester we will focus on the abilities and potentials of disabled and handicapped citizens, and develop the argument that different people have different and unique possibilities and potentials. We want to understand negative destructive attitudes and opinions that promulgate stereotypes and myths about handicapped citizens based on prejudice, ignorance, misinformation, lack of information, fear, and strategies for changing attitudes and feelings toward handicapped citizens at school, work, and in the community by working with, helping, volunteering or observing handicapped citizens.

Comments about this course should be addressed to:

Dr. Thomas Rose
Montgomery College
Rockville, MD 20850

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOORSUND AVENUE
HOUSTON, TEXAS 77030

P. O. Box 20095
Houston, Texas 77025

Telephone
Area Code 713, 797-1440

March 8, 1978

Helga Roth
Chief, Clearinghouse
on the Handicapped
DHEW
H.H. Humphrey Bldg.
Room 339D
Wash., D.C. 21201

Dear Ms. Roth:

Enclosed please find a copy of the paper which you requested. I hope you find it interesting and useful.

Sincerely,

Lex Frieden
New Options Research Director

enclosure

LF/asm

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOURSUND AVENUE
HOUSTON, TEXAS 77030

P. O. Box 20095
Houston, Texas 77025

Telephone
Area Code 713, 797-1440

March 8, 1978

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Montgomery College
Rockville, MD 20850

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Comments about this course should be addressed to:
Dr. Thomas Rose
Montgomery College
Rockville, MD 20850

Send
paper

Edward J. Lynch JR

#418 301 E. 88.5W.

D.C. 20024

(H)(202) - 484-0333

(O)(202) - 245-7733

areas so they can lead productive independent lives. WHY HUMAN SERVICES ARE NOT

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organizations. We will study specific disabling conditions so that students will

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Montgomery College
Rockville, MD 20850

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P. O. Box 20095
Houston, Texas 77025

Telephone
Area Code 713, 797-1440

March 8, 1978

Edward J. Lynch Jr.
#418 301 G. St. SW
Washington, D.C. 20024

Dear Mr. Lynch:

Enclosed please find a copy of the paper which you requested. I hope you find it interesting and useful.

Sincerely,

Lex Frieden
New Options Research Director

enclosure

LF/asm

<u>Last Name</u>	<u>First Name</u>	<u>Business Address</u>	<u>Business Tele.</u>	<u>Home Tele.</u>
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TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOURSUND AVENUE
HOUSTON, TEXAS 77030

P. O. Box 20095
Houston, Texas 77025

Telephone
Area Code 713, 797-1440

March 1, 1978

Dr. E.C. Keller
West Virginia University

Dear Dr. Keller,

I certainly enjoyed being a part of the recent AAAS Symposium which you arranged, and I appreciate the opportunity to participate. I am enclosing a copy of an improved version of the paper for submission to the AAAS journal. As you know, I am anxious to hear whether they intend to use the article. If not, I shall submit it to another journal for publication.

Thanks again.

Your friend,

Lex Frieden
New Options Research Director

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FRIEDEN, Lex

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Technology Transfer for the Handicapped
Science and the Needs of the Handicapped

Organized by E.C. KELLER, JR.: Paper by LEX FRIEDEN,
Texas Institute for Rehabilitation and Research,
Houston, Texas

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Technology Transfer for the Handicapped. LEX FRIEDEN
(Texas Institute for Rehabilitation and Research).

Comparatively few applications of the vast scientific and technological resources in the world today have been made to benefit handicapped individuals. Present efforts in the United States are fragmented and underfunded. They are given inadequate priority and attention, and they suffer from lack of commitment, coordination and follow through. The Panel on Programs to Aid the Handicapped of the House of Representatives Committee on Science and Technology has recommended that a major national commitment of high visibility, credibility and authority be made to enhance and insure the effective transfer of science and technology to the handicapped. This commitment may be accomplished by the assignment of new responsibilities to the National Aeronautics and Space Administration.



National Aeronautics and
Space Administration

Houston, Texas 77058

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B & W

NOVEMBER 1977

S-77-30146

JOHNSON SPACE CENTER, HOUSTON, TEXAS

DAVID'S MOBILE ISOLATION SYSTEM -- David, isolated from common household activities since birth because of a rare hereditary disease, gets his first look at running water, thanks to greater mobility provided by his new "spacesuit" and its life support system developed as a spinoff from NASA technology. This session for David in his new suit took place at Texas Children's Hospital in Houston, where a large part of David's life has been spent in isolators in the Clinical Research Center under the care of physicians from Baylor College of Medicine. David's severe case of combined immune deficiency necessitates constant germ-proof isolation; and the mobile isolation system will provide greater mobility. Photograph was taken by the Medical Photographic/Illustration Department of TCH. NASA-JSC contributed the design and fabrication of the isolation system.

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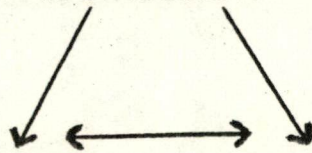
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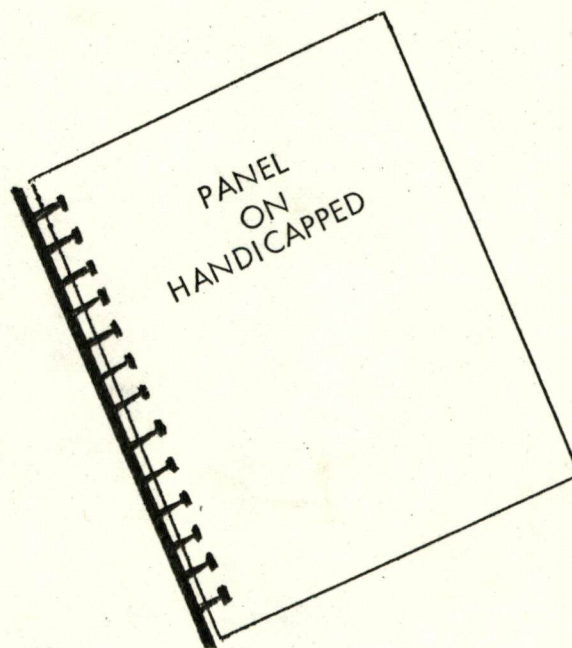
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REPORT



AREAS

A. NEEDS

B. RESEARCH EMPHASIS

C. LIMITING FACTORS

D. INFORMATION SHARING

E. UTILIZATION BARRIERS

* The author served on the Gen. on S&T's
Panel on P to S the 11 During 76 & 77.

TECHNOLOGY TRANSFER FOR THE HANDICAPPED

By Lex Frieden *

Texas Institute for Rehabilitation and Research
Houston, Texas

January 3, 1978

There are many scientific and technologic developments in the world today which may have great benefits for handicapped individuals. Space program discoveries, electronic and communication advances, and medical research promise significant contributions towards meeting the needs of handicapped individuals. Practical applications of these developments will have direct bearing on diagnostic and therapeutic treatments, and on the vocational, educational, recreational, and mobility needs of the disabled. Further applications will have indirect impact on the social and economic well being of many of ~~these~~ ^{handicapped} people.

within the past decade,
~~Ayers (1977) points out that~~ the field of electronic circuitry has been revolutionized by microminuterization techniques primarily developed by the space industry. ^{Ayers 77} Alternative power sources to replace standard batteries, some using nuclear energy, are already ^{commercially available} in use. As a result, any prosthetic device ~~that now employs signal pick-up sensors and battery power~~ can be reduced in size and weight.

~~It~~ will last longer and work more efficiently. Sophisticated microcircuits have already reduced computer processor size to a degree where intricate mobility prosthetics can be entirely

~~preprogrammed~~ ^(Engel 77)

preprogrammed.

Another example of a recent technological development which has been transferred from another field to aid the handicapped is that of the laser. The laser beam walking cane is used by blind persons as a mobility aid to detect drop offs and obstacles.

The Optacon is an often cited dramatic example of a successful effort by a team of advanced technologists working in a university research environment to ameliorate a human problem. The Optacon is a book sized electronic device with a movable camera the size of a pocketknife and a tactile screen the size of a fingertip. By presenting a tactile image on an array of fibertory pins, the Optacon allows blind persons to read ordinary printed matter directly and independently. The reader simply passes the camera over printed material with one hand while using the other hand to feel the image the camera sees. Optacon users can read as fast as 90 words per minute. Eventually, a simpler and more rugged Optacon of cigarette pack size which requires only one hand for use will be produced. (Linville 1973).

At TIRR, miniature electronic devices are planted in the nerve ways of spinal cord injured individuals to relieve spasticity and facilitate voluntary motor control of residual muscle and nerve groups. This allows some persons who are unable to walk due to spasticity caused by nerve damage to do so. In another project, advanced mathematical and computer techniques have been

(Rudvin, 1977)

used in the process of stereometric measurement to predict and measure changes in body geometry relative to scoliotic conditions. This method may improve the rate of detection from screening by as much as 400% (Herron, 1977).

These are impressive examples of what can be done by the transfer of technology from one field to another, and many more could be described. However, the need for a greater effort is even more dramatic than all the examples which could be cited. The Rehabilitation Services Administration ~~estimates~~ estimates that between 20 and 25 million individuals in the United States having neuromuscular, muscular skeletal or sensory disabilities could benefit from rehabilitation engineering services designed to transfer technology to the handicapped. (inf.)

Adapt
room
full

A recent series of workshops sponsored by the Veterans Administration and RSA made several significant findings:

1. There are approximately 700,000 wheelchair users living in the United States utilizing less than adequate and often unsafe wheelchairs.
 2. There are approximately 125,000 handicapped individuals using hand controlled vehicles in the United States, with approximately twice that number of potential users, who are using vehicles which frequently have unsafe controls or which have difficult and inappropriate accessibility.
- WC*
he
22

3. Four million Americans have walking disorders which can be remedied or at least partially alleviated with appropriate orthotic prescription, fitting, and training.

4. More than 120,000 individuals have implanted artificial joints, but the number of failures or rejections have been much higher than desirable.

5. Four hundred thousand amputees and four million persons who wear limb braces could be aided by the application of new information on prostheses and orthoses.

6. An estimated 400,000,000 dollars is spent on the treatment of tissue pressure sores which could be avoided by the application of advanced research techniques.

7. Approximately 500,000 blind persons could benefit from further development of speech ^{and tactile} output reading machines currently in prototype form.

8. The development of a high speed, quite and economical braille writer and display device would benefit 60,000 braille users.

9. Fourteen and five tenths million hearing impaired individuals could benefit from improvements in the state of the art of hearing aid production, prescription, and distribution.

10. A major need for the 1.8 million deaf individuals in the United States is a standardized system of tele-communications.

11. With the exception of alarm systems, few devices have been developed to aid approximately 12,500 deaf-blind people.

and so on
~~Artist could go on, but~~
 Perhaps the most significant finding of all those made during this exhaustive series of state of the art workshops is that "There is an inadequate method of taking techniques and devices from the laboratory and moving them into production and use." This finding has been corroborated by a number of sources. *(WHC ConSec.)*

In 1976, the U.S. House of Representatives Committee on Science and Technology began a study on research programs to aide the handicapped. According to Congressman Teague, chairman of the committee, this investigation was initiated in an effort to identify the needs and the problems of the handicapped, and to determine how the vast scientific and technological resources in the United States might be better directed toward addressing these needs and problems. The panel concluded in its report dated April, 1977 that the present research and development efforts on the part of the government and private enterprise are minuscule and too fragmented. Compounding this problem is the fact that the results of such research are often unavailable to the handicapped public. Among other things, the panel found limited needs assessment, imbalances in research emphasis, severe limiting factors in research efforts, insufficient sharing of information and knowledge and incoordination of research efforts, and many barriers impeding utilization of R & D results by handicapped persons.

There is no doubt ^{but} ~~that~~ what the present and projected needs justify a far greater effort to transfer technology for the handicapped. In other words, technology, ~~the systematic application of scientific or other organized knowledge to~~ practical tasks (Galbraith, 1967), must be moved or transferred from fields where it is well developed, such as space exploration or weapons development, into the field of handicapping conditions at a far greater rate than is now the case.

There are many barriers to the effective transfer of technology generally, and specifically where it involves transfer of technology to aid the handicapped. In an awareness paper prepared for the White House Conference on Handicapped Individuals, the following are said to hamper the development of new technology and the adaptation of existing technology for the handicapped: (1) inattention to the definition of discreet, project oriented tasks; (2) a lack of suitable basic science to support the managerial decision processes required; (3) a scarcity of people trained and educated in the application of engineering principles to the handicapped; (4) the high cost of technical failures induced by non-perception of real needs; (5) the need to develop techniques of problem definition and program management. (Ayers, 1977).

Given the natural barriers to technology transfer which exist in all fields, ~~a series~~ ^{many} of recommendations to improve technology transfer for the handicapped ^{have} ~~has been made by a variety of~~

Recommendations

most significant

~~sources.~~ Among the ~~most frequently mentioned~~ recommendations, ~~are~~ the following: *two are probably the*

1. Obtain better demographic and sociologic data for planning.
2. Train more rehabilitation engineers
3. Involve more handicapped individuals in needs determination and definition
4. Coordinate efforts based on national rather than parochial objectives
5. Provide adequate and stable funding
6. Improve the balances between basic and applied research, complex and simple solutions, and between alternative solutions.
7. Facilitate the sharing of information and knowledge by all interested parties. *Share*
8. Facilitate the cooperation between the public and private sectors
9. Educate consumers on the use and acceptance of new devices and systems
10. Establish centralized distribution, maintenance, and repair centers. *center*
11. Establish a centralized comprehensive information service.
- ~~12. Provide additional funding~~
- 12* 13. Establish a system for setting national priorities and coordinating new and existing efforts.

12

2

adequate and stable funding must be provided

Of all those ~~recommendations made and listed here~~, the last two are probably the most significant. With respect to economic investment in R & D for the handicapped, the scope is far too small considering the potential benefits and needs. Of the approximately 21 billion dollars which is spent annually in the form of services and financial assistance and economic loss of productivity for the handicapped, approximately 31 million is allocated from federal sources for R & D. This is a ratio of 0.15%. Among the civilian population, all government R & D expenditures including not only devices and systems but all research in the rehabilitation field, amounted to only \$2.92 per disabled person in 1976. In 1975, 3.7% of the national health care budget was spent on research and development. Only .7% of that research and development budget was spent on rehabilitation research. In other words, of the 118.5 billion dollars spent on health care in 1975, only 0.026% of that amount was spent on rehabilitation research and development. When one considers that rehabilitation in general and rehabilitation research and development in particular may eventually reduce the total health care cost, the magnitude of these efforts seems to be extraordinarily and disproportionately low.

The second major recommendation is

~~The final recommendation listed above~~ is significant from the standpoint that there are no less than 103 federal authorities bearing directly or indirectly on R & D for the handicapped. In addition to these federal authorities are countless state, local, and private authorities. Presently there are no means

to establish a system for setting national priorities and coordinating new and existing efforts.

to coordinate or systemize efforts between or across these various authorities.

Perceiving the relationship between all of the barriers and recommendations made above, the House of Representatives panel of programs to aid the handicapped recommended that a major national commitment of high visibility, creditability and authority to be made to enhance and insure the effective transfer of science and technology to the handicapped (Report of the panel, 1977). The Committee on Science and Technology requested the panel to make its recommendations more specific. In response to that request, the panel met through the Fall and Winter of 1977 and made the following additional recommendations: (R 800 175)

- . That the National Aeronautics and Space Administration (NASA) be designated as the principal government agency to manage, control, and coordinate the U.S. effort to use science and technology in aiding handicapped persons.
- . That needed legislation be drafted to add to the National Aeronautics and Space Administration mission the requisite authority and responsibility for this program, including necessary science and technology program authority.
- . That the National Aeronautics and Space Administration authorizations for funding and staff be increased immediately, progressively, and substantially to accomplish this vital program.

- . That the national importance of this program and its need for top level direction be recognized by the Presidential appointment of a National Aeronautics and Space Administration Associate Administrator or other appropriate designee to manage it.
- . That an 18-member Science and Technology Board for Handicapped Persons be appointed by the President, whose members are to serve staggered five-year terms.
- . That the Science and Technology Board should report to the Administrator of the National Aeronautics and Space Administration, the President, and the Congress using annual reports and other appropriate means.
- . That Presidential appointments to the Board should be drawn from nominations submitted by consumers, researchers, practitioners, and other concerned public and private individuals and groups.
- . That the capability of the National Aeronautics and Space Administration for contracting and co-development with industry be expanded so that new programs insure industry responsiveness to research and development to meet the needs of handicapped persons.
- . That other agencies' existing programs for handicapped people, together with their authorizations

and appropriations, not be adversely affected
in normal growth and development as a result of
this action.

Prober

These recommendations clearly reflect the panels belief that a greater national scientific and technologic effort benefitting handicapped individuals is in the best interest of our country.

The recommendation to assign NASA lead agency responsibility in this projected effort was ^{MADE} ~~that~~ only after careful study and extensive deliberation. The panel reviewed various models by which a program might be undertaken. The Rehabilitation Services Administration, National Institutes of Health, Veterans Administration, National Science Foundation, and NASA are a few of the possible models which were considered. Each possibility was analyzed in light of its potential impact. The panel actually rated possible lead agencies in terms of program success criteria.

Prober

~~Those criteria were:~~

SUCCESS CRITERIA

1. Proper Input

Potential to get and use input from the handicapped on their needs and priorities

2. Involvement

Potential capability to involve key persons in other activities which affect program operations and success

3. Feedback, Responsiveness, Flexibility, and Adaptability

Likelihood of revision of operations from feedback from handicapped, researchers and others regarding program benefits and deficits

4. Organize and Manage Support

Likelihood to be able to organize and to manage the program's scope, depth and balance of emphases

- Multi-discipline, multi-purpose, multi-professional public/private effort having compability with agency's philosophy and practices
- Technological support for information gathering; processing, networking; for communication system for needs input and user information output
- Internal capability for managing basic and applied research hardware development, testing, distribution, and technical and knowledge transfer capabilities
- External access to knowledge sources, technical information within and outside of government

5. Leadership and Credibility

Potential capability to develop and retain leadership posture internally within government and externally in the public sector

6. Informing for Commitment

Likelihood of strengthening and sustaining Congressional, Presidential and public interest and commitment

7. Regulation and Guidance (how much on what)

Probable acceptance of governance of an autonomous body (a council, trusteeship or board for policy, program and fiscal priority and overview).

8. Developing and Protecting the New

Likelihood of developing and safeguarding and incrementing a new program with fiscal capacity less than the responsibilities including:

- Top level administrative support potential
- Attracting and holding new personnel for programs
- Justifying budget growth in executive and legislative branches of government

9. Holding Harmless What Exists and Building on It

Likelihood of the alternative to protect and augment existing R&D funding in other agencies, departments, etc. dealing with the handicapped

10. Outcome Usage and Impact

Potential to transfer and stimulate practice usage of existing and newly procured knowledge, methods and technology

- Potential for impacting the service delivery system, conceptually, methodologically and quantitatively
- Potential for impacting the educational system for practitioners and their updating conceptually and procedurally
- Developing methods, procedures, systems for pilot testing, evaluation, production, marketing and distribution, and maintenance of hardware

11. Timeliness

Likelihood of rapid response to program initiation, change and/or implementation

systematic selection

By this ~~ranking~~ process, the National Aeronautics and Space Administration was considered the most feasible host agency for the proposed entity and the National Science and Technology Board for Handicapped Persons. *[There is little doubt that]*

NASA has the capability to insure
There is no doubt that the problems involved in the effective transfer of technology to benefit handicapped individuals

are complex. NASA has earned an international reputation for

the management of complex problems. It has an extensive communication

network in place and an active information exchange process

NASA

cont

for data collection and dissemination which can be expanded to incorporate communication needs identified for a comprehensive, national, coordinated research effort for handicapped persons. Additionally, NASA has existing technology utilization and life science programs to supplement its recognized technological capacity. These existing programs would certainly compliment those which have been proposed.

is bound to
 There ~~will~~ be much discussion about the pros and cons of placing the responsibility for an effort of this nature and scope in the hands of NASA, ~~before legislation is drafted and passed.~~
 Much of this discussion will relate to issues of great importance and consequence. However, more of it may result from petty jealousies between agencies and vested interests in turf protection. It is crucial that those who judge the merits of the proposed plan distinguish those objections which are based on reason from those which are based on selfish interests.

Technology transfer does not occur in a vacuum. Unless ~~there is~~ *the proper* a ~~technology for analysis, development and application of solutions~~ *may* to ~~practical needs~~ of the handicapped, the impact of future scientific discoveries ~~will go~~ unrealized. The handicapped people of this country, and the country itself, cannot afford to let this happen. *The proposed initiative*

Technology transfer does not occur in a vacuum. In order for future discoveries in other fields to have an impact on the lives of handicapped individuals, a systematic method for analyzing, developing and applying possible solutions to practical needs of the handicapped must be developed. This process involves supervision, management, and technical expertise. NASA has the capability to insure that the fruits of our technology will more fully benefit handicapped individuals. The great scientific and technologic wellspring of the world today ^{is} should be used more effectively to benefit the people of the world. The ^{proposed} present initiative ^{would} will surely be a positive and far reaching step in that direction. After all, it is about time that NASA took a bigger step. ^{making certain that} ~~for intentions~~ ~~here and there~~

Unless the proper mix of resources and program management is achieved the impact of future sc. dis. may go unachieved. The handi - - -



to 14



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25 OCTOBER 1974

S-74-33225

NEW YORK CITY, NEW YORK

~~UNIT FROM NASA RESEARCH~~ Four-year-old Jennifer Guarasolo,
~~shown with her mother, Mrs. Kathleen Guarasolo, takes a moment out~~
~~from play to recharge her implanted pacemaker. A unit that is re-~~
~~chargeable from outside the body for a period of 10 to 20 years,~~
~~it eliminates the need for surgery to undergo an operation every~~
~~two years for battery replacement. It can be recharged in 90 minutes,~~
~~and stores enough energy to last eight weeks, though the previous~~
~~recharge period is only a week. The pacemaker was developed by the~~
~~Applied Physics Laboratory of Johns Hopkins University, Baltimore, Mary-~~
~~land. The electronic and electronic components designed by NASA for use~~
~~in spacecraft.~~

PHOTO CREDIT: NASA or National Aeronautics and Space Administration

of tech transfer to benefit the handicapped

this unit is

Another example of space tech benefit to the handicapped

This is an implanted rechargeable pacemaker. The pacemaker is another example of space tech benefit to the handicapped.

AP-3 Sandra McGee



National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

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MAR 1974

S-74-18389

JOHNSON SPACE CENTER, HOUSTON, TEXAS

FIREMAN'S BREATHING GEAR---A NASA-Johnson Space Center test subject models lightweight breathing system which will be tested by various fire stations in the nation during the coming year. The Firefighter's Breathing System was developed by engineers at JSC using materials and technology from the U.S. space program to design and build tanks and masks that are lighter and more efficient than systems now in use. The air tank is built of an aluminum liner with a glass fiber overwrap---a technique originally developed for solid propellant rocket motor cases. Two fire stations in Houston and two in New York and possibly others will use the system in field application. Project engineer Pat McLaughlan of JSC's Crew Systems Division said, "While current systems are capable of doing the job, the lower weight and added duration of the new system will provide the firefighter greater safety and efficiency."

PHOTO CREDIT: NASA or National Aeronautics and Space Administration



National Aeronautics and
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Houston, Texas 77058

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NOVEMBER 1977

S-77-30139

JOHNSON SPACE CENTER, HOUSTON, TEXAS

DAVID'S MOBILE ISOLATION SYSTEM ——— David, a six-year old suffering from severe combined immune deficiency, a rare hereditary disease affecting males, displays his newly found mobility—afforded by this mobile isolation garment and its support system (out of frame)—by strolling in the corridors of Texas Children's Hospital (TCH). He calls attention to writing his name on the blackboard. David has been cared for since birth in a series of germ-proof isolators located in the Clinical Research Center at TCH, under the care of Baylor College of Medicine. This photo was taken by TCH's Medical Photo/Illustration Department. The design and fabrication for the system were contributed by the NASA-Johnson Space Center (JSC).



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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OCTOBER 1973

S-75-34353

JOHNSON SPACE CENTER, HOUSTON, TEXAS

BENEFITS FROM SPACE RESEARCH-----On-the-scene medical treatment provided by Telecare equipment and communications can be a key factor in saving a patient's life, particularly in cases of heart attacks, shock or drowning. In this simulated emergency, medical technicians are applying a defibrillator to stimulate a patient's heart. The technician at left is in two-way radio communication with a physician. Telecare technology stems from medical instrumentation and techniques developed for NASA's manned space flight program. SCI Systems, Inc., Houston, is installing 28 units in emergency vehicles for the City of Houston, Texas, and the system is expected to be operational before the end of 1973.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration



National Aeronautics and
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OCTOBER 1976

JOHNSON SPACE CENTER, HOUSTON, TEXAS

SHUTTLE MISSION PROFILE-----An artist's concept depicting the Space Shuttle Orbiter placing a Space Tug and payload in Earth orbit as a prelude to Tug's transporting the payload package to an Earth synchronous orbit. Note the manipulator arm extending out of the Orbiter's cargo bay.



National Aeronautics and
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12 AUGUST 1977

JOHNSON SPACE CENTER, HOUSTON, TEXAS

SHUTTLE ALT FF-1 MCC-----An overall view of mission control operations in the Mission Control Center, Building 30, at the Johnson Space Center, during the first free flight of the Shuttle Approach and Landing Tests (ALT) conducted on August 12, 1977 at the Dryden Flight Research Center in Southern California. When this picture was taken the Orbiter 101 "Enterprise" had not separated from the NASA 747 carrier aircraft, as can be seen on the television monitor in the foreground.



National Aeronautics and
Space Administration

Houston, Texas 77058

For Release:

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COLOR

OCTOBER 1976

JOHNSON SPACE CENTER, HOUSTON, TEXAS

SHUTTLE/SPACE STATION ACTIVITY—An artist's concept depicting activity at a possible manned, modularized space station in Earth orbit. The modules would house various equipment, functions and activities of the space station. The modules would be carried to Earth orbit by a Space Shuttle Orbiter. An Orbiter is at the upper left.



National Aeronautics and
Space Administration

Houston, Texas 77058

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COLOR

20 JULY 1969

MAINED SPACECRAFT CENTER, HOUSTON, TEXAS

APOLLO 11 EVA PHOTO-----Astronaut Edwin E. Aldrin Jr., lunar module pilot, walks on the surface of the Moon near the leg of the Lunar module during Apollo 11 extravehicular activity. Astronaut Neil A. Armstrong, Apollo 11 commander, took this picture with a 70mm lunar surface camera.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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COLOR

1 AUGUST 1971

AS15-88-11866

MANNNED SPACECRAFT CENTER, HOUSTON, TEXAS

APOLLO 15 EVA PHOTOGRAPH-----Astronaut James B. Irwin, lunar module pilot, gives a military salute while standing beside the deployed U.S. flag during the Apollo 15 lunar surface extravehicular activity at the Hadley-Apennine landing site. The flag was deployed toward the end of EVA-2. The Lunar Module "Falcon" is in the center. On the right is the Lunar Roving Vehicle. This view is looking almost due south. Hadley Delta in the background rises approximately 4,000 meters (about 13,124 feet) above the plain. The base of the mountain is approximately 5 kilometers (about 3 statute miles) away. This photograph was taken by Astronaut David R. Scott, Apollo 15 commander.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration

Science and the Needs of the Handicapped

Arranged by: E. C. KELLER, JR. (Prof. of Biology,
Biology Dept., West Virginia Univ., Morgantown, WV)

Friday, 17 February / Sheraton-Park / Arl.-Alex

9:00 a.m. Research, Education, and Counselling Needs
for the Handicapped in Science
Presiding: E. C. KELLER, JR.

Research Needs of the Handicapped
ROBERT W. MANN (Whitaker Prof. of Biomed. Eng., Mass.
Inst. of Tech., Cambridge, MA.)

Science Education Needs for the Handicapped
ROBERT LARSEN (Argonne National Lab., Argonne, IL)

College Counselling for the Handicapped
RICHARD H. JOHNSON (Counselor, Southern Ill. Univ.,
Carbondale, IL)

Discussants:

JOHN GAVIN (Director of Molecular Biology, Miles
Laboratories, Elkhart, IN.), DORIS HADARY (Prof.
of Chemistry, American Univ., Washington, D.C.),
PHYLLIS STEARNER (Argonne National Labs, Argonne, IL),
KENNETH RICKER (Prof. of Sci. Ed., Dept. Sci. Ed.,
Univ. Georgia, Athens, GA)

3:00 p.m. Technology Needs and the Handicapped
Presiding: E. C. KELLER, JR.

Technology Assessment of Rehabilitation Techniques
R. A. DUDEK (Horn Prof. of Ind. Eng., Dept. of Ind.
Eng., Texas Tech. Univ., Lubbock, TX)

Technology Diffusion and Service Delivery for the
Handicapped
JERRY TUREN (Prgm. Dir., Soc. Serv. Res., The
Urban Institute, Washington, D.C.)

Technology Transfer for the Handicapped
LEX FRIEDEN (Dept. of Soc. Psych., Univ. of Houston,
Houston, TX)

Discussants:

RALF HOTCHKISS (Director, Center for Concerned
Engineering, Washington, D.C.) HADI MADJID
(Arthur D. Little, Co., Cambridge, MA.) MYRON
WEINBERGER (Professor of Medicine, School of Medicine,
Indiana Univ., Indianapolis, IN.)

SAMPLE OF FORMAT

Invited Paper Abstract

30 Indent Five Spaces and Type Title in Upper and Lower
29 Case Letters and Underline. AUTHOR'S NAME (Institution in
28 Parentheses), SECOND AUTHOR (Institution).*

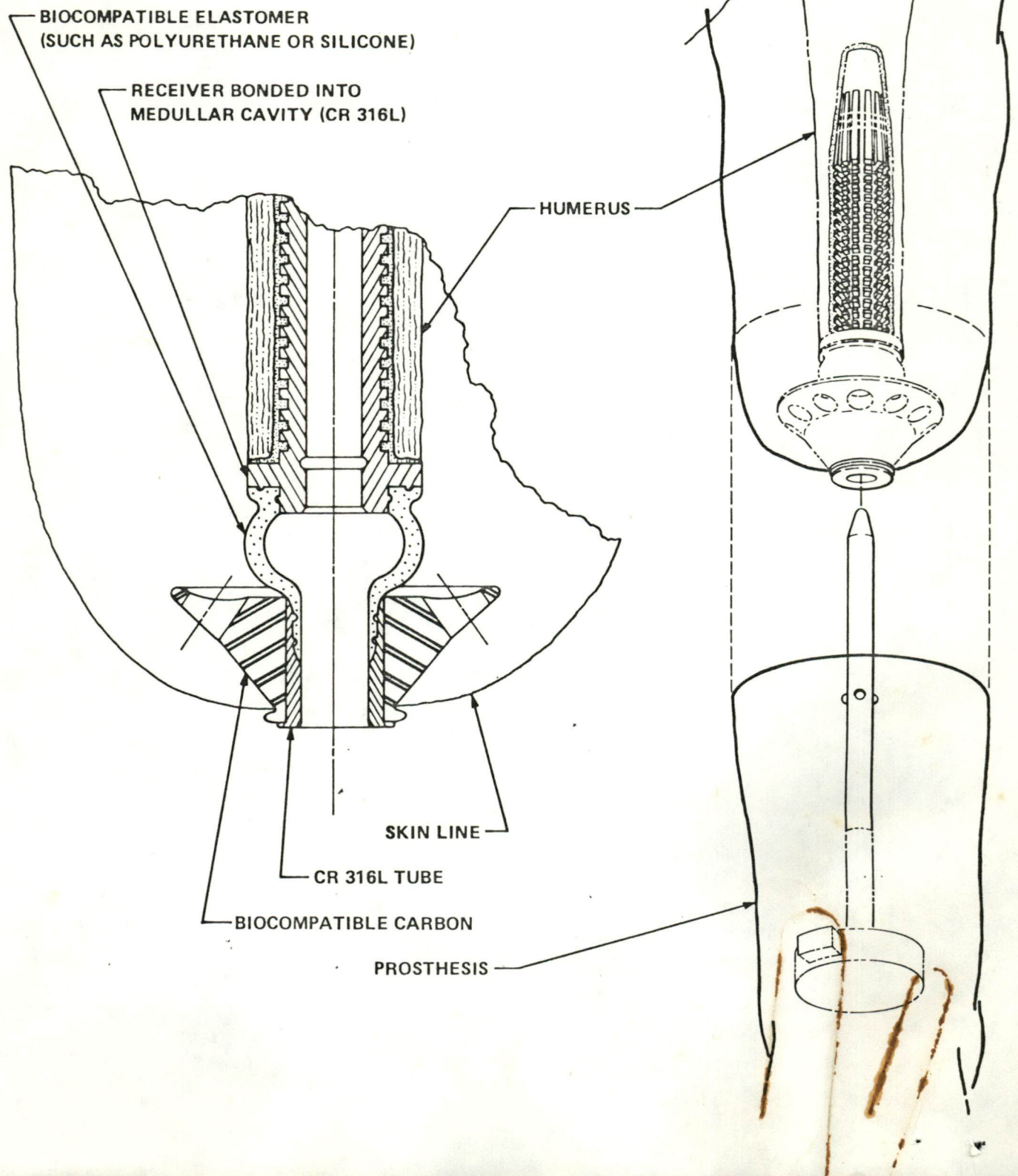
27
26 Skip 1 space and type abstract. The full width of the col-
25 umn of typed material should be 5 inches (12.7 cm) and must
24 not extend beyond the blue lines on the enclosed abstract
23 paper. Abstracts which extend over the blue lines will not
22 be printed (only the title and authors will be printed).
21 The total length of the material, from top of title to bot-
20 tom of text (including footnotes) must not exceed beyond
19 line 1 (bottom of abstract paper); material which takes up
18 more than this space is subject to arbitrary cutting. All
17 special symbols and signs which must be hand lettered
16 (e.g., π) must be rendered in reproducible black ink as
15 clearly and carefully as possible. The entire abstract
14 should be of camera-ready quality so that it can be photo-
13 graphed, turned into a plate, and printed. The printed
12 abstract will be about 2/3 the size of the typed version.
11 Avoid paragraphing; it wastes space. However, you may use
10 your allocated space to neatly letter in equations and dia-
9 grams, as you deem necessary

$$-\frac{\hbar^2}{2m} \nabla^2 \psi + V \psi = i \hbar \frac{\partial \psi}{\partial t}$$

5 as indicated in this example.

4
3 *Skip 1 space and type footnote. Authors' names should be
2 in all upper case letters; institutions in upper and lower
1 case letters.

CONCEPT,
UPPER ARM ATTACHMENT
TO PROSTHESIS



Technology Transfer for the Handicapped

"There is an inadequate method of taking techniques and devices from the laboratory and moving them into production and use."

RSA - VA Workshops

The Panel recommends:

An overview entity should be established with
credibility and high visibility reflecting a
national commitment.

Panel on Research Programs
to Aid the Handicapped, 1977

The Panel recommends:

That the National Aeronautics and Space Administration (NASA) be designated as the principal government agency to coordinate and participate in the U.S. effort to use science and technology in aiding handicapped persons.

Panel on Research Programs
to Aid the Handicapped, 1978

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOURSUND AVENUE
HOUSTON, TEXAS 77030

P. O. Box 20095
Houston, Texas 77025

Telephone
Area Code 713, 797-1440

M E M O

TO: Dr. Spencer
FROM: Lex Frieden
DATE: January 16, 1978

As you know, I am presenting a paper entitled Technology Transfer for the Handicapped at the A.A.A.S. meeting in Washington, February 17, 1978. I would like approval to use Institute travel funds for this purpose. Projected expenses will be \$488 air fare (includes attendant - 2 way coach), \$42 room one night, plus \$30 food, and \$12 cab = \$572. It is possible that A.A.A.S. may share these expenses.



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

November 28, 1977

Mr. Sherman E. Roodzant
Technical Consultant
Committee on Science and
Technology
U. S. House of Representatives
Washington, D. C. 20515

Dear Sherm:

I am following up on the remarks I made at the Committee meeting last month concerning the research and development of technology for handicapped people in the United Soviet Socialist Republic.

As Commissioner of the Rehabilitation Services Administration in 1974, I headed an American delegation to Russia on their rehabilitation and social security programs. While in Moscow we visited Professor N. I. Kondrashin, Director of the Central Institute for Prosthetics Application and Prosthetics Development. The projects at his Institute were quite impressive. One of the points Professor Kondrashin stressed was the close relationship between his Institute and the Space Agency in Russia. He said that the Space Agency was pursuing the application of space technology to the technical needs of the handicapped. He showed us several advanced appliances that were developed through the space program.

Obviously, the utilization of space technology makes good sense in terms of hardware for disabled people. The developments of space robots that could be transferred to exoskeleton devices and light weight energy mechanisms that could be used for human motion of paralyzed limbs are just examples of possible transfer. I hope the Committee will follow up on pulling the best from the progress and programs of our National Aeronautics & Space Administration.

It is a real pleasure working with you and the Committee. We in the Department of the Interior stand ready to assist your noble efforts in any way possible.

Sincerely,

Dr. Andrew S. Adams
Staff Assistant-Policy, Budget
and Administration





United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

November 28, 1977

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Sincerely,

Dr. Andrew S. Adams
Staff Assistant-Policy, Budget
and Administration



<u>Last Name</u>	<u>First Name</u>	<u>Business Address</u>	<u>Business Tele.</u>	<u>Home Tele.</u>
10. Madjid	Hadi	Arthur D. Little Co. Cambridge, Mass. 02139	(617)864-5770	523-7336
11. Ricker	Kenneth	Science Ed. Univ. of Georgia Rm 212, Aderhold Hall Athens, GA 30602	(404)542-1763	
12. Stearner	Phyllis	Dept. of Biology Argonne Natl. Lab. Argonne, IN 60439	(312)739-7711 X2740	
13. Turen	Jerry	Soc. Serv. Research Urban Institute Washington, D.C. 20037	(202)223-1950 X463	
14. Weinberger	H. Myron	School of Medicine Indiana Univ. 1100 W. Michigan St. Indianapolis, IN 46202	(317)264-8153	253-7927

Frieden

THE NASA BIOMEDICAL APPLICATIONS TEAM PROGRAM

INTRODUCTION

The Technology Utilization Program

Biomedical Applications Teams are an important element of the overall NASA Technology Utilization Office. The Technology Utilization Office was established in 1962 for the following purposes:

1. To increase the return on the National investment in aeronautical and space programs by helping to bring about additional uses of the knowledge gained in these programs.
2. To shorten the time from development of new knowledge to its dissemination and effective utilization.
3. To aid the movement of new knowledge across organizational, disciplinary, and regional boundaries.
4. To help develop better methods for communicating and applying Government generated knowledge to private industry.

The Office has organized its activities on a nationwide basis (transfer network) to promote effective utilization of the vast amounts of new technology and other technical information generated by aerospace research and development programs. (Enclosure 1)

PROGRAM (GENERAL)

The Biomedical Applications Teams

Biomedical Applications Teams (BATEams) were established by NASA in 1966 for the specific purpose of transferring aerospace technology to the solution of biomedical problems. Basically, each BATEam acts as an interface (broker) between the medical profession, rehabilitation centers, mission agencies, manufacturer, and NASA scientists and engineers. Team members met with investigators in the medical and biological sciences, physicians, and medical specialist, to define significant technological

problems. This methodology demands that specific medical needs are identified and defined through direct contact with potential users of Aerospace Technology. Only those problems are considered which meet the following criteria:

1. No ready solution is available through commercial medical instrument manufacturers. That is to say that the new or improved products are probably made possible only through the use of NASA technology.
2. The problem can be defined in terms such that an aerospace related technology could be applicable to a solution.
3. Solution of the problem would make a significant contribution to medical research or clinical medical practice. The emphasis, therefore, is on identifying and commercializing those applications of NASA technology that are significant commercialization, opportunities or provide major medical break-through.

There are three Biomedical Applications Teams established at the following institutions:

1. Stanford University School of Medicine
Cardiology Division
Biomedical Technology Transfer
701 Welch Road - Suite 3303
Palo Alto, California 94304
2. Research Triangle Institute
P. O. Box 12194
Research Triangle Park, North Carolina 27709
3. Advisory Center for Medical Technology and Systems
University of Wisconsin
1500 Johnson Drive
Madison, Wisconsin 53706

Technology Transfer Process

The term "technology" itself is very broad, including both hardware and software, as

well as the engineering expertise that has been a part of aerospace projects. There are many different ways in which technology developed through the Space Program can be applied or transferred to solving biomedical problems. No single approach to transferring technology to medicine is applicable to all medical problems. The approach is adapted to the particular problem and institution involved. However, the general procedure followed by the Biomedical Applications Teams consists of four basic steps:

1. Identification of Commercialization Opportunities
2. Screening of Commercialization Opportunities
3. Development of Commercialization Strategy
4. Implementation of Commercialization Strategy

These steps are described in the following paragraphs.

PROGRAM (SPECIFIC)

Identification of Commercialization Opportunities - In order to identify commercialization opportunities, the Team serves as an active interface between medical investigators and the body of scientific and technical knowledge that has resulted from this Nation's aerospace research program. The Team attempts to carefully define the technological needs facing the medical community and to identify relevant aerospace technology to solve those needs. The needs are those encountered in clinical and rehabilitation medicine and medical research programs in major clinics and medical schools and in the National Institutes of Health. The Team actively engages in the identification of these needs through direct contact with the clinical rehabilitation and medical research staffs. The objective is to define precisely and accurately the characteristics of the technology required to solve the needs. In many cases, following the characterization of the required technology, it is obvious that the need should not be considered by the Team. The "should not" reasons could include the following: (1) the need can be solved using commercially available equipment; (2) the need cannot be solved, so that an entirely different approach is indicated; (3) the real problem is medical and not technical in nature; (4) the possible solutions would have little probability of being commercialized; and (5) the requirements cannot be specified because insufficient information exists.

After the problem is defined, a BATEam member confers with the problem originator. Clarification of technological aspects of the problem leads to the formulation of a "Problem Statement." Besides defining the problem in greater detail, the Problem Statement answers the following questions:

1. What medical specialty is involved?
2. How has this problem been solved in the past?
3. What presently available commercial equipment is applicable?
4. What broad medical impact will solution of the problem have?
5. Can the technological solution offered by NASA be readily made commercially available?

Aerospace technology that may be relevant to the solution of a need is identified by three approaches. First, a manual (or computer) search is made of the aerospace information bank. These searches are made at one of NASA's six Industrial Applications Centers (IAC). On-line computer searchers utilize the NASA Scientific and Technical Information Facility in BWI Airport, Maryland. The information that can be accessed through the information bank consists of more than one million documents, articles, and translations that have been abstracted in the Scientific and Technical Aerospace Reports (STAR), The International Aerospace Abstracts (IAA), Computer Program Abstracts, Tech Briefs, and in many other publications. Second, the Team contacts individuals at the NASA Field Centers who are likely to have a good overview of all work being done, which is related to the requirements of a specific medical need. Third, problem statements are circulated to engineers and scientists at NASA Field Centers who may be able to identify relevant technology and suggest possible solutions. These statements are circulated in a highly selective manner with the distribution being determined by the Team, Technology Utilization Officers (TUO) at the NASA Field Centers, and other individuals at the Field Centers.

All potentially relevant technology that is identified by the search procedures is evaluated by the Team to determine whether a potential solution to a specific need has been found. Those items of technology that represent potential solutions to needs are presented problem originators along with available supporting data and information.

Any required reengineering (and the details of implementing the potential solutions) are discussed with the problem originator.

The problem originator and the Team must then work together to evaluate potential solutions. Their decision to implement a proposed solution will depend upon a number of factors: (1) their assessment of the technical validity of the proposed potential solution; (2) the medical applicability of the proposed solution; (3) consideration of the cost and time necessary to complete the implementation; and (4) appreciation of factors which would contribute to later development of a commercially attractive device. They should evaluate the appropriateness of the proposed solutions and select one solution for further action. Then, the team prepares two commercialization packages which describes the solution, the medical need, the patent status, and various pertinent aspects of the potential market. This package is used to aid in the identification of a manufacturer.

Those solutions that have been selected by the above procedures are subjected to the second step--screening of commercialization opportunities.

Screening of Commercialization Opportunities - Effective screening of commercialization opportunities is at least as important to the success of the Biomedical Applications Team Program as any of the operational steps. For it is through this screening process that the Team identifies those commercialization opportunities that have a high probability of being commercialized. In addition, much of the data used in the development of commercialization strategy is accumulated during this process. Currently, the following criteria are being utilized to screen commercialization opportunities:

- (a) The solution uses NASA technology or expertise.
- (b) The solution provides an innovative improvement in treatment or diagnosis, or it results in a reduction in cost of health care.
- (c) The solution will have a significant impact on the medical field, and the character of that impact will be positive.
- (d) The market size is adequate for the necessary capital risks, and the solution can be manufactured at a cost which will permit penetration of this market.

- (e) A latent demand exists for the solution, or a demand can be created using pertinent marketing techniques.
- (f) The potential manufacturers are identified who are willing to join a NASA-Industrial-Medical Team to commercialize the solution and who will agree to sharing the costs of this development effort.
- (g) The existing distribution patterns and organizations that will move the product from the manufacturer to the potential user, if not an integral part of the manufacturer's organization, are identified.
- (h) The funding for the necessary development, engineering evaluation, and marketing necessary to commercialize this solution have been tentatively identified, with all or most of the funds coming from sources other than NASA.

Commercialization opportunities that do not satisfy these criteria are rejected or placed into a category entitled "Institutional" (more than 50% co-funded by a mission agency) or "Demonstration" (more than 60% co-funded by a mission agency). In all cases that are not coupled with a manufacturer, NASA conducts a market study to learn more about the potential for wide-spread use. Those that do are classified as having a high probability of being commercialized and are documented in a commercialization opportunity report. The Team now initiates the third step--development of commercialization strategy.

Development of Commercialization Strategy - Studies have clearly shown that the manufacturer must be involved early in the product development procedure. Therefore, the Team immediately undertakes the identification of a suitable manufacturer. Copies of the commercialization package, which describes the commercialization opportunity, are forwarded to suitable manufacturers. An officer for each of these manufacturers is personally interviewed. Thus, favoritism is avoided. Once the manufacturer is identified, the NASA-Industrial-Medical Team is formed. The role of each member is defined and any agreements which are found necessary, such as licensing arrangements, are negotiated. This newly formed NASA-Industrial-Medical Team, with the Biomedical Applications Team now acting as a consultant and coordinator (broker), must create the product development and marketing plans. The costs of carrying out these plans are estimated, and it is agreed how much of this cost each member will underwrite.

If costs cannot be covered by the NASA-Industrial-Medical Team, sources for the necessary additional funds must be identified. Possible sources are such organizations as the National Institutes of Health, The Rehabilitation Services Administration, the Veterans Administration, and others.

The distribution of the finished product can pose a serious problem. It must be carefully considered in the marketing plan, since many manufacturers do not have their own product distribution and product maintenance systems. These needs must be met. They may require the addition of a fourth member to the NASA-Industrial-Medical Team. Unfortunately, the cost of such a distribution system can make it economically impossible to market the NASA device. Therefore, it is best to learn this before the expenditure of much time, money, and effort.

Two other factors which must be considered are: (1) the special medical testing required by such organizations as the Food and Drug Administration; and (2) the effort to develop a new market. Both of these needs are usually adequately provided for if care has been exercised in the selection of the manufacturer. If properly qualified, the manufacturer will have extensive experience in both of these areas. If either factor is not considered in the selection of the manufacturer, the commercialization effort will almost certainly fail.

Funding sources must be identified. Ideally, NASA funding will not be required. Rather, all or most of the funding will normally be provided by the government agency that has the primary responsibility for the particular area of medical need. As an example, when the medical need involves some cancer treatment technique, the government agency to provide most of the funding would be the National Cancer Institute. If NASA funding is needed and can be justified, the Team will work closely with the involved NASA Field Center to prepare the necessary Research and Technology Objectives and Plans (RTOP) for submission to NASA Headquarters. However, before submission of the RTOP, the commercialization strategy has been completed and the commercialization opportunity has been classified as a potential commercialization: (1) the NASA-Industrial-Medical Team has been formed; (2) the development and marketing plans have been completed; (3) the sources of co-funding have been identified; and (4) the potential commercialization report has been prepared and distributed. Descriptions of this strategy become an integral part of the RTOP.

The formal approval of the RTOP by NASA Headquarters or, in the case where an RTOP is not required, the approval of the commercialization strategy by the NASA-Industrial-

Medical Team will initiate the final step in the Team methodology-implementation of commercialization strategy.

Implementation of Commercialization Strategy - In this final step, the role of the Team is one of monitoring, coordinating, and reporting. However, this Team activity is vital to the success of the commercialization effort. By carefully monitoring and coordinating the activities of individual members of the NASA-Industrial-Medical Team, minor problems can be prevented from becoming major obstacles. In addition, the project overview held by the Team, plus knowledge of the technology transfer process, gives the Team considerable insight as to the possible sources of difficulties. Thus, the Team can help guide the project around these problem areas.

Reports and documentation are an integral part of the Team methodology; they are involved at most steps in the transfer of technology. The step involving the implementation of commercialization strategy is, no exception. Periodic status reports must be issued to keep all interested parties informed. Upon completion of a commercialization, the Team must prepare a commercialization report. The resulting reports and documentation facilitate a later analysis of the entire technology application process.

TERMS OFTEN USED

In the Biomedical Applications Team Program, a number of terms have evolved that describe the elements and processes in this program. Because of their number and unfamiliarity to many readers, these terms are listed and defined for reference.

Biomedical Applications Team (Team) - The Team is a multidisciplinary group of engineers and scientists engaged in the activities of identifying the technological needs in medicine and rehabilitation and the appropriate aerospace technology to solve those needs with the specific objective of effecting the commercialization of the resulting solutions. The methodology used by the Team involves: (1) Identifying Commercialization Opportunities - select and define significant medical technological needs and the appropriate solutions that use NASA-developed technology; (2) Screening

Commercialization Opportunities - identify those commercialization opportunities that have a high probability of being commercialized; (3) Developing Commercialization Strategy - form a NASA-Industrial-Medical Team, and create the necessary development and marketing plans, including identifying the necessary funding; and (4) Implementing the Commercialization Strategy - coordinate and monitor the NASA-Industrial-Medical Team implementation of the commercialization strategy.

Commercialization - The application of NASA technology may result in a marketable product. A commercialization occurs when this product, or a variation that also contains the NASA-developed technology, is announced and/or made commercially available to the public.

Commercialization Opportunity - The efforts of the Team have led to the identification of NASA technology which solves a significant medical need. This technological solution is carefully screened. A commercialization opportunity is a solution that has been identified by the screening process to have a high probability of being commercialized.

Computer Information Search - A computerized information search is a search of the aerospace information bank established by NASA and made available through six Industrial Applications Centers (IAC) in the United States. This information bank consists of more than one million documents that have been indexed and abstracted in the Scientific and Technical Aerospace Reports (STAR) and the International Aerospace Abstracts (IAA).

Impact - An impact is reported when information is given to a problem originator with the results that he changes his activities in a way that enhances his progress toward a medical objective. Thus, an impact is analogous to a technology application except that some requirements for a technology application are not satisfied.

Need - A need is a specific and definable technological requirement that cannot be satisfied by commercially available equipment or by application of information that is available to the problem originator through routinely used information channels.

Participating Institution - A medically oriented educational institution, hospital, medical center, or government agency having as one of its organizational objectives the improvement of medical health care is listed as a participating institution.

Potential Commercialization - When the efforts of the Team have led to the organization of a NASA-Industrial-Medical Team, and to the development and implementation of the commercialization strategy, including the tentative identification of funding, that is necessary to transform a commercialization opportunity into a successful commercialized product, the commercialization opportunity is classified as a potential commercialization.

Potential Technology Application - The search for NASA technology by the Biomedical Applications Team leads to the identification of relevant technology that offers strong potential for solving the particular needs. A potential technology application occurs when the Team and the problem originator agree on the applicability of the specific NASA technology to the particular need and when a reasonable plan for achieving implementation exists.

Problem Originator or Researcher - A problem originator is an individual actively involved in an effort to reach a specific objective in biology or medicine and faced with a specific technological need that is impeding progress toward achieving that objective.

Problem Statement - A problem statement is a concise, written statement of a need used for communicating (1) sufficient details to allow a computer search to be performed by the information search specialists, and (2) sufficient information to enable NASA engineers and scientists to consider possible solutions to the need. This document should not be confused with a preliminary problem statement which is a one-page brief description of the need. This document is designed to initiate the solution search.

RTOP (Research and Technology Objectives and Plans) - The Biomedical Applications Team has helped organize a NASA-Industrial-Medical Team to pursue the commercialization of a commercialization opportunity. Development, funding, and marketing plans have been prepared. An RTOP is a comprehensive proposal made by a NASA Center to NASA Headquarters for funding to support this commercialization effort.

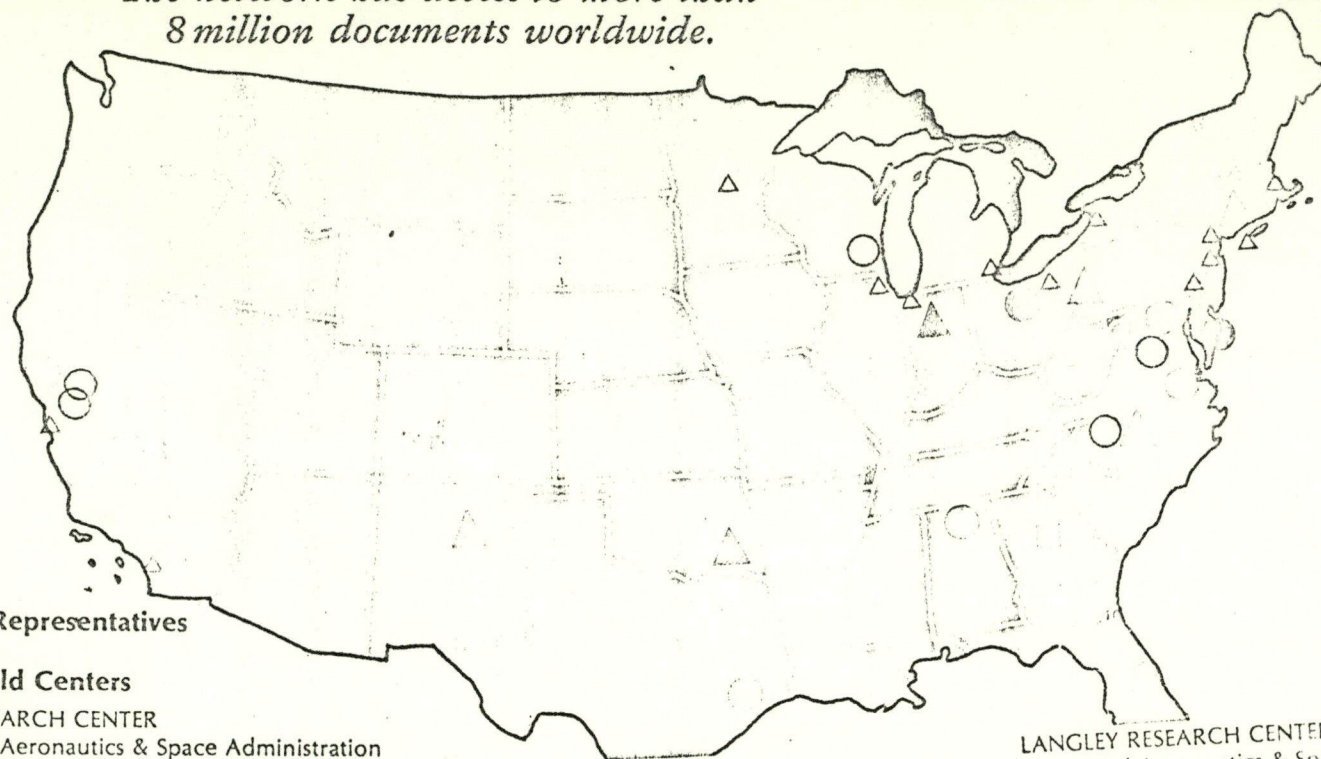
Technology Application - The key factor that permits a potential technology application to become a technology application is implementation. A technology application occurs when aerospace technology is implemented to solve a need different from the one for which the technology was originally developed.

Widespread Use of Technology - The application of NASA technology solves a particular medical need. Widespread use of technology occurs when this solution, or a variation that also contains the NASA-developed technology, causes a service or a device to become available to a wide segment of the public.

R. P. Whitten
Chief, Biomedical Applications Division
NASA Headquarters

*The network has access to more than
8 million documents worldwide.*

NASA TECHNOLOGY TRANSFER NETWORK



△ Off-Site Representatives

○ NASA Field Centers

AMES RESEARCH CENTER

National Aeronautics & Space Administration
Moffett Field, Calif. 94035

Technology Utilization Officer: *Charles C. Kubokawa*
Phone: (415) 965-5554

HUGH L. DRYDEN FLIGHT RESEARCH CENTER

National Aeronautics & Space Administration
P.O. Box 273
Edwards, Calif. 93523

Technology Utilization Officer: *Clinton T. Johnson*
Phone: (805) 258-3311, Ext. 568

GODDARD SPACE FLIGHT CENTER

National Aeronautics & Space Administration
Greenbelt, Md. 20771

Technology Utilization Officer: *Donald S. Friedman*
Phone: (301) 982-6242

LYNDON B. JOHNSON SPACE CENTER

National Aeronautics & Space Administration
Houston, Texas 77058

Technology Utilization Officer: *John T. Wheeler*
Phone: (713) 483-3809

JOHN F. KENNEDY SPACE CENTER

National Aeronautics & Space Administration
Kennedy Space Center, Fla. 32899

Technology Utilization Officer: *Raymond Cerrato*
Phone: (305) 867-2780

LANGLEY RESEARCH CENTER

National Aeronautics & Space Administration
Langley Station
Hampton, Va. 23665

Technology Utilization & Applications Programs
Officer: *John Samos*
Phone: (804) 827-3281

LEWIS RESEARCH CENTER

National Aeronautics & Space Administration
21000 Brookpark Road
Cleveland, Ohio 44135

Technology Utilization Officer: *Paul Foster*
Phone: (216) 433-4000, Ext. 6422

GEORGE C. MARSHALL SPACE FLIGHT CENTER

National Aeronautics & Space Administration
Marshall Space Flight Center, Ala. 35812

Director, Technology Utilization Office:
Aubrey D. Smith
Phone: (205) 453-2224

NASA JET PROPULSION LABORATORY

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Industrial Applications Centers

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(ARAC)**

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**KNOWLEDGE AVAILABILITY SYSTEMS CENTER
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**NEW ENGLAND RESEARCH APPLICATION CENTER
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TECHNOLOGY USE STUDIES CENTER (TUSC)

Southeastern State University
Durant, Oklahoma 74701

C. Henry Gold, Ph.D., director
Phone: (405) 924-0121, Ext. 413



COSMIC

112 Barrow Hall
University of Georgia
Athens, Ga. 30602

Walter McRae, Ph.D., director
Phone: (404) 524-3265

1. few applic

2. probs (Paper 1-5)

3. several specific

needs have been indicated
by Fed Com Sec.

These include:

↳ The fact is that
efforts are ~~small~~
uncoordinated.

4. In order to improve

visibility ^{overview}
credibility ^{of}
authority ^{coordination}
(influence)

specific planning

apparent lack of effort
harness principal courses
noticeable absence
effective transfer
facilitate

fragmented
underfunded
inadequate staff
and attention
results not made
available to him

not missing
document

November 28, 1977

Dr. E.C. Keller, Jr.
Professor of Biology
Committee Member
AAAS Handicapped in Science Project
West Virginia University
Morgantown, West Virginia 26506

Dear Dr. Keller:

Enclosed is the abstract for my paper. You should receive a draft copy by December 30. I notice that my name was left off the most recent mailing I received from you (see enclosed). I assume this was inadvertant.

Sincerely,

Lex Frieden
New Options Research Director

LF/asm

enclosure

West Virginia University

MORGANTOWN, WEST VIRGINIA 26506

College of Arts and Sciences
Department of Biology
Area Code 304/293-5201

October 4, 1977

Lex Frieden
Social Psychology
Univ. of Houston
Houston, TX 77042

Dear ~~Mr.~~ Frieden:

Enclosed is a copy of the final symposium program for the AAAS meeting in February. This program is considerably contracted from the one we proposed and hence some papers were deleted, some condensed, and some combined.

Also enclosed is the list of all participants. I would encourage you to correspond or call those individuals with related topics for reduction of possible overlap and for increased complementation.

Also enclosed is an abstract blank for you to fill out and return as soon as possible. We will hope to get these in time to get them published and we will need them soon.

The overall plan is to have you prepare a rough draft of your paper (a 35 to 40 minute presentation) by Christmas for reproduction and passing on to the respective discussants. We will tape the sessions, but as of now I do not have funds to get them transcribed, but I am working on it. Also, in agreeing to have the symposium, the AAAS has asked for the first rights for publishing.

If I can supply more information, or can help in any way, please do not hesitate to call me.

Yours truly,



E. C. Keller, Jr.
Professor of Biology
Committee Member
AAAS Handicapped in Science Project

Encl/several
ECK/bfc

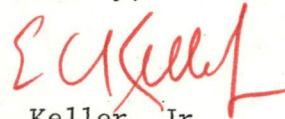
MEMORANDUM

Enclosed are the registration materials for the February AAAS meeting. Will you please send me a rough draft of your papers by January 1 (four copies if possible) for distribution to the appropriate discussant panel members.

Let me know if there is anything that I can do to expedite the process.

Thank you.

Yours truly,



E.C. Keller, Jr.
Professor of Biology

ECK/bls

Executive Summary

The state of the art in science and technology is such that, with a redirection of essential resources, major advances can be achieved in providing handicapped individuals with a healthy condition, greater mobility, environment access, and an opportunity to live lives commensurate with their capabilities and desires and worth. That this Nation's resources are not now so directed is a monumental tragedy. How it may be so directed in an efficient and effective manner is the substance of this report.

No comprehensive system to ensure that the majority gain the ability to contribute work efforts and self development exists. Many handicapped citizens have not achieved an adequate state of health from early detection, timely treatment intervention, and follow up. Nor do they have uniformly available access to rehabilitation services for restoration of functions. Few have had the opportunity to develop capacities to adapt or to gain the means and competencies required for a productive and satisfactory existence. The means to insure maximum longevity through freedom from life-threatening and life-shortening conditions has not yet to be achieved for the majority of handicapped persons.

Resources have not been developed as a national capacity nor has the personal right and opportunity for the handicapped to get such benefits been made possible. Financing of such services exist principally for disabled veterans and injured workers, but not for the average citizen. Physical barriers and prejudiced attitudes as to their performance potential in life activities have not been overcome.

Magnitude of these conditions has not been identified, examined and dealt with to prevent or minimize disability. Lack of control disability means that the handicapped individual cannot have the equal opportunities and access conditions that have been mandated as a right by recent law and regulations. Even participation in family life is made difficult or impossible from failure to redress these discriminations. The access to education and training for work and for family and personal responsibilities and to achieve sufficient income for independent living and a meaningful life is possible for too few handicapped persons.

Even though some of these personal, family and societal disabilities are not solvable, many research problems can be solved. Basic and applied research, technical development, and production and distribution of devices and systems would assist and enlarge possible activities of living and quality of life. Making available assistance, procurement of devices, and environmental modifications

would have great impact. There needs to be wide spread usage of tested concepts, technologies and methodologies.

Current research and development efforts to provide such solutions are miniscule when compared to the needs, the scope of problems and their practical importance for a majority of our citizens.

CONCLUSIONS - Executive Summary

1. The Panel reviewed the report of the previous Panel and concluded that the findings are valid and should be accepted as guidance by this Panel. (A compilation of the findings, summarized by the previous Panel is included in Appendix B of this report.)

2. The Panel was unanimous in its belief that the most urgent need is for the Congress to designate and fund an entity with authority, responsibility, and accessibility for coordinating, supporting, and guiding research programs for the benefit of handicapped individuals. A government-industry-consumer partnership embodied in a National Council on Science and Technology for the Handicapped. Persons responsible for guiding the research and development effort, together with ^{leadership} by highly capable, credible and visible governmental entity is required for the needed comprehensiveness, effectiveness and efficiency to be achieved.

3. The entity designated must have a demonstrated capacity for management of scientific and technological efforts, for cost-effective programmatic attacks on persistent problems, for assuring adequate financial support, and for inter-agency and public-private coordination and cooperation. It must make a major commitment to this effort, beginning with top-level administration and continuing through all components of the program.

4. A comprehensive, cohesive, and balanced program will only be achieved where governmental and private sector officials consult with disabled persons and their representatives on planning, directing, and coordinating the total national effort. To that end, it is imperative that handicapped individuals be significant participants in the program, both as working members of the organization and as advisors to the chief executive of the entity designated.

5. The integrity of the current effort throughout the government must be maintained and augmented through the mechanism of a national council and lead agency, rather than being denigrated or superceded by it. Creation of a new leadership role should not detract in emphasis and funding from the on-going efforts in VA, RSA, NIH and other government agencies. Their programs must be protected for the present, and planned and coordinated for the future so that the national program will truly be cooperative, comprehensive, and coordinated among all participants.

6. The entity selected for a leadership role in the national program to aid the handicapped should be^{an} established government organization with readily available staffing, funding, information gathering/disseminating and contracting procedures already in place and operating. The proposed entity would have fiscal and policy control over its programs and a capability for entering into cooperative agreements with other governmental agencies for all planned and authorized programs.

7. The Director of the proposed program and members of the National Council should be selected by the President from among nominees proposed by researchers, consumers, practitioners, ^{the nation} and responsible government officials knowledgeable about research and development programs for disabled people.

8. The total effort is challenging in its impact upon this nation and its people. Encompassing the prevention of disabling diseases and conditions, the care for and rehabilitation of those affected, and the cure of many disabling conditions, the National Program must use all of the management, technical, medical and scientific skills available to bring the benefits of science and technology to the nation's handicapped citizens.

Fulton

The second Panel commenced by reviewing the work of the first Panel. With minor exceptions they approved its methods, findings and recommendations. Basically these were:

Methods: Hearing witnesses from a broad spectrum of organizations (both government and private sector) serving the handicapped, and especially from the handicapped themselves.

Principal Finding: That the whole matter of aid to the handicapped is a far greater undertaking than it first appears. ~~To have~~ Any hope of accomplishing it in an efficient, prompt and meaningful manner requires a massive attack on a coordinated broad front ranging from soundly developed census figures thru need determination, state of the art knowledge, basic and/or applied research, prototype development and testing, production design, tooling and manufacturing, distribution, servicing, education of distributor, service personnel therapists and users alike - and with every project requiring cross comparison of relative merits and with broad public support.

While good work is presently being done in a number of these areas, it is highly fragmented both vertically and horizontally, i.e.: the efforts are in widely separated areas of concern, leaving large unaddressed gaps, and even in those areas where solutions have been developed often they do not reach the handicapped in usable form.

Prioritizing of even the requirements is too big a job for a temporary Panel to tackle. Likewise it is too large for the legislative branch to solve on a case by case basis. Yet this is the way the present system has grown. As various needs have been recognized they have one by one been legislated upon. Individual laws have been generated to deal with architectural barriers, with public transportation, with basic and applied research, with deliverability and with service.

These laws have been created on a piecemeal basis, they have worked piecemeal and they have therefore, achieved piecemeal results, too often oblivious of the immediate needs of the handicapped. The modus operandi has been akin to letting a national highway system self-develop when, where, as and if each town and its roads grew for its own sole benefit - government aid occasionally being infused into widely separated areas but without knowledge or understanding of how the whole system will ever be brought together.

Because of its piecemeal development to date, efforts for the handicapped have been assigned to various existing organizations according to subject and in most cases have become swallowed up in apparently far bigger issues facing those organizations. The relative miniscule funding accompanying the project has also mitigated against their accomplishment.

To recognize the validity of the first Panel's findings one need only review the Final Report of the President's Committee on Handicapped Individuals. See Appendix _____, for typical findings common to both the White House Conference and this Panel, all pointing toward the same solution.

Recommendations (Of the First Panel): That means be found to integrate the effort into a comprehensive program responsibly conducted by one organization that would draw upon all existing capabilities: government, private sector, and consumer.

The time has come to simplify the present complicated system which has grown like topsy and which is now totally inadequate to cope with the enormity of what has become a national problem.

The current second Panel has undertaken to provide a practical and virtually readily-available course of action.

D R A F T

Body of Report

The Panel recommends that there be established and funded, an entity with authority, responsibility and accessibility for coordinating, supporting and guiding programs for the benefit of the handicapped individual. Responding to consumer needs, this entity will conduct and support basic and clinical research and development programs, and such other activities as will ensure the delivery of the fruits of these actions to the handicapped individual.

In order to assure continual attention to the needs of the handicapped and continuity of ongoing efforts provisions will be made:

That existing programs and their present and future funding in all other agencies relevant to handicapped individuals not be diminished or altered by the new entity;

That totally new funding be authorized for the work of the new entity on those needs of the handicapped individual not currently being addressed by existing agencies;

That appropriate interagency transfer of personnel and funds be an inherent part of the program.

This entity shall consist of a National Council on Science and Technology for Handicapped Persons, an appropriate federal agency with adequate staff and funding to achieve the purposes set forth above. In carrying out its functions, this entity

page 2

will have full and ready access to existing public and private organizations and facilities and will not duplicate these authorities; it will endeavor to synergize and supplement national and international programs to aid the handicapped.

The Federal agency shall provide an internal organizational element of sufficient stature to command the respect and cooperation of other agencies and national and international organizations concerned with aiding handicapped persons.

The organizational element will:

1. Report directly to the Administrator of the Federal agency. That is to say the administrative level and fiscal integrity of the new entity should be such as to ensure maximum visibility and accessibility to top administration levels.

The Federal agency will provide colocated positions from such agencies ^{as} ~~of~~ the VA (e.g. - the Chief Medical Director's office); the DHEW, (e.g. - Office of the Commissioner of the RSA) and other government agencies as appropriate. These positions will be functional and serve as the focus for management, inter-agency agreement and cooperation requisite to implement this program.

The Administrator of the Federal agency will appoint a National Council on Science and Technology for Handicapped Persons. This council will consist of not less than 12 and not more than 18 members.

Program implementation will consist of intramural and extramural research programs that are: (1) basic, (2) applied and (3) clinical in nature. The research management of this entity will include a total plan that assures the research, development, test and evaluation of its program reaches the consumer. The

following are considered essential components of the program:

1. Interagency programs
2. Industry contracts/grants/codevelopment
3. Codevelopment with federal/state/local rehabilitation centers
4. University grant/contract programs
5. Mobility studies

Codevelopment or cofunding with industry is considered an essential element of this program. The federal agency should be encouraged to work as early as possible with potential manufacturers in order to motivate, facilitate and insure transfer of the science and technology to the consumer. Such codevelopment programs will be based upon the willingness of the manufacturer to contribute 50% or more of the prototype development cost necessary to transfer the technology to the consumer.

The Federal agency will provide for a annual review of its program to aid handicapped persons. This review will be two fold:

1. Experts in the appropriate medical/engineering/consumer fields will review proposed projects. The recommended projects will constitute a program.
2. The council will review the program and provide recommendations to that program and direction to future thrusts to be considered.

Projects initiated during the year that were not included during the annual review will be reviewed by experts in the appropriate

page 3

field and mission agencies. In addition, the project concept will be coordinated with appropriate members of the Council.

A. Structure of the Council

1. The Council shall be composed of 15 members appointed by the President. The Chairperson of the Council shall be nominated by the President and confirmed by the Senate. There shall be (1) three members of the Council from the U. S. government agencies most concerned, i.e., the Chief Medical Director of the VA or his designee, the Commissioner of RSA or his designee, and the Administrator of NASA or his designee; (2) three individuals concerned with research in rehabilitation (medical, engineering, psycho-social-vocational); (3) three individuals concerned with rehabilitation service delivery (CSAVR) and professional training; and (4) six individuals who are themselves handicapped and knowledgeable of the needs and conditions of their peers.

2. The administrative level and fiscal integrity of the new entity should be such as to insure maximum visibility and accessibility to top administration levels. In this way the Council will advise and make recommendations directly to the Administrator of the host agency.

3. The members of the Council should be appointed to staggered terms, one-third initially for two years, one-third for three years, and one-third for five years. Ordinary tenure shall be for five years and at least one year must elapse prior to any reappointment. Every effort should be made to observe sound affirmative action principles in appointing members.

4. The Council shall have staff with sufficient expertise and resources to carry out the goals. This must include access to usage of NASA technology and that of other government agencies for communication networking data base collection and distribution and establishment of a knowledge base on the state of the art of the research areas. Handicapped individuals should be awarded preference in the hiring practices of this entity.

The same information and communication technology to support research planning and evaluation could be used to develop and operate a service and equipment information system for the handicapped. (As called for in the resolutions of the White House Conference.) Provisions of information could be coupled with requests for information in needs.

5. It is important that the program direction be a highly competent administrator preferable with a background in rehabilitation research and, if possible, disabled. Whether this appointment be in the career service or Schedule C was not resolved. However, if the latter, the panel felt the incumbent should be in the Executive Schedule, in which case the appointment should be made by the President by and with the advice and consent of the Senate. In any event, the incumbent should report directly to the Administrator of the host agency. Those other staff of this entity should be appointed in the

career service, with provision for contracted staffing as indicated.

6. Federal agencies not directly represented on the Council (such as NIH, NIA, SSA, DOD, HUD, DOT, BEH, NSF, PCEH, OHI) shall designate liaison individuals to be the focal points for cooperative activity and Council meetings.

7. Maximum opportunity should be afforded for the interchange of personnel, especially from the VA and RSA, to the host agency. This would assume not only input into planning and execution but also utilization and incorporation into service delivery.

B. Functions of the Council

The functions of the Council shall include:

1. Develop participation by knowledgeable handicapped consumers at all appropriate levels from policy formulation to assessment of the usefulness of science and technology.

2. Revise program from feedback of handicapped, researchers and others regarding program benefits and deficits.

3. Incorporate a policy of consumer advocacy on behalf of handicapped individuals.

4. Define number and needs of served and unserved handicapped persons for R&D development purposes.

5. Develop a five-year national program and financial plan for research activities including a framework for evaluation for balancing need with solution resources, costs and time with the appropriate safeguards in the event of fiscal capacity less than the responsibility.

6. Provide coordination of the many research efforts on behalf of handicapped persons and foster a confluence of joint activities between various government agencies and/or the private sector.

7. Interface with staff and ratify the program plan, objectives, priorities and funding of the entity.

8. Develop a plan to protect and augment existing R&D funding in other agencies and departments.

9. Develop a plan to transfer and stimulate usage of existing and newly procured knowledge methods and technology, especially in the likelihood of rapid response to program initiation, change and/or implementation.

10. Provide a dynamic network of information which compiles and disseminates information to handicapped consumers, services providers, researchers, inventors, etc. Development of means and support for broader understanding of the benefits and requirements for control of disability by the public and the body political by better and expanded information dissemination.

11. Provide upon request, voluntary assessment of government and non-government programs performance in R&D and its utilization.

13. Provide a forum in which consumers may voice concerns about service, research & priorities for funding.

14. Develop a strategy for strengthening and sustaining presidential, congressional and public interest and commitment.

APPENDIX

(Written without knowledge of the content of the body of the report or the Executive Summary and subject to revision after review of the above.)

1. Excerpts from the White House Conference on Handicapped Individuals.
2. Report of the Panel on Research Programs to Aid the Handicapped - portion of the report as determined by content of the Executive Summary. (Panel Report dated April, 1977)
3. Survey of preference of form of project structure and preference of choice of lead agency and success criteria form.
4. Portion of Validity of Findings report as dictated by the body of the report and the executive summary.
5. Reference list.

APPENDIX ITEMS

SUMMARY OF FINDINGS OF THE FIRST PANEL ON RESEARCH PROGRAMS TO AID THE HANDICAPPED

This Panel reviewed the work of its predecessor Panel, considered newly emerging evidence bearing upon the concerns of disabled Americans, and analyzed alternative models potentially applicable to the task of improving the national research effort on behalf of disabled people. Its findings generally parallel those of the previous panel --- validation of the earlier findings is an important result of the current effort --- and in several significant ways extend beyond the previous discoveries. The principal findings appear below.

A. Magnitude and Scope of the Present Effort

1. Far too little research is being directed toward the problems of disabled Americans

The panel finds the size of the present effort to be miniscule. The Federal government expends barely \$31 million annually on research and development (R&D) programs aimed at resolving the problems of American's estimated 10 million severely disabled citizens, or little more than three dollars per person per year. The investment is a mere 0.15 percent of the aggregate Federal expenditure on this population. The panel is deeply disturbed that six hundred times as much, fully \$18 billion, is allocated to income maintenance for severely disabled persons. It finds that a much greater proportion of public funds should be appropriated to efforts to help disabled people gain independence, so that less will be needed to maintain them in dependence

2. Fundamental questions remain unaddressed

Such basic issues as how many Americans have any one or combination of disabilities, what the needs of these people are, how adequate available services and devices are, and what modes of delivery are most effective have not adequately been studied. For the national effort to target its work most productively it needs a "moon" to shoot for, a clearly defined objective. Such a goal is not now possible.

3. Serious imbalances obtain which jeopardize utilization of R&D products

The scope of the current effort is heavily weighted in the development phase with the result that much of what we know and many of the instruments we have devised cannot be used to improve the lives of disabled people. The panel finds that the scope of the present effort must be expanded to include far greater stress upon dissemination and utilization of results.

B. Coordination and Communication

1. Consumer input rarely is secured

The panel finds that disabled people seldom are asked their needs, priorities, and desires. Few R&D programs involve consumers in problem identification, research and development projects,

evaluation, and dissemination. The result is a paucity of directly useable findings and products.

2. Public-private interdigitation is lacking

For R&D results to be disseminated and utilized, the private sector must be involved from the outset. The panel finds that greater public-private cohesion would lead to more effective industry follow-up on Federal seed-money grants and greater utilization of R&D results.- Far too many products remain "on the shelf" for just this reason.

3. Communication between research and development personnel working on disability-related issues is unacceptably poor

Gaps and duplication of effort inevitably result when workers are unaware of what others are doing. The panel finds that inefficiency and waste may be greatly reduced through improved communication.

4. Fragmentation dilutes the effectiveness of already limited efforts

The Federal effort is highly compartmentalized, with many small programs each addressing parts of the whole. This piecemeal approach cannot begin to meet the need, particularly in light of severely restricted funding.

C. Characteristics of a Successful National Effort

1. A much larger, more comprehensive, more cohesive, and more balanced program is urgently needed

The first element of a successful program is funding. The current investment must be multiplied several times for the desired impact to be made. The panel finds that expansion of funding would be highly cost effective because tax-users would become tax-payers with development of improved programs and devices. But size alone is not enough. The effort must be an all-encompassing one that focuses upon the whole of the problem as well as its several parts. Existing programs must be coordinated to bring them together so that gaps and overlaps may be identified and eliminated. The result would be a balanced approach utilizing simple and complex technology, process and product-oriented efforts, basic and applied research.

2. Conjunction of R&D with production and marketing is required for utilization to occur

Industry capable of producing and distributing the final R&D product must be involved from the beginning and throughout the entire process. Market feasibility and cost sharing considerations must be studied prior to implementation of R&D so that the current bottleneck may be broken and results brought to users.

3. A government-industry-consumer partnership is needed to guide the national effort

A comprehensive, cohesive, and balanced program will be achieved only where Federal and private officials consult with disabled people and their representatives to plan, direct, and oversee the research and development effort.

4. A highly credible, visible, and capable agency is required to implement the directives of the governing body

This organization must have a demonstrated capacity for achieving public-private interdigitation, information collation and dissemination, cost-effective programmatic attacks on persistent problems, adequate financial support, and inter-agency cooperation. It must be willing to make a major commitment to the effort, beginning with top-level administration and continuing through all components of the program.

II. IMPLICATIONS OF THE FINDINGS

It is significant, we believe, that the present Panel validates the findings of the previous Panel. Both groups consisted of representatives of the three entities believed essential to a successful program -- government, industry, and disabled people themselves. Both panels found the current effort to be much too limited, fragmented, and ineffective despite the high quality of work now going forward. Where the two panels differ is in the major recommendation. This divergence requires some explication.

The previous Panel concluded that an autonomous body between the public and private sector was needed so that coordination of government and industry efforts would be enhanced. The present panel believes that a public-private-consumer governing body in conjunction with a public agency is more likely to achieve the desired result. The rationale for the autonomous-body alternative is well-stated in the original Panel's report. Here we will confine ourselves to justifying the recommendation of the present Panel.

The combination of a governing body and a lead agency is, we believe, likely to join the leadership of the three critical entities with the implementation capability of an established organization. Start-up cost and time likely will be curtailed sharply without attendant dilution of effectiveness. Political and economic considerations favor utilization of existing capabilities rather than creation of new structures. Interfacilitation and cross-fertilization likely will be improved under the proposed format because ongoing programs and projects in government are joined with the new effort while heretofore-neglected involvement of private industry and disabled consumers is built into the process from the outset.

Summary of Research & Technological Findings of The White House Conference on Handicapped Individuals

In reviewing the Final Report of The White House Conference on Handicapped Individuals, an almost parallel, if not identical, list of recommendations on specific research concerns pertaining to the Disabled Citizens of the country squares with those of the Panel on Research Programs to Aid the Handicapped. In short, this emphasizes and verifies the core issues defined by both Panels. (Both the previous panel and the present panel concur on certain salient recommendations.)

1. Establish a central coordinating body (e.g., a national research center) to strengthen research efforts assign priorities, and collect and disseminate findings to both public and private agencies.

2. Appropriate Federal funds for the dissemination of the research findings of all federally-supported research organizations.

3. Strengthen continuing education and training of service providers/researchers by such action as

- (a) encouraging research interaction with the handicapped;
- (b) providing of scholarships and research grants;
- (c) establishing a "State Professional Information Service."

4. Initiate efforts to make the public aware of the need for research, to publicize successful programs to disseminate results in a form understandable to laymen, and to promote research legislation. Existing agencies should play a stronger role.

5. Provide incentives and opportunities which allow the handicapped to participate in research efforts either as consultants or trained researchers to identify relevant problems.

6. Utilize a combined mass media, public school education approach, with the handicapped trained to act as informed educators, in order to raise public consciousness regarding basic needs of research.

The two resolutions which reaffirm conference recommendations for the research topic are:

- (a) intensified research efforts in the areas of prevention and treatment of handicapping conditions;
- (b) centralized information and retrieval systems -- particularly for dissemination of research and technological findings.

Technology recommendations include:

- (1) Utilize the 1980 census to gather data on disabilities and/or technology needs of the handicapped.

- (2) Develop a central, computerized information system for consumers and professionals which would contain referral, research and funding information.
- (3) Develop some form of national information dissemination system through such means as natural/regional clearinghouse, local centers, token-free hotlines, consumer publications, computerized research banks, etc.
- (4) Develop a national computerized data bank on technology with state agency channels; connections to existing rehabilitation centers. Governor's committees could channel information through Federal Office of Handicapped Individuals.
- (5) Establish a national clearinghouse with a computer bank of information on available technology for access by consumers and professionals utilizing liaison systems and to disseminate information to local areas.

Delegates expressed support for resolutions which endorsed conference recommendations: establish centralized information and retrieval systems - particularly for dissemination of research and technological findings.

RECOMMENDATIONS

1. That the findings of the previous Panel be accepted as valid and considered as findings of this Panel.
2. That the National Aeronautics and Space Administration (NASA) be designated as the principal government agency to manage, control, and coordinate the U.S. effort to use science and technology in aiding handicapped individuals.
3. That needed legislation be drafted to add to the NASA mission the requisite authority and responsibility for this program.
4. That NASA authorizations for funding and staff be increased immediately, progressively, and substantially to accomplish this vital program.
5. That the national importance of this program and its need for top level direction be recognized by Presidential appointment of a NASA Associate Administrator to manage it.
6. That no less than 12 nor more than 15 members of the National Council on Research Programs to Aid the Handicapped be appointed by the President for staggered three-year terms. The National Council will report to the Administrator of NASA, the President, and the Congress through annual reports and other means.

RECOMMENDATIONS (cont.)
page 2

7. Presidential appointments to NASA management positions and to the National Research Council will be based upon nominations submitted by consumers, researchers, practitioners, and other public and private individuals and groups.
8. That the contracting and co-development with industry capability of NASA be applied expeditiously to the new program to ensure industry responsiveness to research and development initiatives.
9. That existing programs for disabled people in other agencies, together with their authorizations and appropriations, not be degraded as a result of this action.