CR-152198

SUGGESTED APPROACH FOR ESTABLISHING A REHABILITATION ENGINEERING INFORMATION SERVICE FOR THE STATE OF CALIFORNIA

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September 1978

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Prepared for:

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Technology Utilization Office
Ames Research Center
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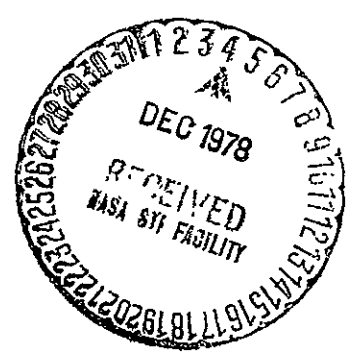

SRI International

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Contract NAS 2 9846
SRI Project MEU-7171

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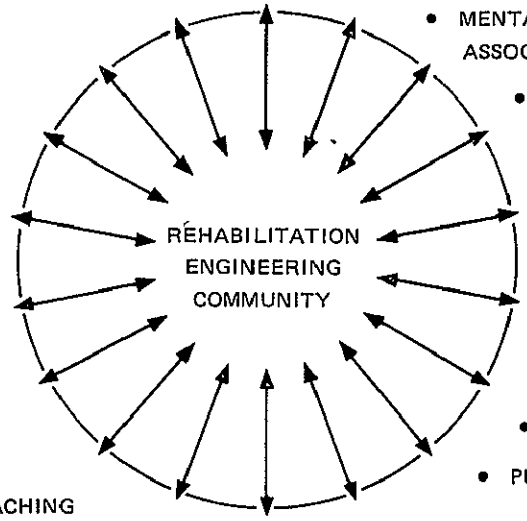
SRI International

The contributions made by science and technology in the 1960s and the 1970s are marvelous. Without doubt, placing a man on the moon and landing a rocket on Mars are stellar achievements. Handicapped American citizens are left to witness these "miracles," while seeing almost no technological advancement in the areas affecting their own disabilities. Considering such problems as the attitudes of the general public towards the handicapped, architectural barriers in the environment, or specific technical needs for those suffering various disabilities, a rather dismal record emerges when compared with improvements in life enjoyed by the general public.

Albert T. Pimental, National Academy of Sciences, National Research Council, Science and Technology in the Service of the Physically Handicapped, Vol. 1, p. v, National Technical Information Service (Springfield, VA, December 1976).

- NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, TECHNOLOGY UTILIZATION
- EMPLOYERS OF THE DISABLED
- BUREAU FOR THE EDUCATION OF THE HANDICAPPED
- RESEARCH AND TRAINING CENTERS
- VETERANS' ADMINISTRATION
- HOSPITALS, MEDICAL CENTERS
- INSURANCE COMPANIES
- MANUFACTURERS
- RESEARCH INSTITUTES
- RSA REGIONAL OFFICES
- WORK EVALUATION CENTERS
- EDUCATIONAL INSTITUTIONS (TEACHING & RESEARCH)
- STATE DEPARTMENTS OF REHABILITATION
- PHYSICIANS, CLERGY, LAWYERS, AND OTHER PROFESSIONALS



- REHABILITATION SERVICES ADMINISTRATION, WASHINGTON, D.C
- STATE AND FEDERAL DEPARTMENTS OF TRANSPORTATION
- MENTAL HEALTH AND RETARDATION AGENCIES AND ASSOCIATIONS
- DISABLED CONSUMERS (INDIVIDUALS AND ORGANIZATIONS)
- DESIGNER/ENGINEER
- LEGISLATURES AND COURTS
- REHABILITATION FACILITIES
- HOUSING AND URBAN DEVELOPMENT
- REHABILITATION ENGINEERING CENTERS
- VOLUNTARY AGENCIES AND ASSOCIATIONS
- PUBLIC HEALTH AGENCIES AND ASSOCIATIONS (THIRD-PARTY FUNDERS)
- COUNSELORS
  - PHYSICAL THERAPISTS
  - OCCUPATIONAL THERAPISTS
  - INDEPENDENT LIVING SKILLS COORDINATORS
  - VOCATIONAL COUNSELORS

THE PROBLEM How can these diverse groups integrate into a functional community through better information and communication?

THE GOAL To improve the delivery of services and assistive devices to the disabled by creating a communication network and an improved system of information retrieval and dissemination in the rehabilitation community.

MEMBERS OF THE REHABILITATION ENGINEERING COMMUNITY

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I INTRODUCTION AND BACKGROUND

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An ever-expanding body of rehabilitation engineering technology is developing in this country, but it rarely reaches the people for whom it is intended. The increasing concern of state and federal departments of rehabilitation for this technology lag was the stimulus for a series of problem-solving workshops held in California during 1977.

These workshops were organized by the California Department of Rehabilitation. Participants included representatives of Rehabilitation Engineering Centers; Veterans' Administration; hospitals that diagnose handicapped patient needs and prescribe devices; rehabilitation engineers who design the devices, engineering schools that train rehabilitation engineers, industry; social and vocational assistance agencies; funding agencies; legislators; and consumers.

A total of ten workshops were held throughout the state. One of the ten was a general workshop and nine workshops covered special areas such as prosthetics, mobility, sensory deficits, and environmental barriers. During the workshops, participants identified over 100 deterrents to effective rehabilitation engineering technology service. By grouping these identified deterrents, workshop organizers from the California Department of Rehabilitation (Mr. Edward V. Roberts, Director) condensed the list to nine as follows:

- Lack of effective information dissemination.
- Many agencies with many functions (sometimes overlapping) and the resulting confusion.
- Insufficient funding for R&D and evaluation programs.
- Limited number of device suppliers.
- No product evaluations by consumers.
- Unrealistic payment schedules of funding agencies.
- Low-volume market.
- Make-shift curriculum and poor professional image of rehabilitation engineer.
- Inadequate transportation for consumers to access delivery services.

Because communication and lack of information dissemination were expressed most often, and because these barriers are basic to the others, a well-designed rehabilitation engineering information system was selected as the most important ingredient of an effective rehabilitation engineering delivery service. As the Long Beach Workshop report put it:

> A good information system would go a long ways toward solving many of the rest of the problems in the rehabilitation engineering field, and in addition, many of the other problems will not lend themselves to solution until the information system is complete.

As a result of the workshops, the recommendation emerged that the California Department of Rehabilitation take the lead in the development of a coordinated delivery system that would eventually serve the entire state and be a model for similar systems across the nation.

NASA Participation

Because of the success of the National Aeronautics and Space Administration (NASA) in setting up its million document scientific and technical information system, and because of the volume of advanced NASA technology in materials, bioengineering design, and medical developments, the Technology Utilization Office at NASA's Ames Research Center, Moffett Field, California, has shown a continuing interest in the rehabilitation engineering information system concept. To assist the California Department of Rehabilitation in designing an information system, NASA-Ames offered to sponsor a study to determine the size and scope of the rehabilitation engineering community, the current data bases, and the product lines. The gathering of this type of information is an essential element of NASA's technology utilization program, and the NASA-sponsored technology applications teams conduct such surveys as part of the technology transfer process.

During the spring of 1978, the NASA-sponsored Technology Applications Team at SRI International was introduced to representatives of the California State Department of Rehabilitation by Mr. Herbert Holley of the NASA-Ames Technology Utilization Office. It was agreed at that meeting that the SRI Team should conduct the predesign study. The Team would gather the requisite information, submit a report outlining its findings, and suggest the future work necessary for the implementation of an effective rehabilitation engineering information exchange system in California.

Objectives

This initial study has as its objectives:

- Identification of the types and scope of information available in the open literature relating to handicapped/disabled problems.
- Identification of the size and scope of the industry providing goods and services to the handicapped/disabled.

- Identification of those involved with the handicapped community in California, including counselors, rehabilitation engineers, (bio)medical research centers/teams, state agencies, and others.
- The initial definition of the necessary size and scope of a California Rehab-engineering Information Service designed for the rehabilitation community.

Method of Approach

To accomplish these objectives, members of SRI's NASA Technology Applications Team undertook the following action:

- A project team was formed. Team members included Dr. Lo Christy, Ms. Ruth Lizak, Ms. Cynthia Vahlkamp, Ms. Gail Kelton-Fogg, and Dr. Tom Anyos. This team met with California State Department of Rehabilitation personnel at the initiation of the project to ensure that the direction and scope of their activities agreed with California's thoughts and needs on the subject.
- An open literature search, telephone, and personal contacts identified major sources of:
  - Rehabilitation engineering information.
  - Biomedical engineering.
  - Hardware (products) and product information.
  - Rehabilitation programs.
  - Research results not already covered in rehabilitation and bioengineering above.
- The literature search performed above provided a list of additional sources of information and services. This list supplemented the major source compilation and covered selected smaller producers of rehabilitation-related information.
- Contacts with California State Department of Rehabilitation identified the approximate number of information users in the last two of the above. Typical of this list are:
  - The disabled person and family.
  - Rehabilitation engineering service delivery practitioners.
  - Rehabilitation counselors, welfare agents, special education programs, etc.
  - Manufacturers of equipment/products.
  - Educators/legislators.
  - Payment sources (MediCal, Medicare, etc.).
  - General public.

- The Team identified and interviewed over 200 participants engaged in the major aspects of rehabilitation services delivery. In addition, the Team generated a first cut at what information is most required by the user community.

This report outlines the findings of its research effort. The SRI Team also submits its suggestions for the future work necessary for implementation of a full-scale rehabilitation engineering information exchange system in California.

Organization of the Report

The suggested approach to the development of CRIS is presented in six sections in this report. Section II presents a brief summary of the results of the study. Section III focuses on the scope of rehabilitation-related problems. Section IV discusses the requirements of the numerous people who would be concerned participants in a CRIS program. Sections V, VI, and VII examine in detail three proposed organizations that would be an integral part of CRIS. Appendixes A through E provide information with regard to various lists of sources that are participating in research/equipment to meet the needs of the disabled. In addition, samples of an evaluation report and a Veterans Administration survey questionnaire are provided as is a list of the organizations that SRI contacted during the study.

Acknowledgment

The SRI Team wishes to express gratitude to the many professional rehabilitation workers who contributed their time and expertise during the conduct of this study. Particular thanks are accorded to Carolyn Vash and James Reswick of Rancho Los Amigos Hospital, Gordon Cumming, Clarence Nicodemous, and Fred Schlamp of California State Department of Rehabilitation; and Herb Holley of NASA Ames for their continued assistance and direction.

II SUMMARY AND SUGGESTED APPROACH

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For the majority of America's handicapped people, the application of scientific and technological knowledge and tools has been woefully inadequate. These inadequacies have made it difficult for them to overcome the many problems they confront daily. At all levels, from recipients to researchers, there has been a universal demand for a service delivery network that would aid in the development and transfer of technologies and information from the laboratories and clinics into practice.

Improved information exchange is the key for developing service delivery to the disabled. Indeed, there seems to be a universal agreement within the rehabilitation community that the central problem is lack of access to information. Judicious use of communication and information retrieval and processes offers a significant potential for enhancing the effectiveness and efficiency of the service delivery system. An improved information system will help not only the disabled consumer, but also the whole professional rehabilitation community.

This study was conducted to develop a suggested approach for establishing an effective rehabilitation engineering information service for the state of California. The study's goal is to improve the delivery of services and assistive devices to the disabled by creating a communications network in conjunction with an improved system of information retrieval and dissemination in the rehabilitation community.

To develop the initial model for an information service, the SRI Team first undertook an information needs profile of selected segments in rehabilitation. The segments chosen include a profile of consumers, counselors, rehabilitation engineers, administrators, practitioners (medical doctors and nurses), and manufacturers. Funding, the costs for service and equipment, and the subsequent payment were discussed within each of the affected segments. The information needs profile was developed through extensive interviews in more than 200 organizations that were either organized or affected by the disabled. Additionally, an extensive search of the literature was undertaken to better understand the dynamics of the rehabilitation community. Through this process, the barriers that impede the transfer of research results into patient care were brought into focus. The format and content of the proposed information service emerged as the specific needs of each segment were identified.

These profiles provided the basis for the second major portion of the study. The purpose of this part of the research was to identify existing information models and systems both from within the world of rehabilitation and from other sources. The experience of NASA in information documentation and dissemination proved to be particularly helpful

in the consideration of possible models. Thus, by matching a ranked list of informational needs with various models for information processing and communication, the SRI Team was able to provide a suggested approach for setting up a model system for service delivery. This model system, known as the California Rehabilitation Engineering Technology Services (CARE-TECH), would be run by the California Department of Rehabilitation. This proposed project would focus on the issue: "How can the needs of the disabled be served through an improved rehabilitation engineering technology service delivery system?"

The purpose of this study is not to make final recommendations concerning an information service for CARE-TECH. Rather, the results are to provide an orientation and basis for further discussions among NASA, the California State Department of Rehabilitation, and the rehabilitation community.

Suggested Approach

The objective of the proposed California Rehab-engineering Information Service (CRIS) is to support the provision of rehabilitation services to handicapped individuals through the use of technology and information. CRIS consists of three separate organizations that gather and disseminate information. Each suggested organization has its own domain of responsibility and unique interface with the other organizations. (See Figure 1.)

The first organization recommended to be part of CRIS is the Rehab-engineering Information Center. Its responsibility will be to close the technological gap with the direct service arm of the rehabilitation community--e.g., counselors, consumers, and practitioners. Various services will be provided to develop a community infrastructure capable of disseminating the latest information and technology concerning rehabilitation engineering. The Center's responsibilities include the preparation of catalogs of assistive devices and systems, and repair and service directories; equipment design and consultation; mobile training units; a telephone call-in service; and the processing of consumer feedback on devices and services.

The second recommendation entails the creation of an independent, nonprofit evaluation center and clearinghouse. This center will assemble testing results and develop criteria for a cost-benefit analysis of technical devices and rehabilitation engineering services. Tasks that it will perform are to act as a clearinghouse for consumer feedback and professional evaluation, test selected equipment, establish standard testing protocol, and publish a consumer newsletter with an in-depth addendum for professionals.

The purpose of the third recommended organization, the Rehab-technology Applications Unit, is to link user and designer needs with a data base and research expertise. This act of linking, better known as technology transfer, is a process by which a technology, usually newly developed, is brought into use. The proposed Rehab-technology

INFORMATION EXCHANGE WITHIN CRIS

OBJECTIVE TO SUPPORT THE PROVISION OF REHABILITATION SERVICES TO HANDICAPPED INDIVIDUALS THROUGH THE USE OF TECHNOLOGY AND INFORMATION

INFORMATION EXCHANGE POSSIBILITIES

Provide access to computerized data banks for literature searches and a catalog of devices

Transfer technology and shorten the time gap between the discovery and effective use of new knowledge in the marketplace

Identify barriers and incentives to the technology transfer process

Disseminate new information related to the rehabilitation engineering field

Evaluate and select needs of the consumer and professionals in rehabilitation community that require new research

Provide consumer feedback and clinical evaluation of selected devices

Develop the necessary community infrastructure for dissemination of evaluative information

Maintain an inventory of devices to be used for training, for evaluation of devices, and consumer education

Serve as a source for documents, blueprints, and audio visual materials

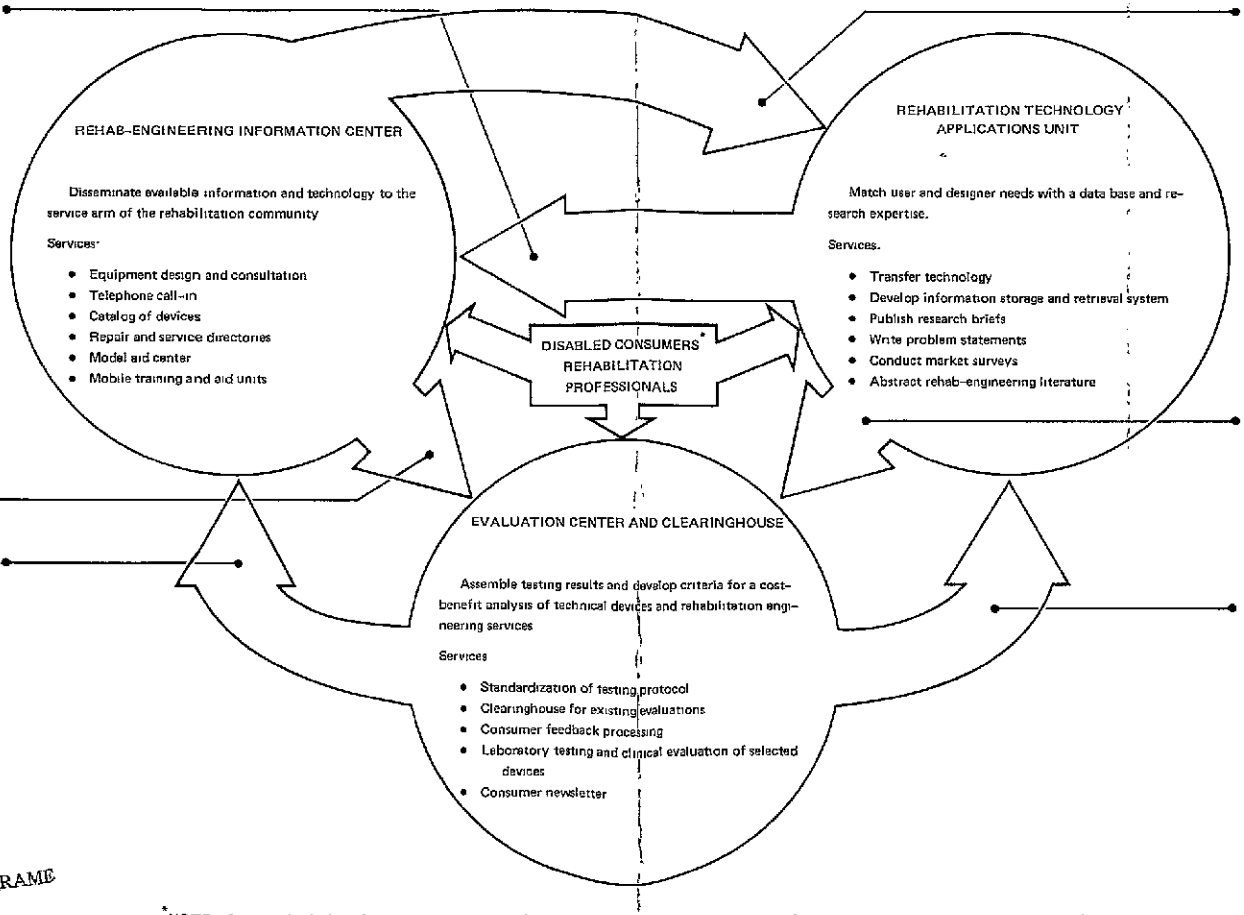
Provide information regarding the safety, effectiveness, and durability of new products and techniques

Serve as a resource of videotapes, photographs, and specifications concerning the recommended application and prescription of devices

Develop studies on the cost-effectiveness of rehabilitation engineering services and devices

Create guidelines governing the purchase of technical equipment

Define an array of technical aids that best serve certain disabilities and functional losses



INFORMATION EXCHANGE POSSIBILITIES

Refer questions that cannot be answered from in-house searches to the Technology Applications Unit

Supply by rehabilitation engineers new directions for research and particular problems

Provide the format and content for a data-based catalog of systems and devices

Assist in the deployment of testing procedures and quality assurance criteria to update evaluation techniques

Identify new technologies and materials in rehabilitation engineering

Provide market surveys and an interface with manufacturers of technological devices

Evaluate devices independently, but in cooperation with the developers

Incorporate the evaluations once the catalog becomes part of the data base

Standardize equipment standards and component interface to facilitate interchangeability of parts

*NOTE Computerized teleconferencing can assist in developing a national network linking segments of the rehabilitation community. Participation in the communication network will support the implementation, operation, and deployment of findings of the California Rehab-Engineering Service Delivery Model.

FIGURE 1 THE THREE AUTONOMOUS ORGANIZATIONS OF THE PROPOSED INFORMATION SERVICE

Applications Unit is a composite model based on NASA Technology Utilization Program combined with examples drawn from existing rehabilitation programs. NASA's dissemination formats, computer data bank configuration, and technology applications teams were analyzed for their applicability to rehabilitation engineering. Other models from the National Library of Medicine, the NSF project on teleconferencing, and the Texas IMPART program, were also investigated for possible application.

Transfers of most newly developed technologies can usually be expected to occur slowly and sporadically in the absence of some deliberate effort to expedite their implementation. The Rehab-Technology Applications Unit will pursue both passive and active techniques. Passive transfer is simply the dissemination of information related to the technology in question. In active transfer, a transfer agent follows and aids a transfer from its initial needs identification to the use of the technology. The services provided by the Applications Unit include: transferring technology, developing an information storage and retrieval system, publishing research briefs, writing and disseminating problem statements, and performing market surveys.

To effectively deliver rehabilitation engineering services, more is needed than an information system that provides data or facts and documents or listings of documents that contain them. A means for creating a communications network that links parts of the rehabilitation community together to accomplish this common purpose is required to complement the services provided by an information system. Thus, in this study, major information disseminators on rehabilitation have been identified including laboratories, universities, and companies engaged in rehabilitation engineering. Additionally, the size and scope of the industry providing goods and services to the handicapped are outlined. If these segments are formed into a network, each component would allow others to use its resources and, at the same time, it would gain access to network resources that would otherwise be unavailable.

Computerized teleconferencing can assist in developing a national network linking segments of the rehabilitation community. Participation in the communication network will support the implementation, operation, and development of findings of the California Rehab-engineering Service Delivery Model. Complementing the information system in California with a larger communication network will produce a powerful model for a rehabilitation information service.

The service delivery goals in rehabilitation of equity, effectiveness, and efficiency remain distant. This application of science and technology can "enable" the handicapped by improving their health and providing mobility, communication, and independence--but only if the services and devices are available. Inadequate communication in the rehabilitation community hinders maximum utilization of our national expertise and knowledge. Duplication of effort, inappropriate expenditures of funds, and uninformed decisions are all the logical result

of communication problems within the rehabilitation community as a whole and for rehabilitation engineering in particular. An improved information service would assist the rehabilitation professionals and ultimately bring more handicapped individuals into the mainstream of America.

III SCOPE OF THE PROBLEM

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The lives of millions of disabled Americans, now outside the mainstream of American society, can be enhanced by modern technology. Technology enriches the lives of most Americans, but for many handicapped people,* it is essential to their physical functioning and to their participation in society. Without access to the benefits of technology, they live a life of isolation, boredom, and ultimately, dependency. Perpetuating this cycle of dependency is a terrible waste of human potential. The development, provision, and maintenance of technical devices and services hold promise for the disabled. The delivery of these rehabilitation engineering technology services still remains unrealized.

Technology can help handicapped people overcome the effects of their disabilities in many ways. Hearing aids, pacemakers, and electrical muscle stimulation therapies are examples of the contributions of science and technology in improving the functional capacity of individuals with hearing and cardiovascular disorders. Other modern miracles include electronically controlled prosthetic arms, internal total joint replacements, sip-and-puff wheelchair controls for quadriplegics, electronic systems to record and play back braille, sonar, and laser obstacle detection devices for sight-impaired individuals, and internal power units to permit paralyzed individuals to move their braces.

Nevertheless, any of the above devices and others not mentioned are only prototypes and are not readily available to all who could use them. Many devices do not yet function properly, and new designs and concepts are needed. Wheelchairs can enable individuals without lower limb function to leave their homes and to travel. Nevertheless, many wheelchair users and the organizations that represent them have expressed dissatisfaction with the wheelchair industry, and the present-day wheelchair, whose basic design has changed very little since the 1940s (Clearfield, 1976).* In a survey conducted by the Capital Chapter of the National Paraplegia Foundation, 34% of the respondents stated they were dissatisfied with their wheelchairs; users complained of faulty spokes, shoddy and sometimes flammable upholstery, unreliable wheels and tires, lack of sturdiness and durability, inability to fit through narrow doorways, and poor performance in rainy, snowy, and icy weather. In addition, fast and efficient repair service--a necessity for active wheelchair users--is rare or nonexistent in many areas. For

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*Complete references are listed at the end of this report.

the majority of America's handicapped people, the application of scientific and technological knowledge and tools has been inadequate and has failed to help them overcome many problems they confront daily. At all levels, from recipients to researchers, there has been a universal demand for a service delivery network that would aid in the development and transfer of technologies and information from laboratories and clinics into practice.

The service delivery process is hampered by an exceedingly fragile linkage with technology. Only a fraction of the country's scientific and technological capabilities have been effectively used to aid the physically handicapped. Few of the devices commonly used by the handicapped show the influence of current technology. Many devices such as the wheelchair have been virtually unchanged for decades. The incredible pace of technological innovations and improvements is not interfaced in any organized, consistent, and comprehensive manner to assist the disabled person in overcoming handicapping conditions.

The service delivery process can be understood in light of the specified mission of the RSA. According to the Rehabilitation Act of 1973 (Pub. L No. 93-112, Sec. 3), the purpose of RSA and any service delivery program for the handicapped is to:

> Stimulate the development and utilization (including production and distribution of new and existing devices) of innovative methods of applying advanced medical technology, scientific achievement, and psychological and social knowledge to solve rehabilitation problems.

It is important to distinguish between human service delivery systems and information systems designed to support the delivery system. Certain problems within the service delivery process can be addressed through an information system, other problems, such as the level of funding, require additional strategies. System designers and/or rehabilitation administrators should be aware of the dynamics and functions of the service delivery process so as to form a realistically defined information system. The pattern of service provision to clients encompasses some or all of the functions outlined in Figure 2. These ten functions are part of the service delivery system rather than the information system.

Existing approaches to improved service delivery do not appear to better the present situation for the disabled population. Even in this day of modern medical breakthroughs and increased public concern over the topic of the disabled, the goals of a health care delivery system of access, effectiveness, and efficiency remain elusive. Direct approach to service delivery has been impeded by the lack of information and a communications network. Therefore, it becomes important to assess the potential of communications for improving the effective and efficient application of available resources.

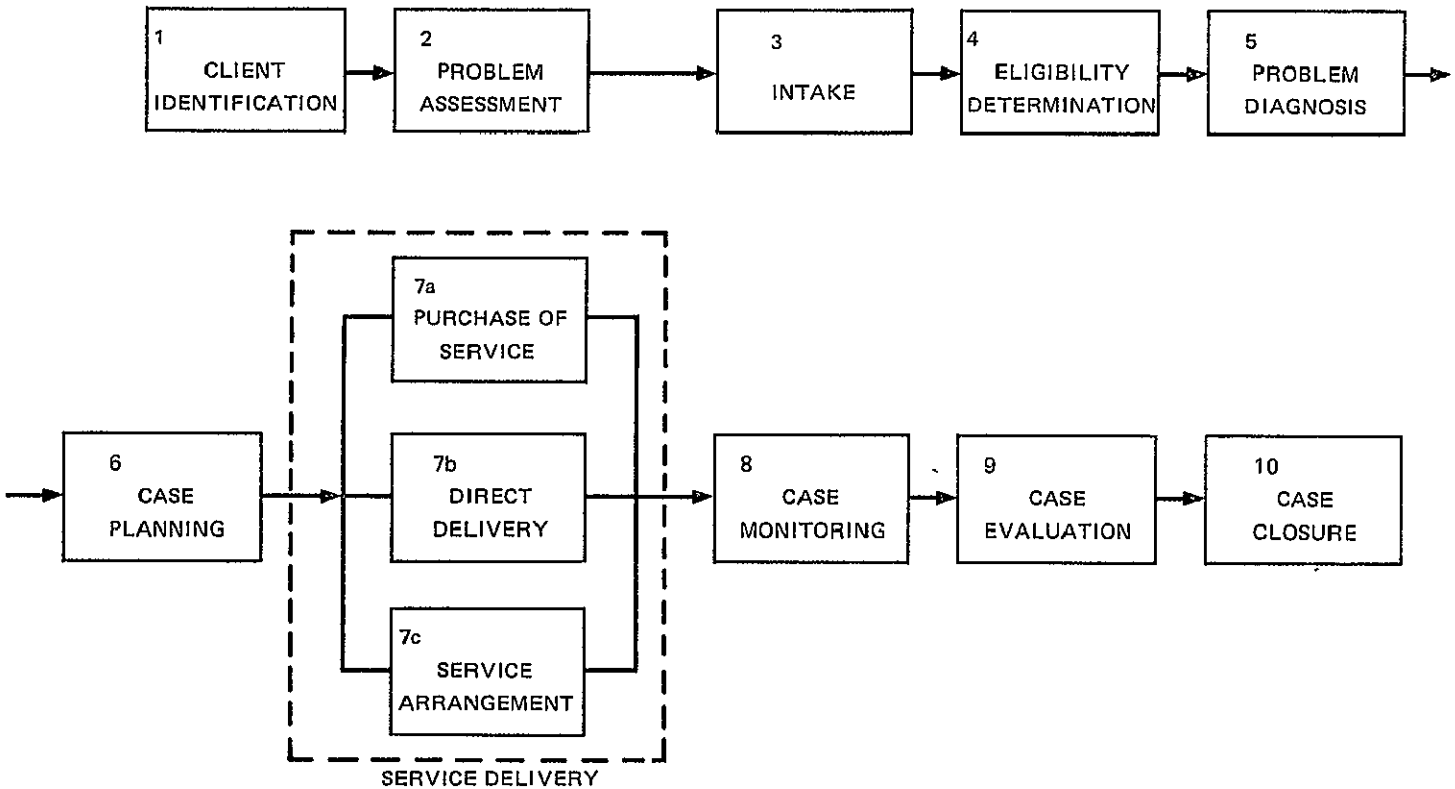


FIGURE 2 THE HUMAN SERVICE DELIVERY PROCESS

Disabled consumers lack information about what is available, the quality and effectiveness of devices, where and how they may be obtained, and how to be reimbursed for devices. Counselors, physicians, therapists, advisors, etc., lack information on devices and their appropriateness for particular patients. Developers and suppliers of equipment for the disabled have insufficient market data. Designers are unaware of existing equipment and new technological developments and also lack information on the real needs of disabled consumers. All members of the community do not have access to sufficient evaluative information to make the decisions that will ultimately affect the disabled.

The purpose of an operational system would be to match the information needs of various sectors of the rehabilitation community with available programs and processes of the informational sciences. Hence, improved information exchange is the key. Indeed, the rehabilitation community seems in universal agreement that the central problem is one of access to information. Judicious use of communication and information retrieval and processes offers a significant potential for enhancing the effectiveness and efficiency of the service delivery system. An improved information system will help not only the disabled consumer, but also the entire professional rehabilitation network.

Scientific and technological knowledge has been inadequately and ineffectively applied to the needs of handicapped people. There has been no general application of technological information to expand the life and employment possibilities for the handicapped population. Instead of sharing information, technology has been applied in specific cases in specific localities, on a project-by-project basis. This one-on-one situation with its concomitant duplication of effort causes rehabilitation costs to soar. The purpose of an improved information system would therefore be twofold: increase the use of existing technologies and to promote the development of new technologies. An objective of technological research and development programs is not merely to demonstrate the feasibility of a new device in a closed clinical setting, but to promote the widespread use of that device. This information system can assist in the design and development of devices, the distribution of existing technologies and techniques, the training and educating of physicians and allied health personnel, and in the subsequent maintenance and readaption of equipment.

Improved information and communication can assist in the development and distribution of technology that would help the disabled population in overcoming the effects of their disabilities. Although the lives of some disabled individuals have been enriched by technological advances, it is questionable whether these advances have enriched the lives of the disabled population as a whole. In actuality, only a fraction of disabled Americans currently are able to benefit from existing technologies that would improve the quality of their lives. An information system concerning technological developments, available equipment, and training techniques will aid in the service delivery process. Therefore, an improved service delivery network is the only way for the disabled to secure and use any proven technology that will allow them to lead more productive, functional, and satisfying lives.

The Universe of Needs

The vast scientific and technological knowledge and resources available in the United States today should be helping disabled people, particularly severely disabled people, to overcome the effects of their handicaps, care for themselves, travel, work, and participate in community affairs to the full extent of their interests and potentials. But who are the disabled and what is their universe of needs?

The White House Conference on Handicapped Individuals, held in May 1977, defines the term "handicapped individual" as follows:

> A handicapped individual is one who has a physical or mental impairment or condition which places him at a disadvantage in a major life activity such as ambulation, communication, self-care, socialization, vocational training, employment, transportation, adapting to housing, etc. The Physical or Mental impairment or condition must be static, of long duration, or slowly progressive.

This definition is used by the Department of Health, Education, and Welfare's (HEW) Office of Handicapped Individuals.

The population of chronically disabled people in America is variously estimated at 25 to 35 million, or between 10% and 15% of the total U.S. population. Over 11 million of these people can be classified as severely disabled--that is, they have major impairments that significantly limit their capacity for self-care, mobility, and employment. Approximately 5% of the handicapped population could benefit from technical devices and services if they were available. Moreover, advances in medical knowledge and technology and a faster, more mechanized life style point toward a rise rather than a significant drop in the number of persons affected by disabilities. Furthermore, persons who a generation or two ago would have died from congenital defects, traumatic injury, or disabling diseases are being sustained through these advances in medicine and technology. Increasing numbers of older persons, with attendant disabilities in many cases, including arthritis, renal disease, retinitis pigmentosa, and many others, are adding to the problem. Recreational accidents and disabling automobile and motorcycle accidents are increasing the number of persons with spinal cord injuries and traumatic brain damage. Cancer, stroke, and heart disease continue inexorably to add to the list of disabled individuals.

Disability can be caused by disease, accidents, or injuries sustained at home, at work, in travel or at play, or by congenital conditions. Disease is the major cause of disability, but accidents, particularly motor vehicle and work accidents--which are largely a side effect of modern technological advances--are significant causes of disability in the United States. Nevertheless, even though advanced technology heightens the incidence of disabling accidents, it can be used in many ways to reduce or eliminate the effects of an impairment.

Every handicapped individual with a disability that interferes with some aspect of normal life should have the benefit of any technological advances that can improve their capacity to function. Unfortunately, not every disabled person who should benefit from existing technologies has access to them. Second, technologies that could be developed have been hindered through lack of funding and insufficient information for designers and engineers. Present efforts to improve existing technologies and develop new ones fail to keep pace with the urgent needs of the millions of disabled Americans.

Disabled persons face complications in life style not dreamed of by the more independent 85% of the American population. The following statistical information, compiled by the Social Security Administration (SSA), is useful in beginning to portray a profile of disability in America. The ratios apply to totally disabled individuals in relation to nondisabled:

	Disabled Versus Nondisabled
Hospitalization (men)	4 times as often
Days hospitalized	3 times longer
Cost of medical care	3 times higher
Median cost of care as a percentage of income	5 times as high
Average income	0.5

In addition, disabled people face other expenses that the "able-bodied" do not have. For example, an electric wheelchair costs $3,000 to $4,000. Add to that an annual maintenance cost of from $1,200 to $1,600--more than maintenance for most automobiles. Interpreters for the deaf, readers for the blind, attendants for severe paraplegics, home health care, all represent continuing expenses for disabled people.

Limited income of the handicapped is another major factor that deters the production and distribution of rehabilitation devices by industry. The Urban Institute (June 1975) conducted a comprehensive study of 900 severely disabled individuals throughout the country and found that more than 50% of the individuals who indicated that they needed equipment could not purchase the equipment because the cost was prohibitive. In a subsequent study (Urban Institute, December 1976) of the needs of handicapped consumers, nearly one-half of the 1,000 consumer organizations surveyed reported that their constituents lacked the ability to pay for various types of rehabilitative equipment, such as wheelchairs, prostheses, and orthoses that they needed. Most handicapped Americans have insufficient financial resources to purchase technological devices that would enhance their functional capacities. Handicapped people constitute a large proportion of impoverished Americans.

Other data help fill out this disparaging picture. Of the totally disabled people in this country, 37.5% have incomes, earned or unearned, below the poverty level. Only 55% of totally disabled have health insurance protection compared with 90% of the rest of the population. Thus, research efforts and service delivery priorities should be based on solving problems and needs of the handicapped that would decrease dependence on public financial assistance by increasing personal independence, vocational and economic productivity, and educational self-development.

Many parallels exist between the conditions and attitudes faced by disabled Americans and those confronting the racial minorities. Inability to obtain employment, public attitudes toward disability, poverty, inadequate health care, and other forms of discrimination are as relevant to disabled people now as they were to the minorities in decades past.

Lately, America's already well-organized handicapped citizens are pushing their cause with increasing militancy through:

- Demonstrations in several cities to protest obstructions to their full use of public transportation facilities.
- Legal challenges to restrictions on their employment and education.
- Formation of new organizations and coalitions of existing groups representing the handicapped.

Thomas Carroll, director of the National Center for Law and the Handicapped, states that enforcement of the Federal Rehabilitation Act is behind much of the "whole new move of militancy." Increased incidence of lawsuits, media exposure, and formation of new organizations are all fostering an environment that demands attention for the handicapped and their needs. One example of this new movement is the Center for Independent Living (CIL) in California and its counterparts in other states. CIL, a consumer self-help organization, seeks to ensure that all proven rehabilitation technologies are actually applied. It is attempting to demonstrate that a consumer-based organization can deliver services that might not otherwise be provided.

Nevertheless, recent gains could be held to a standstill or even reversed. The growing sentiment against rising government expenditures has already begun to affect recent legislative gains made by the disabled's movement. The growing antiinflation, cost-cutting mood at all levels--from local city halls to Congress and the White House--could delay or weaken enforcement of federal laws against physical and program limitations for the handicapped. On top of the funding problems is the growing crisis in information transfer. Access to knowledge about the latest procedures, techniques, and devices is currently being blocked by an antiquated information system. Better utilization of existing funds can be accomplished through improved information storage and dissemination.

Under provisos of the Rehabilitation Act, cities can be forced to install elevators in subway and train stations, provide buses that the handicapped can board without undue difficulty, and revamp public buildings to make them accessible to those in wheelchairs. The costs of such improvements will be steep because increased mobility creates a demand for improved equipment and devices to allow the disabled to lead a more normal life. On the other hand, advocacy groups contend that these costs will be less than the long-run costs of keeping the employable handicapped on welfare rolls instead of in jobs.

The U.S. government currently spends $9.5 billion in disability benefits, not including SSI benefits, for handicapped people between the ages of 16 and 64 who do not work. Many of these people can and should be employed. Some of the reasons they are not working are:

- Lack of training or adequate education to equip them to successfully compete in the labor market.
- Lack of transportation.
- Compensation from employment is less than SSI benefits and thus insufficient for self-maintenance.
- Needed equipment that could enable the handicapped to be productive persons and workers is either unavailable or nonfunctional.

The rehabilitation community emphasizes that truly beneficial programs are not those that "maintain" the disabled, but those that "mainstream" the disabled, with the ultimate aim of enabling the disabled to become independent.

To move into the "mainstream," the handicapped and disabled need information about the availability and utilization of services, techniques, devices, prostheses, etc., that could be useful to them. Many need special devices, training, or both, to accomplish such basic tasks as eating, moving from place to place, communicating and taking care of themselves. They need to know what public facilities are accessible to them. Unless they know what is available to them, and how to obtain it, the 20 to 30 million handicapped will continue to be more dependent and limited than need be.

Those working with the handicapped have as great a need to know what is available, where, and for how much. Researchers and rehabilitation engineers need to know about new/available inventions, products, the disabled user's needs and experience so as to complete the feedback loop of a complete information network. Therefore, timely access to the most current information available is essential to support continued work and advances in the rehabilitation field.

The Information Problem and the Profession

The rehabilitation profession, only recently recognized as a distinct field with its own knowledge base, is being faced with the contemporary phenomenon popularly called the "information explosion." In the past, the relatively limited parameters of the rehabilitation community allowed adequate communication along informal lines. Today, however, the growth of rehabilitation professions and the technologies available to them are creating an information base too comprehensive and complex to be served solely through informal channels and chance meetings of informed persons.

The rehabilitation fields are expanding, encompassing more professions, new therapeutic techniques, and innumerable new assistive devices and their accompanying vocabularies. Ten or more years ago, how many rehabilitation specialists had heard of "biofeedback," "the Opticon," "computer-aided arms," or "microprocessors"?

The body of information is increasing in size, direction, and scope: as some diseases are conquered, others are discovered. As some therapeutic techniques are found useless or lose popularity, others are touted. New research data often invalidate last year's orthodoxy.

Technologies developed for handicapped people usually cannot be used without special training. This special training is needed not only by the handicapped consumers of the technology, but also by the professionals and technicians who train the disabled consumers. Accordingly, any information program to apply a proven technology to the needs of handicapped individuals must include an allocation of sufficient time and resources for this essential training. New techniques and technologies along with the special training provided to professionals and to disabled persons have significantly reduced recurring medical problems and hospital costs and enabled such individuals to enter a variety of occupations and lead full active, independent lives.

Instruments, appliances, and devices are not the only beneficial technologies for handicapped people. Equally important are systems technologies (the methods used in the rehabilitation process) which, like other restorative technologies, bring know-how and techniques to bear upon specific problems. One systems technology entails work evaluation and job analysis. This method determines the demands of specific jobs and assesses the capacity of the disabled individual to satisfy work requirements and function effectively in that context. Systems analysis of job tasks and work behavior is found in present-day industrial engineering concepts and methods as applied to the total work force in industry. Another systems technology is the comprehensive team approach for developing and implementing an individualized rehabilitation plan. The team consists of the disabled person and family and a group of experts from various fields that bear upon the rehabilitation process.

Systems technology is only beginning to be used in rehabilitation, whereas in the engineering field it has been used for many years. Complex tasks such as those that NASA has undertaken would have been severely hampered if systems technologies had not been used. A systems approach can profoundly affect the planning and delivery of rehabilitation services, and cannot be overlooked in defining "technology."

It is important to understand that disability is not monolithic. Each category of disability such as blindness, deafness, heart disorders, speech impairments, orthopedic deformities, and respiratory abnormalities presents unique needs and problems. In addition, disabled individuals within each category vary greatly from one another with respect to their functional limitations and capacities. It is not unusual for a handicapped person to have two or more disabilities. The disabled person may require a multiplicity of treatment modalities because no one technology is applicable to several disabling conditions. Also, a technological development that benefits a category of disability will not necessarily benefit every handicapped person with that disability to the same degree or in the same manner.

Additionally, there is no single rehabilitation discipline with precisely defined boundaries. Services are provided to blind, deaf, speechless, physically and mentally handicapped, and developmentally disabled persons with various combinations of impairments. Consequently, the needs and complications of disabled people do not fall neatly into established disciplines. Rehabilitation work tends to be cross-disciplinary and is characterized by a diversity of clientele and professional functions. In addition, changing social priorities and more well-defined professional standards now point to treating the total human being rather than merely applying "functional bandaids."

An example of this complexity can be examined by understanding the specialties and subspecialties that come to bear upon an upper extremity amputee. Before World War II, very few technologies and professionals dealt with an upper extremity disability. The expertise of the blacksmith, the harness maker, the surgeon, and a few others provided the only options for a person with this handicap. World War II marked the beginning of American science and technology in rehabilitation. The metallurgist and the chemist were added along with the psychologist and a number of others to the specialties that affected the success of a rehabilitation. Bringing prosthetics from a craft to a science has increased the subspecialties that are used in providing and applying externally powered devices to well over 100.

Figure 3 is an attempt to show the intercommunication that takes place within the rehabilitation community. Note that there are clusters of related interests. For example, there are the advisory groups--government financial support administrations and private financial support--all clustering together as the backup input essential to these programs. Similarly, there is the disabled person who, in turn, must fulfill his/her social and domestic roles as well as the immediate requirements for rehabilitation. In Figure 3 there is a close association with the consumer and medical group as seen in their proximity.

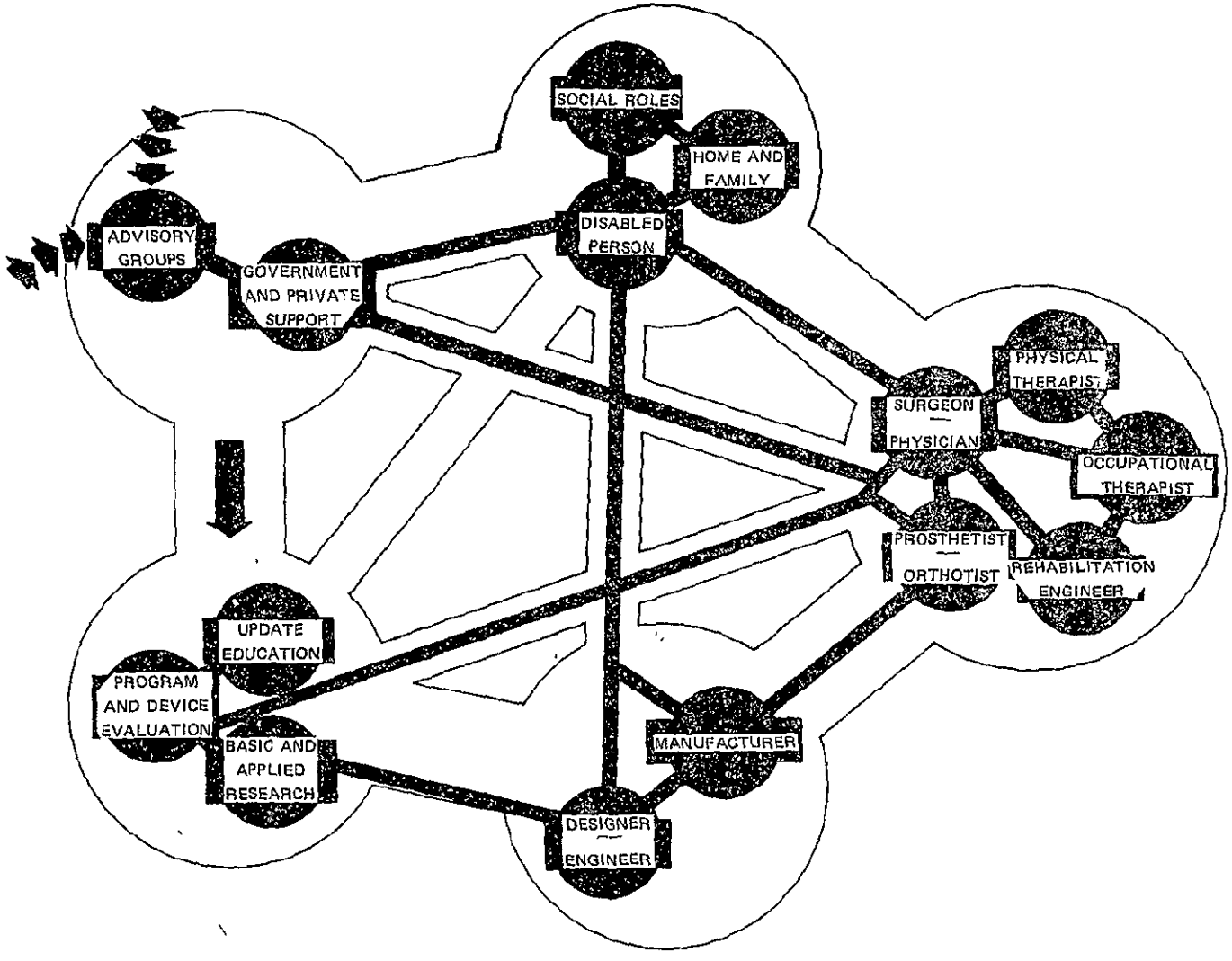


FIGURE 3 PRIMARY COMMUNICATION PATHWAYS IN THE REHABILITATION COMMUNITY

At the bottom of Figure 3, the close association of the designer engineer and manufacturer are shown. They, in turn, are directly contacting the medical group. The medical group, in turn, must depend upon the updating of education and basic and applied research so as to progress in service delivery.

The fitting of a prosthesis and other adaptive equipment now requires highly specialized technicians. All these specialties are directed toward enabling the clients to fulfill their roles in society and to develop their relationships with their families in a form that will yield a maximum amount of rehabilitation.

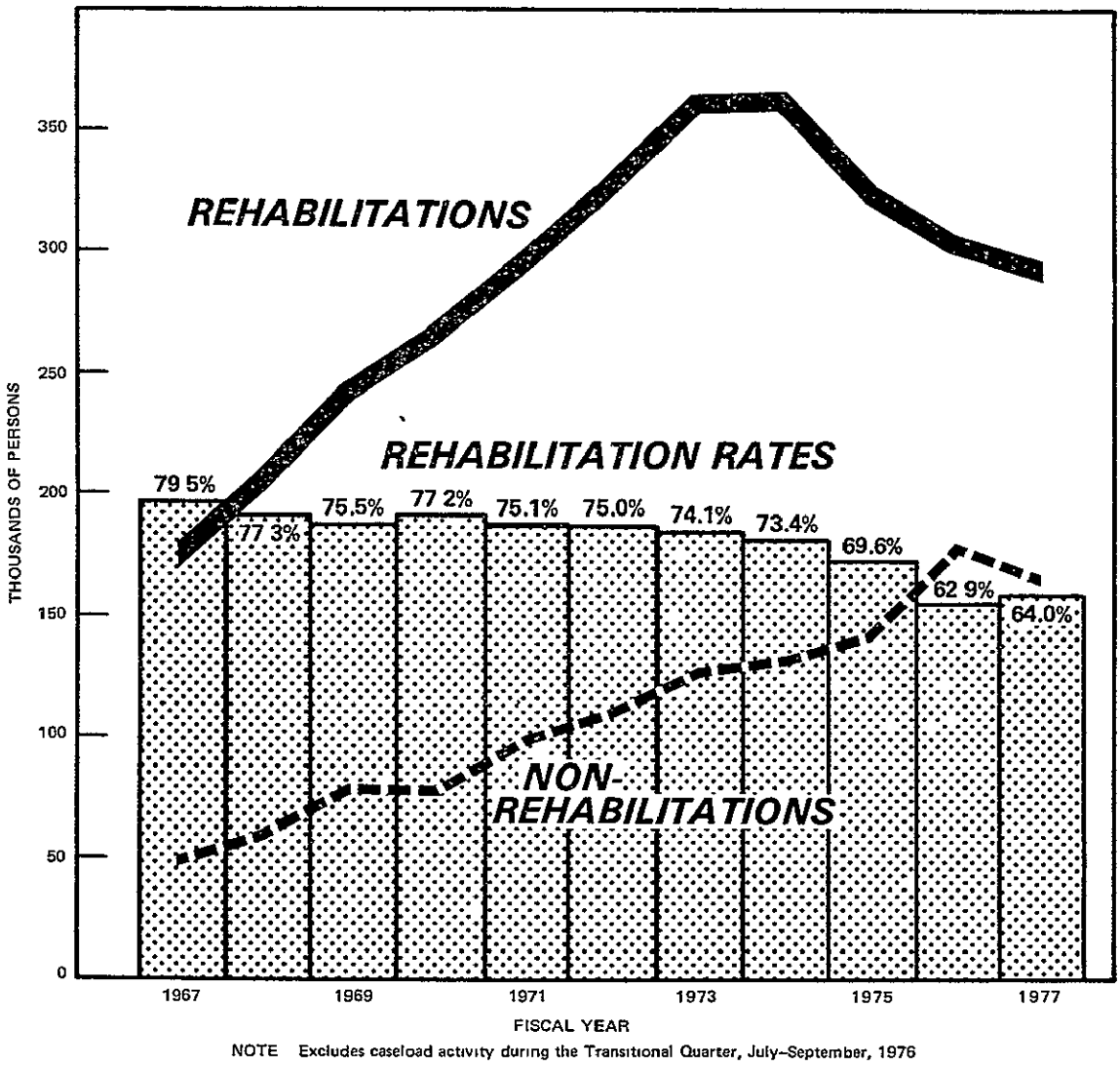
As the body of information and technology grows, rehabilitation professionals are finding it increasingly difficult to keep abreast of all advances that could be used in treatment cases. The effects of the information explosion in complicating service delivery is beginning to show in the number of persons rehabilitated each year, as shown in Figures 4 and 5. The total number of persons rehabilitated rises each year until approximately 1974. The years of 1974-1977 show a significant decline from a high of 350,000 to 300,000 persons per year. Of all cases closed from the active statuses either rehabilitated or not rehabilitated in FY 1977, 64.0% were rehabilitated as compared with 62.9% in the prior fiscal year. More significantly, until the last year, this rehabilitation rate had declined for 6 consecutive years. In fiscal year 1977, state vocational rehabilitation agencies recorded 291,202 successful rehabilitations, a decline of 4% from the number rehabilitated in the prior year - the third consecutive yearly decrease after 20 years of uninterrupted growth.

This decrease is attributed in part to the inclusion of the severely disabled in the definition of the "rehabilitatable" population. The severely disabled rely heavily on technological developments in assistive devices as well as advanced training methods. As more severely disabled individuals use the service delivery system, the deficiencies of technology and information transfer from the rehabilitation engineers and researchers to the treatment and consumer areas are magnified.

Audience Variation

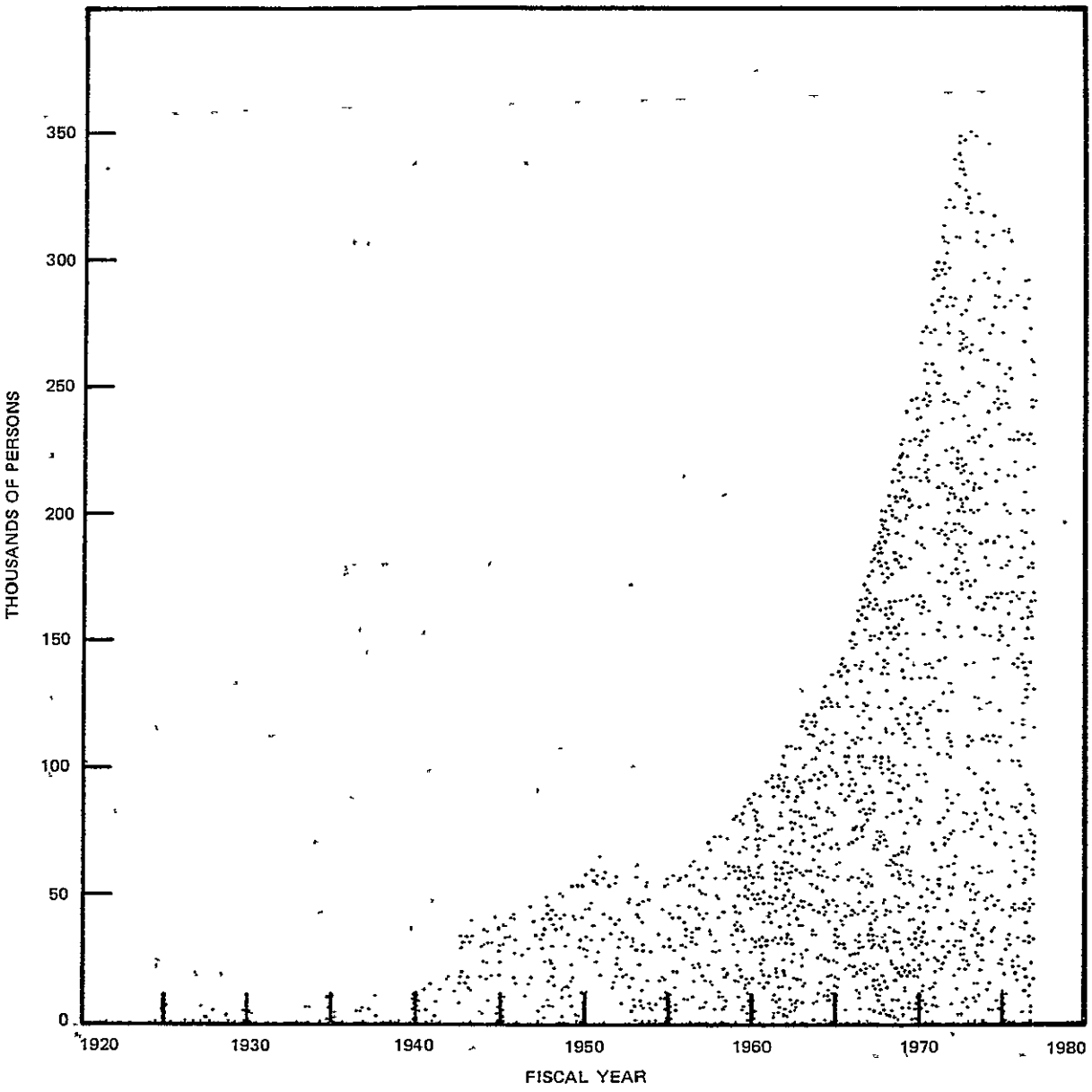
The sources of rehabilitation information have increased dramatically as researchers, practitioners, and administrators endeavor to serve the rehabilitation community more effectively. As the sources expand, the audience for such information becomes broader.

Rehabilitation professionals are educated in a variety of disciplines, including medicine, physiology, engineering, psychology, law, and vocational guidance. Moreover, these same individuals participate in such diverse activities as patient care, basic and applied research, university teaching, training of handicapped individuals and families, counseling and placement, policy planning, legislative development, and client advocacy.



NOTE Excludes caseload activity during the Transitional Quarter, July–September, 1976

FIGURE 4 NUMBER OF PERSONS REHABILITATED AND NOT REHABILITATED, AND REHABILITATION RATES, FY 1967-1977



NOTE Excludes caseload activity during the Transitional Quarter, July–September, 1976

FIGURE 5 NUMBER OF PERSONS REHABILITATED
FY 1921-1977

Furthermore, as advocacy groups expand, more disabled individuals are demanding the right to information once reserved for professionals. As these consumer groups now recognize, and as the professionals in the service network have known all along, access to essential information is mandatory for effective decisionmaking and service delivery.

Much is at issue. As professionals deliberate on what types of information should be made available and how much responsibility should be taken by the individual in the decisionmaking process, the lay community struggles with a basic distrust of the traditional decisionmakers and the information they tend to withhold. Thus, the informational needs of the rehabilitation community are widely diverse in both subject and format.

Information Diversity

In the eighteenth century, Samuel Johnson noted, "Knowledge is of two kinds. We either know a subject ourselves or we know where we can find information about it." As information has expanded, specialization within the professions has proliferated to such a point that the idea of an all knowledgeable "renaissance person" in rehabilitation has become an antiquated dream.

To operate effectively in the present-day environment, specialists know where to find information dealing with their concerns and problems and also to efficiently locate material outside their particular areas of training. Researchers have established that the number of printed materials alone doubles every 10-15 years and that this growth rate is increasing exponentially. With the advent of computers equipped with trillion-bit memories and instant recall, coupled to telecommunications, the capabilities of information storage and dissemination are extended even further. The information problem today is more one of superabundance than paucity.

Difficulties of Existing Information Sources

There have been many different attempts to centralize rehabilitation information. They range from literature collections on a single disability, to computerized files with broad topical ranges--e.g., "special education"--to international registers of research data.

Today, an individual seeking rehabilitation-related information is confronted by a bewildering array of possible sources, each with its particular scope and conventions or usage. Every information source has enacted its own protocol for using its resources with little or no standardization and has thereby further confused the user. The process of locating relevant literature is often a hit or miss affair that discourages all but the most persistent. In many cases, information is provided too late to prove useful. Moreover, it may be expressed in language incomprehensible to the person who needs it, or it may be in a medium unsuitable

to his requirements. Consequently, much of the information with a potential for assisting handicapped individuals goes unused.

System Requirements

The current problems of an information system fall somewhere between the downfall of the renaissance person and the creation of a computer capable of compiling all necessary information and making the correct dissemination decisions. No matter how much information we horde within the memory banks, the computer still cannot take the place of professionals and informed consumers. Information is not the cure, but only an aid toward the creation of better decisionmaking abilities, more profitable lines of research, and more efficient service delivery.

The essence of the information problem has always been how to put relevant information into use, and how to get people to use the information to increase their effectiveness. Because of the information explosion, there are no longer three books and 15 articles on hip-replacement prostheses, but perhaps 40 significant books in four languages and 167 major articles in seven languages, some highly technical, some theoretical, some subjective, and so forth. The dissemination of research briefs and literature reviews does not stimulate innovation directly, but only in conjunction with a well-developed plan for consultation and assistance.

Appropriate information utilization requires that:

- Individuals perceive their needs for the information.
- It be provided in a timely manner.
- It be packaged in a suitable medium.
- Needed assistance or demonstration be provided concurrently.
- There is follow-through to ensure that information provided meets the need.

The key to success is for the information disseminators to be an active link between the producer and the consumer of research results.

Framework for Developing an Information/Communication Service

For handicapped people to enjoy optimum utilization of technological advances, there must be a concerted effort by government, industry, schools of technology, private foundations, and handicapped persons themselves in the planning and conduct of a rehabilitation engineering technology information service. As has been noted with increasing frequency of late, the pluralistic nature of the rehabilitation community and the fragmented nature of rehabilitation engineering technical information has made it difficult, if not impossible, to improve the service delivery process. Human service information systems are a late starter in the race to apply modern technology to solving the problems of our society.

As will become evident in the following section of the needs profile of various members of the rehabilitation community, there is a difference between communication networks and information systems. The information system refers to a body of organizing procedures for identifying, collecting, processing, retrieving, and disseminating information. The information is in the form of data or documents that provide a memory function that allows us to learn from the experiences of others. These data/document banks can provide a tremendous service only if the information is preserved in written or audiovisual form. Much information in the rehabilitation community exists in unretrievable form--i.e., within a person's expertise or a team's experience.

Information systems are a relatively passive form of information utilization. A well-designed information/data base will do little if the problem relates to the poor level of communication between involved parties. An active communication network can promote rapid diffusion of the latest and most pertinent information. Simply stated, the idea is to link organizations and systems of rehabilitation engineering information into a network to ensure that complementary and mutually supportive services will evolve. A network capitalizes on existing information stores and dissemination plans, thus avoiding unnecessary duplication of services. One drawback with a communication network is that its operation is dependent on the participation of only a small, select group. An information system, on the other hand, can be expanded to an unlimited number of parties. A communications network, such as teleconferencing, can support the development of a more sophisticated information system.

Every developing information/data base is confronted with the problem of extracting valuable but undocumented information. This problem is particularly acute in rehabilitation because the community has relied so long on the informal communication channels. The rehabilitation community has grown too large and complex for communication networks to be the sole means of information transfer. Communication networks and information systems must work together to aid the service delivery process for the disabled.

Commitment to developing an information system must be the responsibility of every member in rehabilitation. Administrative agencies can force the documentation of important information through the contract and grant process. The monies for research and development should have a minimum of 10% written into each contract for the documentation and dissemination of new technologies and techniques. Rehabilitation engineers must save blueprints and solutions to client needs so as to effectively use the initial time and money devoted for development. Third-part funders can require better feedback mechanisms to document the various trade-offs between cost and function in devices and services. Disabled consumers can demand the right for better evaluated information about their conditions and the devices on which they are dependent. This commitment can facilitate in the development of a system, but specific decisions concerning what tasks it should undertake and the manner of operation are dependent on answers to many other questions.

Some of the basic considerations in setting up an information service are: the scope of the information base (which topics, in what depth); how to satisfy the distinct needs of the professional and lay audiences; and what form should the information be presented in to maximize its usefulness. Decisions also need to be made about the general framework of the system. Will the system involve the use of electronic data processing equipment, or can the purposes be accomplished through publications and telephone hot lines? Is it to be active, automatically distributing material to an audience-at-large, or passive, awaiting inquiries? Is it to be selective, or is all available information on a subject transmitted? Will an information specialist be used to access the system, or will users have direct access to the information? Who will be the target audience(s)? Should the system be objective or have a degree of subjectivity built into it in the form of product evaluations or annotated bibliographies? What distinction exists between the human service delivery system and the human service information system that supports it? Will control of the information system be held by the organization which it serves? The system development plan--should it be short-range or long-range? Simple or detailed? Will the implementation plan involve all potential users in its preparation? What can be done to ensure the acceptance and utilization of output? Early in the development process, has adequate training and orientation for users been planned for and implemented? Will the system design be modular, flexible, and simple so as to respond to new demands and information?

All of the above factors must additionally be weighted against the factors of money and time. An effective system must address all the above questions. The essential consideration in designing any information system is creating an operational format that meets the needs of the participants. The following section identifies the needs of selected members of the rehabilitation community, in the hope that it provides a solid basis for future planning.

IV INFORMATION NEEDS PROFILE

IV INFORMATION NEEDS PROFILE

The people most directly involved with service delivery in the rehabilitation community can be classified into six groups. consumers, counselors, medical practitioners, administrators, rehabilitation engineers, and manufacturers. Each group has different informational needs, all of which must be considered in the design of an information delivery service. To identify the range of needs, the SRI team interviewed representatives from all segments of the rehabilitation community. Some overlapping of professional backgrounds and information requirements exists among the different segments; however, each segment was considered separately by the SRI team, and is discussed separately below.

In the course of the interviews, it became evident that the counselors, consumers, and rehabilitation engineers would benefit the most from an information system, as these three groups account for the majority of discussions on technological devices and service delivery. In the following sections, this emphasis is reflected in the relative comprehensiveness of the treatment of these three groups.

Consumers

The consumer group is composed of two segments: a large, passive segment and a smaller, active one. Within the active segment are both vocal (advocacy groups) and nonvocal consumers, the nonvocal being those who are concentrating their energies on integrating themselves in the workaday world. Within the passive segment are those who have no interest in rehabilitation information because they have lost all hope of being rehabilitated, and those who have no interest, because they have learned, consciously or unconsciously, to accept their situation and expect no improvement in it. SRI attempted to survey all consumer types: those persons who are active, either vocally or nonvocally; and those at various levels of accepting the status quo.

Consumers stressed the need for better feedback mechanisms both to the manufacturer/designer and to third-party funders. As might be expected, new product descriptions were the "most wanted" information. Information on the availability of current products was also seen as inadequate, and many times misleading, because of the advertising copy used. Consumers also found it difficult to make decisions on nonevaluated merchandise. Additional informational gaps mentioned by consumers related to modification and repair of assistive devices.

Most of the consumers interviewed by the SRI team relied heavily on their equipment salesmen for repairs and alterations, sometimes waiting months for parts and service. One cerebral palsied consumer was confined to a new but poorly fitted wheelchair, a customized wheelchair made especially for her. She knew of only one vendor, the one represented by "her salesman," whom she tried not to annoy for fear he might abandon her.

One problem mentioned repeatedly by the consumer group may not be solved by an information system. A handicapped person may receive aid from many agencies during his lifetime. Each agency has in its files a record of the aid provided and progress made during the agency's period of concern, but nowhere is there a composite record of progress, aids, or the agencies that provided the aids. Thus, the handicapped person must attempt to acquaint each new funding or aid center with his/her history. In addition to requiring extra time and paperwork, this disjointed process results in lost (or forgotten) information.

An information delivery system to meet all the needs of those members of the consumer group interviewed by the SRI team should include:

- A feedback capability to register consumer problems.
- Descriptions of new products and potential products.
- Descriptions of available products, especially products for special needs.
- MediCal and Medicare funding criteria.
- An explanation of Social Security provisions, especially for the blind.
- Instructions for home modifications.
- A directory of agencies and the services they provide.
- A directory of accessible public buildings and facilities.
- A directory by location of repair shops and jobbing shops for repairing and adapting equipment.
- Case histories of all consumers to document assistance given and progress made with each agency assignment, and to provide patterns for future cases.
- Clarification of regulations concerning liability for device-related injuries.

As mentioned above, a consumer needs list was desired by almost all of the consumers surveyed, followed by descriptions of new products, currently available products, and potential products (e.g., patented inventions and technology at the testing stage) (see Table 1).

Table 1

REHABILITATION ENGINEERING INFORMATION SYSTEM:
CONSUMER NEEDS

Need	Consumer* A	B	C	D	E	F	G	H	I	J	K	Total
Consumer needs list		x	x	x		x	x	x		x	x	8
New product descriptions	x		x		x			x	x	x	x	7
Product evaluations	x		x	x	x			x			x	6
Potential products (patents)					x			x	x	x	x	5
Directory of repair shops		x					x	x			x	4
Instructions for home modification	x					x	x				x	4
Directory of accessible public buildings and facilities		x	x			x		x				4
Directory of agencies and services		x		x				x				3
Case studies	x							x		x		3
Clarification of legal liability			x					x			x	3
Medical/Medicare funding criteria			x	x								2
Social Security provisions		x								x		2

*These consumers include the arthritic, quadraplegic, cerebral palsied, paraplegic, and blind.

All interviewees were asked if they would use an information system if it were readily available and easy to use. The majority responded with an emphatic "yes" and the rest with a "maybe." Of note is the fact that some "yesses" were given by members of the passive segment of the group. The concept that they might seek their own answers to questions, or perhaps even find solutions to their device-related problems, was new to them. An accessible, well-constructed information system could be the stimulus for increasing the interest of the passive consumer in rehabilitation, and hence, for enriching his/her life.

All of those interviewed had an opinion to offer regarding the method of information dissemination. Some, particularly the blind consumers, wanted a call-in service; some wanted a book or series of books; all wanted a newsletter containing new product information, letters to the editor, and articles related to independent living.

Counselors

Within the counseling community are physical and occupational therapists, rehabilitation counselors, independent living skills coordinators, speech therapists, hydrotherapists, social workers, employment counselors, and so forth. These are the people who directly assist in the handicapped person's rehabilitation and as such give advice on rehabilitation engineering needs. The SRI team interviewed all types of counselors, a total of 44 in 21 rehabilitation facilities.

The physical therapist's main problem seems to be in recommending home therapy equipment for use after the patient is released from the hospital--equipment related to that used in the hospital to strengthen muscles and increase coordination but simpler in form. As one PT put it, "... the more sophisticated the equipment, the more it breaks down." There is also a concern that inappropriately designed equipment might deter client independence.

Catalogs are the PT's primary source of information. An information system that would consolidate the massive collection of product information would be very useful. One PT complained that many times she could not remember the source of specific product information when she needed it, and therefore had to leaf through many catalogs.

The PTs interviewed would prefer a manual system--perhaps a series of loose-leaf volumes for easy updating. Each volume should consider a different disability or family of assistive devices (e.g., mobility, communication, employment opportunity, personal care, prosthetics), with additional categorization of devices within each family. Product information should include descriptions of currently available devices, illustrations, distributors, prices, and evaluations. Particularly wanted by PTs is an evaluation of product durability and appropriateness for specific disabilities.

The physical therapist would be greatly assisted by a system satisfying only a few informational needs:

- Current product descriptions
- New product descriptions
- Product evaluations
- MediCal/Medicare funding criteria
- Case studies.

"New products" include devices that may still be awaiting MediCal/Medicare approval and therefore are listed as a separate package of information.

The occupational therapist's role in the rehabilitation process begins as soon as the disabled is physically able to be fitted for a prosthetic device or brace. While physical therapy, to strengthen muscles and increase coordination, is continuing, the OT is working with the disabled to ensure (1) proper device selection, (2) proper fit, and (3) readiness and ability to use the device. This training in the use of the device may extend to the home and work environments, and include many additional assistive devices. Because of limited resources, or to save time, OTs often find themselves doing the actual device adaptation for their clients. Thus, the SRI team found that readily available information about self-help aids and equipment designed for individualized needs is of great importance to this group, as is information on prosthetics and orthotics. Presently, OTs rely heavily upon vendors for new product information and solutions to individualized needs. In addition, OTs often exchange information among themselves through informal networks between clinics. These two forms of information gathering often are erratic and inaccurate.

OTs would welcome an on-line information retrieval system or set of books from which specific information about equipment could be extracted easily. One OT stressed the point that she did not want "a huge catalog of crutches, canes, and wheelchairs." By this, the OT did not mean that information on crutches, canes, and wheelchairs is not wanted, but rather that rehabilitation usually requires much more than routine mobility assistance. Most important to the OT is information on devices to meet special needs of the handicapped, such as self-help aids for specific disabilities. A wish for hands-on familiarity with new products was expressed by all of the OTs.

OTs would like information on new products and processes as well as a complete listing of currently available products. Like the physical therapist, the OT spends many needless hours in search of appropriate assistive devices. Discussions with OTs produced the following needs list:

- New product or process descriptions.
- A complete catalog of currently available devices.
- Descriptions of specialized equipment.
- R&D information and projected completion dates.
- Client feedback.
- Used equipment bank.
- Directory of services.
- Directory of accessible public buildings and facilities.
- Directory of training instructors.

- Directory of skilled workmen for equipment modification.
- Information on eligibility and funding for various devices and services.

Some of the independent living skills coordinators interviewed by the SRI team were occupational therapists; some were not. However, the ILS coordinator function appears to be a variation of the OT position. ILS coordinators are concerned mainly with teaching the disabled consumer to use specific assistive devices in an everyday environment. The purpose of this training program is to ensure that the consumer does not become discouraged before he/she has mastered its usage. For example, simply knowing how to operate an electric chair or a laser cane is not enough. Consumers must learn to use the devices in everyday settings, such as crossing the street. Otherwise, they revert to former modes of action or inaction. ILS coordinators also teach the use of self-help aids in a home environment. Unlike the OTs, they do not fit the consumers with special devices such as braces.

ILS coordinators read the literature of the handicapped community: Accent on Living, Paraplegic Life, and the rehabilitation monograph, Self-Help Devices, to name a few. From these publications, the coordinators learn about new products and gain insight into the problems of the handicapped who are being rehabilitated. For additional product information, the ILS coordinators refer to catalogs. All coordinators contacted by the SRI team had sizable catalog collections.

Like the OTs, the ILS Coordinators are careful in their equipment recommendations. This ensures that no device is ordered that may possibly deter the consumer from overcoming his/her handicap. In making specific recommendations to clients, the ILS coordinators feel constrained from providing maximum assistance by:

- Catalogs that do not specify the type of patient to be helped by the device.
- Jargon of medical and engineering professions.
- The reluctance of some agencies to share useful information.
- Nonstandardized replacement parts that must be ordered from the equipment manufacturer.
- A lack of service departments at supply houses.
- A lack of service manuals.

An information system in manual form is sought by ILS coordinators. Coordinators at the Center for Independent Living are currently using the seven-volune series published by the National Association for Crippling Diseases (London), which is very well organized into activities (e.g., washing), problems (e.g., soap slippage), and solutions, both commercial and noncommercial. This series provides very useful "how-to" information for simple devices and adaptations; however, its equipment recommendations are of little benefit except when they can be correlated with U.S. products.

The information sought by ILS coordinators was identified as:

- Funding criteria for MediCal/Medicare
- Directory of agencies and their services
- Instructions for simple adaptive engineering
- Directory of adaptive engineering and repair shops
- Directory of accessible public buildings and recreation areas.

Vocational counselors approach the employment problem of the handicapped from the standpoints of both the prospective employer and the prospective employee. They counsel employers on architectural barriers and equipment needs related to hiring the handicapped, and disperse many of the misconceptions concerning the degree of change required. The VC identifies jobs that can be performed by the handicapped with special tools or some adaptation of existing ones, or by some adaptation of the work environment. Training the handicapped employee to perform the work, using the special equipment, is the corresponding function of the VC.

This dual role requires a knowledge of the abilities and disabilities of handicapped individuals and a knowledge of assistive devices. However, information on devices for the workplace is scarce, and this informational gap hinders VC assistance. The few publications that are available on assistive devices are primarily devoted to describing devices used in domestic living. Those assistive devices that are currently described for the workplace are simple adaptations of pre-existing devices used in other areas of living by different types of handicapped persons. These adapted devices have limited effectiveness.

Most assistive devices now used in the workplace are custom-made at a considerable expense to fit one person in a specific job. While various state departments of rehabilitation pay for these devices, there is little or no interchange of information between states and efforts are often duplicated.

Information sought by the VC includes:

- A program, at the state level, that could inform individuals, employers, and rehabilitation professionals about the availability and utilization of assistive devices.
- Directory of accessible buildings.
- Information about what equipment and rehabilitation engineering services third-party funders (Medicare, MediCal) will underwrite.

Interviews were also held with people who teach art and dancing as approaches to rehabilitation. This is a new and growing field. These art and dance therapists appeared to be particularly successful in reaching those handicapped who had previously defied rehabilitation, either due to severe physical limitations or a lack of motivation. Most of the special tools and equipment used in those therapy programs witnessed by

the SRI team were designed by the therapists and built by local carpenters and handymen. Because art and dance therapy programs are few and relatively new, information exchange is limited almost entirely to word-of-mouth networks. A directory of dance therapy programs, published by the American Dance Therapy Association, provides one means for locating resource people. However, most therapists are reluctant to impose on another's time when seeking solutions and have no avenue by which to share their solutions with others. These art and dance therapists seek information on new products to aid coordination and instructions for simple adaptations to standard dance and art equipment. They also would like a directory of accessible art museums and parks to enable the planning of field trips. A call-in service was mentioned as being potentially most useful.

Thus, information to assist dance and art therapists might be:

- New product descriptions
- Instructions for equipment modification
- Rehabilitation techniques and systems.

Summary of Counselor Needs

The combined group of counselors--physical therapists, occupational therapists, independent living skills coordinators, vocational counselors, dance and art therapists and hydrotherapists--produced a long list of problems:

- Slow authorization procedure for funding of new devices.
- Erratic funding requirements.
- Slow response by manufacturers in design updating or modifications.
- No channels to process complaints concerning manufacturers and service delivery.
- Patent infringement worries of adaptive engineers.
- Lack of employer knowledge of the capabilities as well as the needs of the handicapped.
- Too little exchange of information among agencies, especially with regard to innovations and case history comparison.
- Equipment used in hospitals is not right for home use.
- Specific product information cannot be found without having the vendor's name; even then, it is difficult.
- Rehabilitation engineers design aids without first determining the needs of the handicapped.
- Difficulty in communicating with rehabilitation engineers and medical personnel due to professional jargon.

- Inability to judge product quality or appropriateness; catalogs rarely tell the type of patient that would be helped by each device.
- No standardization of replacement parts.
- Lack of service manuals.
- Need directories of agencies and their services.
- Need instructions for simple adaptive engineering.
- Need directory of accessible public buildings and recreation areas.
- Used equipment banks are needed.
- New product or process descriptions are unavailable.

The counselor community identified 29 kinds of information that would resolve or ease its rehabilitation engineering problems. These types of information are listed on Table 2, which indicates the response of each rehabilitation counseling facility to each item indicated. The greatest need (i.e., that expressed by the largest number of facilities) is for a catalog of standard equipment. New product information appears to be second in importance to counselors and therapists, according to the SRI survey. Updated information about MediCal funding requirements are third, followed by R&D abstracts and "how-to" information.

System Design Recommendations

Based on information gathered during the 44 interviews, the California Rehabilitation Engineering Information System (CRIS) should have the following capabilities:

- Manual accessibility to "most needed" information by means of handy loose-leaf binders.
- Phone-in accessibility to an information service or a computerized data base for special needs; e.g., blind and low-vision users.
- Index based on the problem as well as the potential solution.
- Standard format throughout system.
- Built-in correction capability.
- Newsletter update on new product and legislative information and newsletter answers to consumer questions.

Table 2

REHABILITATION ENGINEERING INFORMATION SYSTEM COUNSELOR/THERAPIST NEEDS

Need	Loma Vista School	Chandler-Trapp School	Sam Della Maggiore School	Lighthouse for Blind	Valley Medical Center	Garden-Sullivan	Stanford Children's Hospital	Veterans Administration	Western Center for Blind	Center for Independent Living	Peninsula Center for Blind	Hope Rehabilitation Services	Easter Seal Society	California Heart Association	Cerebral Palsy Ctr. for Bay Area	Adult Independence Dev. Center	Catholic Social Service	CAR (Community Assoc. for Retarded)	De Anza College	Creative Growth	Rancho Los Amigos Hospital	Total
Descriptions of standard equipment			X		X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	16
New product descriptions	X	X			X			X			X		X		X	X		X	X		X	11
Product evaluations		X			X		X			X			X		X	X			X		X	9
Descriptions of specialized equipment	X	X					X			X					X	X			X		X	8
Potential products (patents)		X				X	X	X			X				X	X					X	8
Medical update			X		X	X						X		X	X				X		X	8
Consumer needs list							X	X	X				X					X	X	X	X	7
"How-to" information		X		X		X		X		X		X						X				7
MediCal/Medicare funding criteria					X	X				X		X	X								X	6
Case studies		X			X			X										X	X		X	6
Client feedback	X	X						X					X								X	5
Directory of agencies and services	X	X		X				X					X									5
Loan/resale equipment bank	X	X			X					X												4
Home care/attendant service								X		X				X	X							4
Directory of repair shops										X			X			X			X			4
List of training instructors	X	X	X								X											4
Directory of accessible public buildings and facilities					X								X							X		3
List of skilled workmen	X	X											X									3
Parts standards							X			X											X	3
Social Security provisions				X											X							2
Statistics on crippling diseases, other statistics							X			X												2
Building specifications	X					X																2

Note These results reflect the requested needs by counselors at these facilities and not the overall institutional opinion

Rehabilitation Engineers

Rehabilitation engineering represents a new specialty within the rehabilitation community. This specialty arose from the realization that technology is expanding too rapidly for clinical teams to stay abreast of all the advances. In addition, rehabilitation device design often requires a combination of traditional engineering specialties such as electronics, material, structural, mechanical, and biomedical engineering, as well as an understanding of the handicapped's needs. Thus, ideally, the rehabilitation engineer should act as a technology consultant for the clinical team, suggesting current devices that address special needs or, if no appropriate devices exist, designing new technologies to meet those needs.

The development of new technology and the adaptation of existing technology for handicapped individuals have been impeded by a scarcity of people trained and educated in the application of engineering principles to the needs of the handicapped. Training for rehabilitation engineering is needed in order that there will be qualified engineers capable of accepting responsibilities for the technical aspects of patient care either in rehabilitative facilities or in private practice. It has been recommended that the trainees could be either graduate engineers who would be trained in rehabilitation procedures, or health professionals such as therapists, prosthetists, and orthotists, who would be trained in basic engineering. Other parties in the rehabilitation community as well as the rehabilitation engineers themselves emphasized that the expansion of this new engineering discipline is vital if technology and rehabilitation are to maintain a close relationship.

In addition to seeking out technological developments in other fields that could be transferred, with or without adaptations, to rehabilitation, the rehabilitation engineer would

> ... aid in assessing the disability and in determining assistive equipment specifications, evaluate the feasibility of using available equipment or modifying it for the specific application, determine when a new product or device should be developed, direct this development when it can be accomplished 'in house,' and, finally, be able to complement the process of providing the disabled person with an assistive device when it is technically and economically feasible to do so. (Rehabilitation Education Workshop, 1976)

Unfortunately, this ideal picture of rehabilitation engineering is rarely mirrored in reality. Interviews conducted by the SRI team revealed that rehabilitation engineers are still few in number and fit various descriptions. In light of the fact that this field is so new, the role of the rehabilitation engineer should be carefully defined in terms of a professional discipline, complete with its own training programs, qualification standards, professional organizations and journals. An organization, similar to other professional associations, should be established for exchange of information and ideas.

Not only must the rehabilitation engineers have a better understanding of their profession--what it is and can do--but the rest of the community must be aware of its potential impact on service delivery.

The majority of engineers and designers were not well acquainted with the needs of the rehabilitation community. This lack of involvement with other segments of the community is the problem cited most frequently by rehabilitation engineers and by other groups surveyed. Traditional engineering, at both the student and professional levels, is undertaken in the relative isolation of the laboratory. Devices developed in this atmosphere, while theoretically sound, may be lacking in practicality. Designers themselves have mentioned that, at times, they do not understand the need of the disabled person and spend their time trying to invent and develop devices that are inappropriate. As Dr. Lewis Levitt of Baylor College put it, "The rehabilitation engineer needs to be a part of the patient's treatment team, and not isolated in a laboratory ...." Looking at the rehabilitation engineer as an interface with existing technology, Dr. Y. Challenor of Blythdale Children's Hospital said, "We must become accustomed to the use of engineers at the clinical level, then the technologies will move quickly into treatment practice." Rehabilitation engineers surveyed by the SRI team agree with Dr. Challenor's statement that the technology is available to satisfy many of the needs of the disabled.

A second major problem cited by the rehabilitation engineers was a lack of funding for development of special devices. Government or institutional funding is required for the small-market device, and research funds are limited. If, as Dr. Challenor suggests, the engineer became a part of the clinical team, this barrier to technological application could be overcome. With funding concerns reduced or even eliminated, and a first-hand awareness of the deficiencies and potential capabilities of the disabled, the rehabilitation engineer would be able to satisfy needs to a far greater extent than is currently thought possible.

A third problem that indirectly deters the rehabilitation engineer is the attitude of the third-party agency that will fund the consumer product resulting from the technology application. Third-party funders have an "approved list of equipment" from which most prescriptions must come. Several times, the SRI team heard the complaint that public agencies have rigid attitudes towards the funding of innovative advances and that too much time is spent in the acceptance process. It is during this time that evaluations might be most helpful to the third-party funders to either prove or disprove the appropriateness of the equipment in question. Without approval from third-party funders of equipment that embodies advances in rehabilitation technology, little innovative technology will ever be utilized by the rehabilitation community. Another problem is that third-party funders cover initial equipment purchases, but often do not cover the costs of modification and repair by the rehabilitation engineer, which are essential when providing products for a specialized user group.

Thus, contributing factors in the lag between invention and technology delivery are: the shortage of money, i.e., the limited funds for research; the funding priorities of granting agencies; the prohibitive cost to the patient of delivery of an advanced device; the inability or unwillingness of facilities and third-party funders to invest in new technology.

With the exception of the more established aspects of rehabilitation engineering, such as prosthetics and orthotics, the organization and service arm of rehabilitation engineering is deficient. Because there is no professional organization for rehabilitation engineers, knowledge of one another's work is lacking and, therefore, communication is also lacking. This leads to multiple designs of the same equipment. There are many informational needs of rehabilitation engineers. The primary needs are for a method for finding out which devices are available, ways of locating vendors, and evaluations of equipment, if available.

The rehabilitation engineer would welcome an information delivery service, particularly an on-line system. This information bank should include:

- Descriptions of consumer needs.
- A "Who's Who in Rehabilitation Engineering" to identify the engineers, their locations, and their expertise.
- Funding sources for rehabilitation engineering R&D.
- A listing of vendors for marketing new technology.
- Better information about the state of the art, both nationally and internationally.
- Information on past attempts to design equipment for particular needs.

Administrators, Third-Party Funders, State Agencies, and Private Organizations

Most administrators have professional training in either psychology, social work, or medicine, which enhances their effectiveness at pinpointing the concerns of the handicapped. However, in both the public and private sector, the administrators work under considerable deadline pressure. They have very little, if any, time to gather information that would assist them in the decisionmaking process. Frequently, they rely on their own expertise or that of other accessible individuals.

Generally, administrators need current, reliable information about the activities of other organizations, agencies, and individuals and what resources are available. They need hard data, sometimes summarized in brief descriptive papers, to assist them in keeping up with relevant developments in rehabilitation and related fields. A constant complaint among administrators interviewed was the lack of information about future funding sources for advanced assistive devices and training programs.

There is a need for more precise demographic information on handicapped people of all ages, particularly data on functional limitations in major life activities. This basic information is fundamental to providing a more realistic basis for technological research and for planning and conducting service delivery programs. Present disability studies do not provide this information. The administrators need an overview of the conditions in the disabled population in order to address the problems with effective programs for improved service delivery.

Communication between statewide agencies and from these agencies to the handicapped community proved to be a major concern of top level administrators. Until recently, concern over interagency communication and supportive information services was not a priority issue. Administrators now see the results of what poor communication and a lack of information can do to service delivery. During interviews administrators expressed that actions must be taken to insure better utilization of information if social service agencies are to survive and grow. Information within these organizations is increasingly being regarded as a basic resource for service to the disabled.

Some of the interagency problems, particularly funding sources, have more to do with the lack of information about the purpose and function of the existing agency, than specific consumer information. Ungrounded criticism of service agencies could be redirected toward problem solving if the mission, goals and funding limitations were widely understood. Education about available services would eradicate much of the frustration currently experienced by other administrators, consumers, and the service network.

More reliable and comprehensive information about rehabilitation technology was requested by administrators. Private insurance companies and governmental funders expressed the opinion that essential information necessary for decision making was not provided by the professional counseling community and physicians. Some of this information did exist but was not communicated to the authorizing agency. In other cases important information simply did not exist. Cost benefit studies on certain devices and services as well as basic information about new and experimental items are not available. Without this information administrators of funding agencies cannot justify the additional outlay of money for the initial purchase of devices even though they may suspect that the least expensive item may result in increased life cycle cost.

Administrators unanimously agreed that a catalog of devices would do much to aid the communication between funding agencies and the service network. They requested that the information be periodically updated to reflect changes in the field. Other administrators would welcome a newsletter which covered new developments and devices. Commercially available devices and those about to be introduced had preference to a "dreamers notebook" of unavailable technologies.

The services most frequently cited as desirable are:

- Conferences and meetings on current developments and new technology (this was desired by state personnel in particular).
- Descriptive summaries of state-of-the-art research and progress in various areas of rehabilitation and related fields, in terms understandable to a wide range of professionals.
- Abstracts, obtainable upon request, of relevant selected documents.
- Access to existing documents (a frequent complaint was that copies of cited articles or documents often could not be obtained).

To accommodate the administrator, a rehabilitation engineering information bank should contain:

- Descriptions of new products.
- Abstracts of relevant R&D reports and patent disclosures.
- Product evaluations and cost/benefit studies.
- Agendas of scheduled conferences.
- Demographic statistics for short- and long-range planning.
- Government funding criteria for program implementation and advanced equipment.
- A directory of agencies and services.
- Cost/benefit data related to rehabilitation engineering and technical devices.

Medical Practitioners

For most disabled persons, rehabilitation begins in the hospital under the guidance of medical personnel. Practitioners in such responsible positions need to keep abreast of current developments in rehabilitation and to update or upgrade their skills. In order to capitalize on the experiences in other centers, medical personnel need open communication about the nature and effectiveness of procedures and devices implemented elsewhere.

Many practitioners requested access to a reliable telephone referral service that would provide information on local resources and services available to their clients. Practitioner referral systems based on knowledge of consumer needs and available resources usually exist in direct connection with rehabilitation facilities; such systems are seldom found among primary-contact physicians or other professionals. The practitioners interviewed requested better access to current research information and state-of-the-art monographs packaged to suit their particular requirements. Like administrators, they could use abstracts of selected articles and

brief, readable reports on topics of professional interest. Some practitioners specifically need master catalogs of available rehabilitation-related devices. In addition, many practitioners could use more assistance in the utilization or implementation of information new to them. Workshops on implementing new procedures and multimedia "how-to-do-it" kits were also requested.

A common complaint among those practitioners surveyed by the SRI team focused on the availability of research information and documents. The current abstract services are not easily used. The practitioners would welcome an on-line information retrieval system with a broad data base covering new areas of research.

A few practitioners mentioned the various efforts by the National Library of Medicine to update the education of medical doctors. Services such as the Poison Hot Line have proved invaluable for quick access to the latest information. The practitioners suggested that such programs could provide models for a rehabilitation engineering information system. The SRI team did explore the present offerings and research of the National Library of Medicine and the results appear in the last section of this report.

The practitioner group would welcome the following items:

- Consumer feedback and professional evaluations of new devices and techniques.
- Access to experts willing to be contacted by telephone who would be able to locate needed information.
- Telephone service to aid in referring clients to local resources and services.
- Workshops on new procedures and developments (possibly through mobile units in rural areas or audio-visual materials) and "hands on" equipment training.
- Rehabilitation engineers who are better informed about consumer needs.
- New and current product descriptions.
- Abstracting service on R&D reports and future R&D funding criteria.

Of all the groups in the rehabilitation network, the medical practitioner group seems to be the least discontent with the overall rehabilitation field and identified the fewest deficiencies which were felt major barriers in service delivery.

Manufacturers

Sometimes, communication channels must be opened before information can be transmitted. The informational needs of rehabilitation engineering suppliers and manufacturers were many, but not as great as the need for better communication channels to and from the rest of the rehabilitation community. Criticisms of manufacturers by the rest of the rehabilitation community ranged from lack of innovative designs, to obsolete technology, poor distribution channels, lack of service and repair facilities, and overpriced items. Manufacturers, on the other hand, contend that consumers and advocacy groups do not understand the unique marketplace of rehabilitation equipment. Further study on the needs of the consumer groups and the nature of manufacturing and its distribution channels are a prerequisite for improved information exchange.

Barriers in the Marketplace

In the aggregate, the disabled population is large, but the numbers in the various disability categories are relatively small, a fact that significantly inhibits the development of technologies and the production of technological devices. As indicated earlier, few technologies can be applied generally. Most are specific to a single disabling condition, and the number of disabled people with a particular physical impairment represents a smaller potential market. If the manufacturers could be informed about the market size and better distribution methods and existing patterns, then more manufacturers could make informed decisions about production scales and research priorities.

Manufacturers, both large and small, encounter difficulty in reaching their product consumers. Several manufacturers candidly admitted that they had very little information concerning the real market size when deciding whether to introduce a new item. Even when they knew a sizable market existed, they did not know what distribution channels to use to reach the diverse potential audience. This lack of an aggregated market contributes further to distribution problems, because the costs of maintaining extensive distribution channels over a widely dispersed market appeared prohibitive to the manufacturers.

The "unknowns" of the rehabilitation marketplace also complicate new equipment development. Most rehabilitation equipment manufacturers are small and undercapitalized. Consequently, they avoid risky research and development because the outlook for recovering R&D investments when there are no concrete market definitions is dim at best. Also, low-volume device sales and custom-fitting requirements translate into a low profit margin, further minimizing the capital available for research. On top of these uncertainties is the training cost that may be involved in the use of the technology.

If the nationwide need for rehabilitation devices were known and aggregated, industry might be encouraged to produce some devices not now marketed. Better information and communication could allow better utilization of funds. Moreover, if an adequate market were developed, costs might be reduced, and more consumers would be able to purchase devices without government assistance.

If the manufacturer is involved with research and development, the costs can be tremendous. There are many barriers to producing a commercially available device or instrument. Difficulties and costs multiply when the new technology is implemented into the user community; then, there is not a one-of-a-kind system being operated as a prototype, but rather a system that becomes an accepted component of health care delivery. Dr. James B. Reswick addressed the Committee on Science and Technology of the U.S. House of Representatives concerning the cost of this process:

> The cost to take the idea to the first demonstrable prototype is, let's say, the unit of one; the cost to get this idea into a preproduction prototype that can be evaluated effectively is perhaps twice that. The cost to evaluate it effectively, under new Federal FDA regulations, and the need to perform very broad evaluation tests, to adequately educate physicians and allied health people and so on who would be using the devices, is perhaps four times the original development costs. (Hearings on Science and Technology, 1976)

The reluctance of manufacturers to produce and distribute technologically advanced devices can be attributed to many other reasons, some real and others imagined. There are many other costs associated with a product that are not ostensibly attributed to the device itself. Some reasons why the development of a device is difficult are concern over liability and lawsuits, should a device malfunction; the costs associated with assuring that the technological device meets functional and technical requirements and is reliable and safe for human application; the cost of developing maintenance systems for technologies whose market potential is difficult to identify and quantify; and the fear of no informed-consumer demand for better or new products or services.

A recent issue of Spectrum (Jurgen, 1976), the monthly journal of the Institute of Electrical and Electronic Engineers, outlines causes of this production and distribution problem:

> Although numerous innovative devices to aid the handicapped are constantly being developed, many do not progress beyond the prototype stage. As a result, the disabled are being denied the benefits of technological advances that could make them more self-sufficient and employable.
>
> The problem is complex. Industrial firms, used to the commercial marketplace, are often reluctant to manufacture a rehabilitation device for which there may be no clearly defined market, or a known small market, or a market made up of

customers who often cannot afford to pay for the product. Those companies that have entered the rehabilitation-device manufacturing field have often had to develop unique marketing strategies based, if possible, on government and institutional funding in combination with their own financial resources and, more often than not, with a strong feeling of social consciousness.

Therefore, many small firms with limited marketing, distribution, and service capability refrain from producing medical engineering devices even though they may have the technical capability and interest.

Information Requested

Another difficulty encountered by manufacturers in the development process is access to information about the latest technological innovations. Currently, technological developments applicable to rehabilitation equipment must be extracted from a large variety of sources, many of which are not readily available. There exists no single source of information on new developments and ideas. Several manufacturers requested a data base on rehabilitation engineering that would provide access to the latest literature on rehabilitation engineering. Many designers and manufacturers were aware of the NASA Tech Briefs and suggested a similar format devoted solely to rehabilitation-related technologies.

Third-party funders also contribute to the unpredictability of the rehabilitation equipment marketplace. Manufacturers need up-to-date information on funding requirements. Knowledge of criteria used to decide that one device will be funded while another will not would be helpful in designing new equipment. Information about payment schedule and procedures is mandatory. Delays in payment for delivered equipment are difficult for undercapitalized companies to absorb, as exemplified by the percentage of manufacturers declaring bankruptcy each year. An information system linking third-party funders and suppliers of equipment would remove many of the present-day complications in service delivery.

Presently, there are several channels for acquiring funding information. The standard source is Medicare/Medicaid Guide, published by the Commerce Clearinghouse, Inc. Another source is Medicare Carriers Manual, Part 3 (U.S. Dept. HEW, 1976). Many manufacturers join NADMEC (National Affiliation of Durable Medical Equipment Companies), which prints a newsletter covering common concerns such as Medicare's screening list for durable medical equipment. Still, more information of a better quality is required.

Standardization of equipment was a topic of little agreement among manufacturers. However, they did emphasize that poorly designed standards would do more to decrease technology utilization and innovation than any other factor, and requested that regulatory agencies and resulting legislation be incorporated into the proposed information system.

Standardization of parts should not be confused with standards set for equipment. Standardization of parts would allow a degree of component compatibility.

The feedback mechanisms between manufacturers and the disabled consumer are insufficient. Manufacturers could use some means to compile consumer complaints. Additionally, consumer input was requested in the initial developmental stages.

The types of information useful to the manufacturing community are:

- Priorities and approved equipment of third-party funders.
- Improved consumer feedback.
- Centers or other mechanisms for new equipment demonstration and distribution.
- Information on competitor equipment and new products.
- Technology transfer mechanisms that assist in the development of a device (e.g., "tech" briefs on rehabilitation and data base on rehabilitative engineering).
- Market size and characteristics.
- Existing equipment standards.
- New technological developments applicable to rehabilitation equipment.

Synthesizing the Information Needs of the Rehabilitation Community

As mentioned above, the SRI team conducted interviews with more than 200 representatives of the different segments--consumers, counselors, practitioners, manufacturers, rehabilitation engineers, evaluators, administrators--of the rehabilitation community. Based on material gathered during these interviews, a composite picture of informational needs related to rehabilitation engineering has been drawn.

As expected, the counseling community (consisting of independent living skills coordinators, physical therapists, occupational therapists, and rehabilitation counselors) indicated the greatest need and desire for an information service. Most counselors or case workers have contact with disabled consumers during an essential phase of rehabilitation. Major equipment purchasing decisions are made or recommended during this time. It is also here that the least amount of time is available to learn about new equipment development, research projects or engineering principles in design and development of equipment modification or new equipment. In addition, these counselors are the hub of the rehabilitation community, with all other segments relying heavily on them for information. Thus, an information system geared primarily for use by the counseling segment could benefit all of the rehabilitation community.

The composite of informational needs is provided in Table 3. As the table shows, all segments of the rehabilitation community want information on new products and the development stage of future products. Most members of the community would also welcome a consumer needs list, a complete catalog of available products, and product evaluations by both professionals and consumers. These five "packages" of information might constitute the initial data base. At some later time, additional informational packages might be added: regularly updated MediCal/Medicare funding criteria for assistive devices, a directory of rehabilitation agencies and the services they provide to facilitate referrals; and current demographic statistics for future planning. In its final form, a system probably should satisfy most of the informational needs of the counselor/therapist group; that is, all those listed in the second column of Table 3.

Table 3

SYNTHESIS OF INFORMATIONAL NEEDS EXPRESSED BY THE REHABILITATION COMMUNITY

Need	Consumers	Counselors	Practitioners	Administrators	Rehabilitation Engineers	Manufacturers	Total
New product descriptions	X	X	X	X	X	X	6
Potential products (R&D patents)	X	X	X	X	X	X	6
Product evaluations	X	X	X	X	X		5
Consumer needs list	X	X	X		X	X	5
Catalog of available products	X	X	X		X	X	5
MediCal/Medicare funding criteria	X	X		X	X		4
Directory of agencies and services	X	X	X	X			4
Instructions for home modifications	X	X			X		3
Conference and exhibit calendar		X	X	X			3
Future funding criteria			X	X	X		3
Directory of repair shops	X	X					2
Loan/resale equipment bank	X	X					2
Equipment standards		X		X			2
Directory of accessible public buildings and facilities	X	X					2
Case studies	X	X					2
Service manuals		X			X		2
Demography				X		X	2
Products/instructions for workplace modification		X			X		2

V THE REHAB-ENGINEERING INFORMATION CENTER

V THE REHAB-ENGINEERING INFORMATION CENTER

The purpose of this section is not to make final recommendations concerning an information service for CARE-TECH, but rather to provide an orientation and basis for further discussions among NASA, the California State Department of Rehabilitation, and the rehabilitation community.

Suggested Approach to CRIS

The objective of the proposed California Rehab-engineering Information Service (CRIS) is to support the provision of rehabilitation services to handicapped individuals through the use of technology and information. CRIS will consist of three separate organizations that will gather and disseminate information. Each suggested organization will have its own domain of responsibility and unique interface with the other organizations. The three proposed organizations are the Rehab-engineering Information Center, the Evaluation Center and Clearinghouse, and the Rehab-technology Application Unit. This section of this report discusses the establishment of the Rehab-engineering Information Center.

The responsibility of the Rehab-engineering Information Center will be to close the technological gap with the direct service arm of the rehabilitation community--e.g., counselors, consumers, and practitioners. Various services will be provided to develop a community infrastructure capable of disseminating the latest information and technology concerning rehabilitation engineering. The Center's responsibilities include providing: a catalog of assistive devices and systems, repair and service directories, equipment design and consultation, mobile training units, a telephone call-in service, and the processing of consumer feedback on devices and services.

To effectively deliver rehabilitation engineering services, more is needed than an information system that provides data or facts and documents or listings of documents that contain them. A means for creating a communications network that links parts of the rehabilitation community together to accomplish this common purpose is needed to complement the services provided by an information system. Thus, in the study, major information disseminators on rehabilitation have been identified including laboratories, universities, and companies engaged in rehabilitation engineering. Additionally, the size and scope of the industry providing goods and services to the handicapped are outlined. Computerized teleconferencing can assist in developing a national network linking segments of the rehabilitation community. Participation in the communication network will support the implementation, operation, and development of findings

of the California Rehab-engineering Service Delivery Model. If these segments are formed into a network, each component would allow others to use its resources, and at the same time, it would gain access to network resources that would otherwise be unavailable. Complementing the information system in California with a larger communication network will produce a powerful model for a rehabilitation information service.

The service delivery goals in rehabilitation of equity, effectiveness, and efficiency remain distant. The application of science and technology can "enable" the handicapped by improving their health and providing mobility, communication, and independence--but only if the services and devices are available. Inadequate communication in the rehabilitation community hinders maximum utilization of our national expertise and knowledge. Duplication of effort, inappropriate expenditures of funds, and uninformed decisions are all the logical results of communication problems within the rehabilitation community as a whole and for rehabilitation engineering in particular. An improved information service would assist the rehabilitation professionals and ultimately bring more handicapped individuals into the mainstream of activity in America.

Options for the Rehab-engineering Information Center

Telephone Call-in Service

A telephone call-in service offers a multitude of possibilities for increasing the level and quality of information exchange in the rehabilitation community. Two suggested models would be: phone-in accessibility to a manual or computerized data base on systems and devices for the handicapped; and a Tel-Med type of system that has a telephone library of tape-recorded health and rehabilitation messages.

The Telephone Call-in Model--Counselors and consumers requested a telephone-accessible data base that would provide information on the availability of equipment, appropriate equipment usage, safety, and possible funding sources. An ideal method of development for a data base would be through a manual system that could be perfected before it was computerized. The proposed call-in system would aid in determining the types of questions asked and the most useful information display format. The call-in service would also provide the feedback required to develop an effective catalog of devices and equipment.

The primary advantage of the phone-in service is rapid response to information requests. If information is readily available, the telephone monitor could have an inquiry answered during the initial conversation. The fact-retrieval service would be based on published information (materials in the rehabilitation engineering literature collection) and on unpublished information contained in files developed by staff in the course of performing this service. If the request requires a more

intensive search, then the information collected could be mailed to the requestor or provided in a return call. Some requests may require the expertise of a rehabilitation engineer or practitioner. A consulting staff should be on call for the more complicated inquiries. Inquiries for information not readily available may be referred to the Technology Application Unit. (See Section VII.)

To implement this recommendation, organizations already familiar with setting up telephone call-in services should be contacted. One such organization is the San Francisco Light House for the Blind. There is also extensive literature on call-in services that should be tapped.

The Tel-Med Model--The telephone information service could be modeled after the existing Tel-Med system. The Tel-Med is a call-in service operational in many cities around the country. The Mills Memorial Hospital Auxiliary of San Mateo, California, sponsors this free public service from the Bay Area. Other examples exist in Southern California's Orange County.

The Tel-Med model offers a telephone library of tape-recorded health messages (3-7 minutes long). A caller requests any tape from a directory of available messages. The existing Tel-Med system has several hundred tapes covering a wide range of health-related topics, such as "Diabetes in Children," "What Causes Miscarriages," "Anemia," and "Epilepsy." The objective of the service is to aid in the health education of the general public. Thus, the information is designed to help people recognize signs of disease or changes in personal health status, offers counseling in adjusting to a serious illness, and gives health maintenance information such as diet plans. The series of tapes is not designed for use in an emergency or to take the place of the physician or physical therapist.

Although this system does not offer much information for the handicapped or on topics of interest to the rehabilitation community, it could be redesigned for such an audience. Like the existing system, it could contain general-interest tapes for the education of the disabled and those concerned with rehabilitation and also could have tapes issued weekly for Physical and Occupational Therapists' use in keeping abreast of new developments, coming conferences, and where to find more information on selected topics. As in the medical community at large, those concerned with rehabilitation need to be kept updated on new developments in their field. A Tel-Med type system for the rehabilitation community could perform such a task.

Catalog

Little effort has been directed toward consolidating information about available technological devices and systems for efficient access. Rehabilitation professionals and consumers have demonstrated a great need for more appropriate data on which to base their selection of devices.

The lack of a centralized source of information on devices and the inadequate information dissemination on technology for the handicapped has needlessly hampered service delivery. Thus, a major priority of the California information system should be to produce a catalog of adaptive and assistive equipment for use by rehabilitation teams and consumers in selecting rehabilitative devices.

This catalog would be an information resource directory listing facts on devices, distributors, manufacturers, R&D activities, and agencies offering information and assistance in purchasing and maintaining devices. Information regarding the evaluation, safety, durability, serviceability, and costs could also be included.

The particular format of the catalog and the information required for well-informed decisionmaking would be developed over the initial period of system implementation. The format and content should be organized to facilitate use by both consumers and rehabilitation team members. Two versions may be required for clear representation of relevant information to particular audiences. A thesaurus with index and cross-reference would be mandatory.

The information system data bank should be designed to update the catalog; to continually reassess its content; to provide dissemination to consumers, rehabilitation personnel, manufacturers, and distributors; and to provide relevant information to public agencies. This same data bank would also be accessible to the telephone call-in system discussed above.

The catalog should be designed as a manual system that lends itself to future automation should this be desired. In deciding on computerization of the completed system, participating agencies will have to scrutinize time and cost-benefit measures. Ultimate computerization of the catalog will depend on whether or not the system is used nationwide. The initial feedback derived from performance in California would facilitate a coordinated nationwide system. A nationwide system would require an updating of the catalog at the federal level, with data inputs and distribution by state agencies.

Several questions need to be answered before the system is fully implemented:

- What categories of information are most needed?
- What should the format of the system be--manual, loose-leaf, computerized terminals, or call?
- Will the catalog have one style, or will it be redesigned for target audiences?
- How will the catalog affect manufacturers and their distribution channels? Should evaluations be included and, if so, should there be any limits on their distribution?

Following are examples of information dissemination systems in Europe and the USA which would be consulted when developing a catalog of devices.

ICTA Information Centre, FACK, S-161 03 Bromma 3, Sweden

ICTA collects and disseminates on an international basis information about equipment development in the United States and Europe. Approximately 20 information sheets that give essential technical data as well as the price and manufacturer are published each year. The sheets are illustrated with photographs and drawings and have texts in English, French, German, and Spanish. Subscriptions are $8 per year, and back issues are available for $15.

Equipment for the Disabled, 2 Foredown Drive, Portslade, Sussex BN4 2BB, England

In 1960, the National Fund for Research into Crippling Diseases published a loose-leaf series of guides to equipment. By 1974, the series had evolved into 10 separate booklets that averaged 50-60 pages and dealt with an aspect of daily living. The booklets are: "Wheelchairs and Outdoor Transport," "Communication," "Clothing and Dressing for Adults," "Home Management," "Disabled Mother," "Personal Care," "Leisure and Gardening," "Housing and Furniture," "Hoists and Walking Aids," and "Disabled Child." Subsequent editions of these booklets are published by the Oxford Regional Health Authority on behalf of the Department of Health and Social Security. They contain commercial sources and approximate prices, directions for homemade adaptations, and include selected bibliographies. Orders for booklets may be sent to the above address. Price per copy is $2.10 or the set of 10 is $21.00 plus $1.90 for a binder. Professional inquiries concerning equipment should be addressed to Equipment for the Disabled, Marborough Lodge, Nuffield Orthopaedic Centre, Headington, Oxford OX3 7LD.

Disabled Living Foundation, 346 Kensington High Street, London W14 SNS, England

The Disabled Living Foundation (DLF) has a comprehensive Information Service and Aids Centre with a permanent display of equipment, gadgets, and publications. DLF also publishes a bimonthly newsletter on a subscription basis ($14 for overseas). The subscription service publishes current addresses of manufacturers of every type of aid or equipment ranging from household equipment to wheelchairs and the latest publications and information of concern to both the disabled and the elderly. Two

other closely allied aids centers, one in Scotland and one in Liverpool, have been patterned after the DLF. The latter, opened by the Liverpool Social Services Department, can be used by disabled persons who wish to make an appointment to try out, under the supervision of an occupational therapist, bathroom aids used with typical plumbing.

Information System for Adaptive and Rehabilitation Equipment (ISARE) Adaptive Systems Corporation, 1650 So. Amphlett Blvd., Suite 317, San Mateo, California 94402

ISARE has been in existence since 1968. Information on adaptive and rehabilitation equipment is data-based. The system consists of six index-glossaries with encyclopedic type of descriptions of generic equipment. In addition, a locator book provides a quick way to find equipment, a cross-reference to manufacturers, as well as mailing labels to facilitate collecting an equipment catalog library. The six index glossaries cover the following main categories: existence (daily living skills), in situ motion, adaption to environment, communication, travel, and rehabilitation. The system is available in a loose-leaf binder with update capability. A time-share capability for individuals with a telecommunications capability will be available in the Fall of 1978 for general public access of the data base.

Accent on Information, Gillum Road & High Drive, P.O. Box 700, Bloomington, Illinois 61701

Accent on Information (AOI) is a computer-automated retrieval system operated by Accent on Living, Inc. The system contains information designed to help persons with disabilities live more effectively by providing them with information in the following subject and problem areas: products and devices; mobility aids; mobility problems; vocations; employment, including vocational rehabilitation and training and rights, hiring regulations, and special needs of the handicapped employee; social change, housing and architectural barriers; private and government assistance; organizations; special facilities; special laws and legislation; furniture; business machines; using tools; remote controls; voting--e.g., accessibility of voting booths; formal education of handicapped individuals; activities of daily living; communications; recreation; and physical education. The information service is particularly strong in the areas of activities of daily living and equipment/special devices/aids. AOI does not include a large amount of information on research; however, it does include isolated pieces of information on research of specific importance to disabled people--e.g., spinal cord injury research, new mobility aids, etc. All product information is listed without the addition of evaluations.

The catalog service should undertake to answer inquiries concerning any subject, with the exception of purely medical matters, related to the lives of disabled people. Subjects to be covered by the service should include:

- Beds and associated equipment
- Bathroom equipment
- Personal toilet and incontinence aids and equipment
- Clothing and dressing aids
- Communication aids
- Eating and drinking aids
- Household equipment
- Hoists and lifting equipment
- Mobility aids, including wheelchairs
- Children's aids and equipment
- Facilities and services for disabled people
- Accommodations
- Design of buildings
- Transport and travel
- Leisure activities, including sport and physical recreation.

A catalog for the disabled and the professional community that lists devices and distributors would aid not only the counselors who daily have to make decisions on the most suitable equipment available, but also the researchers who need to know what is currently available so as to evaluate research priorities and reduce duplication of efforts. A catalog that standardized and consolidated the extensive amount of existing information would aid the disabled person, and would facilitate a better service delivery of devices by rehabilitation professionals.

Model Aid Center

Catalogs and improved access data banks represent only one type of information transmittal. Decisions about equipment frequently require that the apparatus be examined for its fit and appropriateness. A "hands-on" approach is essential to match individual disabilities to equipment specifications.

The proposed model aid centers would house permanent displays of equipment, gadgets, and training publications. The equipment would be available for trial, inspection, rental, and purchase, as appropriate. Such a center would enable consumers and professional decisionmakers (counselors, physicians, third-party funders) to examine the quality,

workability, and comfort of devices before purchase and to provide qualified attendants to handle proper fitting. These product-fitting centers could be established in a manner similar to the Disabled Living Foundation in England (discussed earlier in this section), complete with examples of available equipment. The Stanford Children's Hospital also has many new and innovative systems for the handicapped on display.

A central location for device display would also offer manufacturers an opportunity to inspect products on the market and to introduce new equipment or techniques. Currently, there is a long delay between production of a device and its possible acceptance by the community of rehabilitation professionals and equipment users. Model aid centers could become a needed forum for the introduction of new ideas and equipment. Innovative equipment could be given exposure at such centers, and potential purchasers would be afforded an opportunity to test and comment on new items. Additionally, expensive or reusable equipment could be shared among a network of such centers.

The suggestion of a one-stop shopping center for resources and products had an obvious appeal to those whom the SRI team questioned. Several difficulties arise if we take too literally the idea of a department store for the handicapped. The difficulties do not preclude the effectiveness of a model aid center, but merely caution us that the concept for such a center must be carefully thought out and that no ready-made solutions exist. For example, the handicapped are generally not autonomous buyers who are able to afford a majority of this assistive equipment. The real buying is associated with counselors' recommending particular apparatus and third-party funders giving final approval. Furthermore, the clerks in most department stores would not have the sophisticated training needed to provide instruction in the proper use of the equipment.

The specific design for these aid centers should be finalized only after certain basic questions are satisfactorily answered. The following are suggested areas of further inquiry:

- Should the items displayed be bought outright by the center itself, or should vendors display their wares?
- Should the center be staffed by the disabled?
- How much participation, if any, should there be by manufacturers' sales people?
- Should these centers offer training in the use of assistive equipment, and should there be audiovisual training aids?
- Where should the centers be located? Should they be independent, or located in Centers for Independent Living, hospitals, or RSA centers?
- How should aid centers affect existing vendor distribution channels?

Decisions relating to major purchases of equipment and involving thousands of dollars are too often based on manufacturers' advertising copy. These kinds of purchases are rarely cost-effective, and there is untold human discomfort in ill-fitting or inappropriate devices. Therefore, the complete information and opportunity for experimentation provided by model aid centers' demonstrations and displays would improve service to the handicapped.

Mobile Aid Units

Rehabilitation engineering service delivery must be tailored to the particular area served. Model aid centers providing "hands-on" experience with assistive and adaptive devices would not be economically feasible without high rates of usage. Consequently, such centers are workable within the aggregated markets of metropolitan areas, but would hardly be cost-effective in sparsely populated areas. A possible solution would be a traveling display of equipment housed in a mobile unit.

These mobile aid units could go out into the countryside on a regular schedule, or in response to calls. Flexible interiors within the mobile trailer units could be adapted to a variety of special needs. A model house of kitchens, bathrooms, and work environments stocked with assistive devices, is one possibility; or rotating specialty equipment displays would be informative for local physical and occupational therapists. Area rehabilitation professionals could schedule meetings when the mobile unit would be in town. In this situation, new equipment could be demonstrated and new training techniques taught. The mobile unit could include facilities for audiovisual training programs.

Models for such mobile aid centers already exist. For many years, Sweden operated a bus equipped with a specially-adapted kitchen. This mobile kitchen traveled throughout Sweden demonstrating the possibilities of adaptive equipment. The Nebraska Cooperative Extension Service crisscrossed the state with a bus that functioned as a teaching and demonstrating mobile unit. The bus contained a model kitchen and bathroom that homemakers could try out. Rehabilitation counselors were present for questions and gave training programs on caring for the handicapped and on child and family care for disabled homemakers.

Feedback on the problems encountered with particular equipment in the mobile units would provide better assessment of the needs for the handicapped isolated by distance from established rehabilitation service centers. The mobile units also could offer new equipment displays and training programs.

Equipment Loan Centers

Without an improved inventory system and procedures for the loan or rent of existing but unused equipment, the basements and closets of homes and hospitals will remain full of needed devices. A system is

required for loan/rent or trial of noncustom, nonimplanted equipment. This concept would free the state from a strict client-equipment linkage and call for an accurately inventoried equipment reserve.

Medical equipment could be returned to a state "pool" once it was no longer of use to the original recipient. It could then be repaired and re-issued. In this way, durable medical equipment could be borrowed rather than purchased outright and thereby reduce the cost burden. Even when a complete device could not be reused, certain components may be usable. The equipment loan centers could be operated by model aid centers.

Repair and Service Directories

Service delivery should not end with the prescribing and selling of a device, but should continue with maintenance and repair capabilities. There is a lack of adequate repair and service facilities, and those that do exist are oftentimes not well known. The Disability Rights Center, Inc., reports that it has received numerous accounts from consumers of delays in receiving parts, careless handling of replacement orders, and inadequate factory warranty repair services.

Improved communication can improve some of these difficulties. First, a directory of repair facilities is needed, particularly of those shops with a 24-hour emergency number. Second, there is a need for improved repair manuals and instruction booklets that could be used either by consumers themselves or by qualified repair persons not familiar with rehabilitation equipment. Third, there must be an inventory monitoring system for efficient location of appropriate parts needed in the repair process. Existing information models from automobile manufacturers, who often must locate parts in any one of hundreds of warehouses across the nation or internationally, could easily be duplicated for tracking rehabilitation equipment components.

Manufacturers are inclined to design components that are incompatible with those of their competitors. This lack of standardization raises equipment repair costs and complicates the repair process. Other than legislated standardization regulations, development of a good information system to keep track of compatible parts may be the only way to expedite the repair process and lower costs.

Health Fairs

Health fairs or rehabilitation engineering expositions could be used in addition to, or in place of, model aid centers. If the attendance of the members of the rehabilitation community with purchasing power could be guaranteed at fairs or expositions, then manufacturers and designers of equipment could be convinced to display their product lines. These fairs could be useful for medical personnel, hospital and rehabilitation

center administrators and personnel, rehabilitation counselors, architects and designers, educational and governmental personnel dealing with the problems of the disabled. Information, such as funding sources for equipment and referral services, could be provided at the health fairs. The fairs could be both educational and instructional and provide an opportunity for sharing of experiences and discussions of what works and why. Health fairs, like trade fairs held by many major manufacturing groups, provide an excellent channel for low-cost dissemination of information.

The idea of fairs and expositions in the rehabilitation fields has already taken hold. In 1977, 9,000 consumers and professionals attended the first International Disabled Expo held in Chicago. This exposition was subtitled, "The World's Showcase of Products and Services for Individuals with Disabilities." Companies from England as well as various sized manufacturers from all over America displayed their product lines. NAIDEX '78 (National Aids for the Disabled Exposition) is the British predecessor of the Chicago Expo.

In the Spring of 1979, a trade show devoted exclusively to products and services for the disabled will be sponsored by CAPH (California Association of the Physically Handicapped) in Los Angeles.

Incentives to increase the participation of numerous small manufacturers and geographically isolated distributors should be explored. Expositions can be an excellent means for keeping abreast of new developments in all aspects of rehabilitation and for providing for exchange between manufacturers and the disabled consumer.

VI EVALUATION CENTER AND CLEARINGHOUSE

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VI EVALUATION CENTER AND CLEARINGHOUSE

Suggested Approach

One of the three components of the suggested California Rehabilitation Information Service (CRIS) would be an independent Evaluation Center and Clearinghouse. The responsibility of an evaluation center would be to test and report on new products, devices, and techniques for the purpose of providing more effective direction in determining the most suitable rehabilitation programs. At the present time, the application of these innovations, which may have profound effect on the lives of many individuals, is hampered by the lack of information. Devices should be evaluated in an appropriate fashion before they are prescribed so as to ensure compatibility, acceptability, and usefulness. The existing evaluations should be disseminated in several formats, each addressed to differing members of the rehabilitation community. The inputs from equipment users, rehabilitation engineers, and manufacturers should all be synthesized to establish information for better decisionmaking.

Professional information about the specifications and appropriateness of a device to certain disabilities is not available to a majority of the rehabilitation community. Without such evaluations, it is difficult to determine the suitability of a device to a given situation. The growing number of rehabilitation devices reaching the marketplace increases the problems of selecting and applying the most effective devices for a given client with their particular requirements. The few evaluations and case studies that have been reported for particular devices are difficult to obtain because there is no single clearinghouse for evaluations. Because the field is so new, testing protocol and judgment criteria are only beginning to be established, and the majority of the devices on the market have never been evaluated.

A system to handle evaluated information would benefit all members in the rehabilitation community. Evaluation research would increase feedback to the manufacturers and influence further development or modification of a device or the development of new devices that could meet the needs of a more significant portion of the handicapped community. Through the evaluation process, therapists and rehabilitation engineers would be provided in-depth reports on rehabilitation devices. This improved information can lead to more effective decisionmaking and problem-solving. The ultimate benefactor of improved device design and service delivery would be the consumer.*

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*A model of a useful evaluation report, covering "Pick-Up Sticks," published by the National Fund for Research into Crippling Diseases, is presented in Appendix C.

A consumers' union approach to the rehabilitation engineering field would meet a great need only if the system could be designed to avoid bias and political problems. An independent, nonprofit organization could provide such a context and ensure evaluations that are independent of the equipment manufacturers and granting agencies. Such an independent evaluation service could circumvent the problem of a funding agency evaluating products that they had originally designed. Another organizational option would be for the evaluation center and clearinghouse to be maintained by a third party, such as the State Department of Consumer Affairs.

The collected evaluations should be published in a "consumer reports" journal for the handicapped. Publication in rehabilitation, paramedical, and other consumer journals also would be appropriate, as would general distribution to rehabilitation centers, manufacturers, and distributors. However, the dissemination effort should be primarily directed toward educating the handicapped to become critical consumers.

A comprehensive feedback system is one of the most important functions that an information network can provide. One of the major consumer complaints constantly recurring in the SRI survey was that no effective channel existed for equipment- or service-related complaints. A toll-free number could provide such an effective channel for failure feedback and an opportunity for the information to be compiled for inclusion in the central information bank. One suggestion would be to develop a data base of consumers who are using or would like to try equipment. A diversity of clients should be chosen who would have different disabilities and would use the equipment in different contexts, such as the hospital, the home, and the workplace, and then provide feedback on their experiences. One design for a consumer evaluation procedure is diagrammed in Figure 6.

Evaluation usually takes the form of laboratory testing or clinical evaluation or both. In the proposed model, much of the clinical evaluation could take place at the Rehab-engineering Information Center. The direct contact with consumers could be channeled to the Evaluation Center. Consumer review would be an integral part of the testing protocol and should be actively solicited. The laboratory testing would be conducted to determine such characteristics as strength and durability and to verify specifications and technical performance. The clinical evaluation would be carried out to determine the performance, suitability, and acceptability for specific client applications.

Evaluation results usually would include prescription criteria that would indicate the expected consumers of the devices and the purposes they would serve. Ultimately, the Evaluation Center could define an array of technical aids that best serve certain disabilities and functional losses. Equipment standards and standardization of component interface to facilitate interchangeability of parts could also be a responsibility. Device evaluations should not be the only output from the Evaluation Center. In the case of techniques, such as fitting procedures, the method must be taught through journal articles, videotapes, lectures, or short courses.

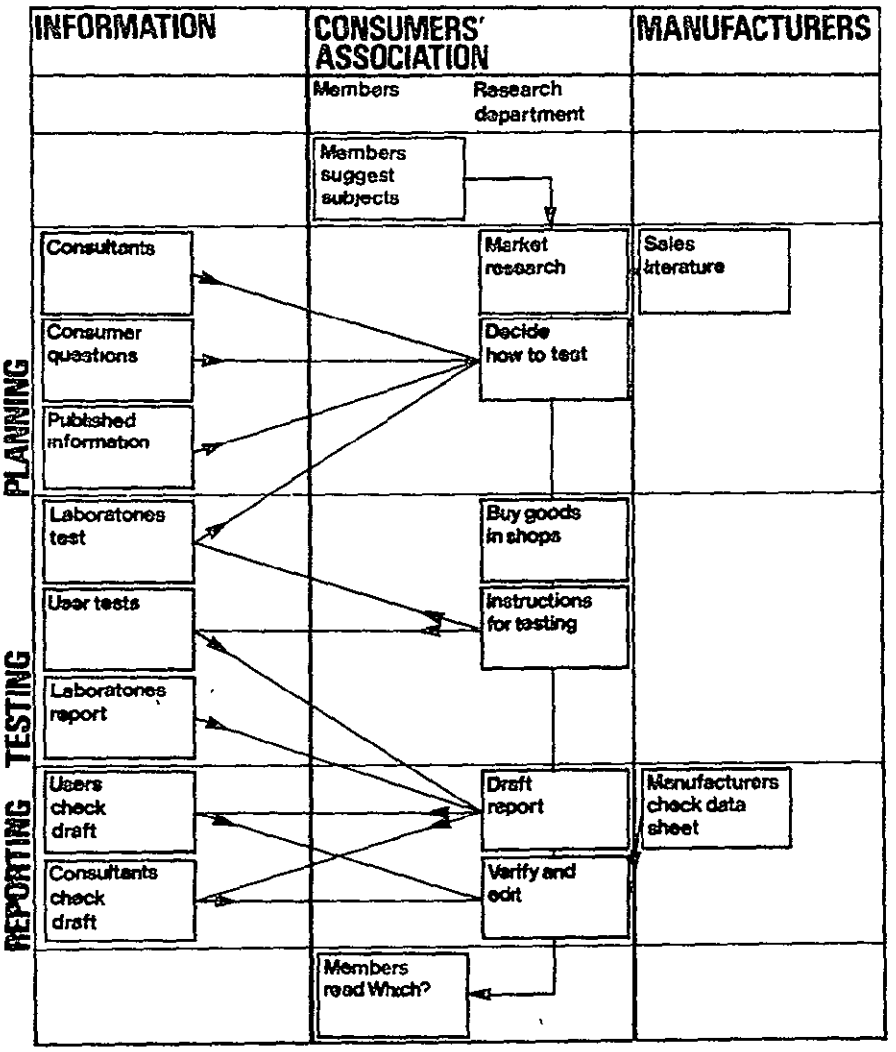

FIGURE 6 DIAGRAM OF PROCEDURE FOR CONSUMER EVALUATION

One general area requiring evaluation is the cost-effectiveness of various aspects of rehabilitation engineering. Criteria for evaluating the durability and appropriateness of expensive equipment should be developed for both assistive and rehabilitation equipment that is under development and that is currently available. The cost-benefit control of the process of rehabilitation engineering and of these devices is essential in light of the tremendous expenditures required. This information would be of assistance to the third-party funders and would improve their ability to make responsible decisions. Factual cost-benefit data are greatly needed to evaluate existing programs and to plan future activities.

Several organizations are currently engaged in the evaluation of assistive devices. Their testing protocols are not standardized, however, and the equipment testing can be infrequent or incomprehensive.

In this country, the Veterans' Administration (VA) Center in New York currently is conducting most of the equipment evaluations. The American Society for Testing Materials (ASTM) has evaluated some products for the VA, but not on a regular basis. ASTM committee F-19, which evaluates orthotics and external prosthetics, was formed at the request of the orthotics-prosthetics industry and assists in the establishment of government standards, when necessary.

Rancho Los Amigos Hospital's Client Service has established an equipment records file rather than a product evaluation program. The equipment record form contains spaces for source, cost, operation, delivery, maintenance, and adaptive information as well as client (consumer) evaluations (see the example in Table 4). This form has been modified several times and is expected to undergo additional periodic reviews for further improvement. The file of equipment records presented in Table 5 is intended for use within the hospital.

Consumer's Union of the U.S., INC., in Mount Vernon, New York, has recently turned its attention to methods of testing and evaluating devices for the handicapped. The Consumer's Union is currently under contract with the VA to investigate their role in this area.

The Chedoke Rehabilitation Center in Hamilton, Ontario, Canada, has recently been developing the testing protocol for devices used by the handicapped. Samples of the testing protocol form and the aid evaluation form used at the Chedoke Center are provided in Tables 6 and 7.

Although the VA has been evaluating rehabilitation devices during the past 20 years, it has released very few evaluations. Their mission has been to assist member VA organizations and not the total rehabilitation community. One reason for this reluctance is a concern about the liability in appearing to endorse specific devices for certain disabilities. The VA has begun to change its emphasis and now works in conjunction with segments of the rehabilitation community. The main reason now for the lack of dissemination of the evaluations is that no effective channels exist. The proposed Evaluation Center and Clearinghouse would have as one

Table 4

RANCHO LOS AMIGOS HOSPITAL

EQUIPMENT RECORD

1. Name of Item: _____
   Model: _____

2. Manufacturer: _____ Local Dist: _____
   Address: _____ _____
   Telephone: _____ _____
   Contact Person: _____ _____

3. Approximate Cost: _____ Date Purchased: _____

4. Equipment Description: _____
   _____
   _____
   a. Unique features and applications: _____
   _____
   _____
   b. Complexity of Operation: High Medium Low
   c. Training Required: Yes No
   d. Maintenance Procedures: Local Factory
   e. Warranty: _____
   f. Delivery Time: _____

5. Compatible Equipment:

Name	Supplier
_____	_____
_____	_____
_____	_____

6. Portable: Yes No
   If No, why not: _____

7. Manufacturer's cooperation to adapt and provide special equipment: Good Poor

SUMMARY OF CLIENT EVALUATIONS

8. Advantages: _____
   _____
   _____
   _____
   _____

9. Limitations: _____
   _____
   _____
   _____
   _____

10. Comments: _____
    _____
    _____
    _____
    _____

Table 5

RANCHO LOS AMIGOS HOSPITAL

REHABILITATION ENGINEERING CENTER

MASTER FILE OF PRODUCTS FOR THE HANDICAPPED

INDEX

Table 6

CHEDOKE REHABILITATION CENTER
TESTING PROTOCOL

The Protocol

The evaluation problem is most acute in the area of complex machines. Page-turners, environmental controllers, electric wheelchairs and the like fall into this category. The "Powered Technical Aid Evaluation Protocol" (see Appendix A) is designed to deal with devices of this type.

The first page of the protocol contains the identification and description of the device under evaluation. Included here are such items as price, distributor(s), documentation available and warranty information. The technical description is arranged as follows:

1) Power requirements are identified.

2) Approvals from agencies such as Underwriter's Laboratories, Canadian Standards Association, Etc. are recorded.

3) The control input requirements for the main unit are identified. Included here are the type of connector and its mate with voltages and contact arrangements needed to initiate action

4) The patient input device(s) are discussed giving details of pressure, range of motion required, power required, etc. for effective control of the machine.

5) A technical description is provided to relate how the main unit accomplishes its function(s). This may include such things as relay or semi-conductor switching of power, mechanical action of page turning, etc.

6) Procedures for getting service and repair work are indicated in answer to the following questions: How does one get service and repairs done? Who, where, if self, a description of routine service appears in this section.

7) The evaluators' observations relating to the technology used, reliability and ruggedness appear in this section. Any incidents of breakage or failure experienced would be described at this point. While the protocol has general applicability, there comes a point when experiments must be devised to reflect properties of specific devices In the case of page-turners, an experiment to indicate reliability might be as follows. Various types of reading material (magazines, text-books, paper-back novels, etc.) would be applied to the machine. Numbers of pages turned without failure for each situation would be noted. Failure would be defined as a situation which could not be corrected using the patient input device in use.

8) Environmental and physical constraints are described. Such things as space requirements, weight of the device, positioning of the patient input device(s), and the position(s) in which the main unit can function are included along with any special constraints of temperature, humidity, special power, etc.

The protocol continues with a functional evaluation under three headings.

1) Patient Input Device(s)

The interfaces available from the manufacturer are identified and described. Details of type and duration of patient action required are included for each type.

2) Number of Functions Available with this System

In the case of an environmental controller, it may indicate that TV, telephone, dictating machine, etc can be activated.

3) Detailed Control Available

Once a function has been selected, what controls remain available to the user? For instance, once the TV is activated, channel-changing capabilities might be available, whereas volume control and fine tuning may not.

The concluding section of the protocol deals with possible enhancements and adaptations of the device. For example, experience may indicate that a Cerebral Palsied child may benefit from the use of a device, but has great difficulty dealing with the switching arrangement as supplied by the manufacturer. This portion would suggest some strategies to cope with the problem, such as new input devices or simple modifications to the existing one or the main unit itself. Further recommendations appear in this section and may be directed to manufacturers, para-medical staff or the consumers Lastly the report provides a summary of the evaluation of the device and it general applicability to various handicaps.

Table 7

CHEDOKE REHABILITATION CENTER

AID EVALUATION FORM

Powered Technical Aid Evaluation

Technical Aid:

Evaluator(s): Date:

General Description (to include description of Technical Aid, Price, Distributor, Documentation Available, Warranty).

PART A TECHNICAL DESCRIPTION

PART B FUNCTIONAL DESCRIPTION

PART C RECOMMENDATIONS AND CONCLUSIONS

PART A Technical Description

1) Power Requirements:

a) Voltage_____
b) Current_____
c) Power Consumption_____
d) Other_____

2) Approvals (✓).

Underwriters Labs. (U.S.A.) ☐
C.S.A. ☐
Ontario Hydro ☐
Other ☐ Specify

_____

3) Input Requirements to Main Unit

a) Type of Connector. Mfr. & Model #___

_____

b) Sketch of "a" with connections labelled. (i.e. - N.O./N.C. contacts, voltages, etc.)

c) Mating connector for "a" (That which is on the Pt input device) Mfr. & Model #_____

4) Patient Input Device(s):
(List each type with a technical description including patient action to operate, power required, etc - use extra sheet if necessary).

5) How does Main Unit Accomplish its Function(s)?
(i.e. - Relay or semiconductor switching of line voltage, mechanical action of page turning, etc.)

6) How does one get Service and Repairs Done?
(Who, Where, and if self, describe routine service).

7) Subjective Feelings about:-

a) Technology used:

b) Reliability:

c) Ruggedness:

8) Environmental Constraints

a) Space occupied by main unit, and weight of same

b) Position(s) in which main unit can function

c) Space required by patient input device(s)

d) How may interface be positioned at patient?

e) Other Physical Constraints (i.e. - special power, temp., humidity, etc)

PART B

1) Patient Input Device(s)

a) Type(s) Available: (under each describe the action required to operate including details of range of forces, range of motion, pressure ranges, duration of patient action, etc.)

Microswitch ☐
Pneumatic ☐
Touch Switch ☐
Proximity Switches ☐
Light Actuated Switches ☐
Voice Actuated Switches ☐
Other_____ ☐

2) Number of Functions Available:
(List types).

3) Detailed Control Available.
(Pros and Cons).

PART C Possible Enhancements and Adaptations

a) Suggestions for other input device(s) (simple)

b) Simple modifications to main unit

c) Simple modifications to input device(s)

Further Recommendations:

Conclusions:

of its missions the collection and dissemination of evaluative information to those who decide the paths of rehabilitation. The VA has a model service delivery program that provides an example for CRIS. A description of this model follows.

VA Model Service Delivery Program for Quadriplegic Home-Living Veterans*

The Veterans Administration Prosthetics Center (VAPC) has established a system for developing, evaluating, and expediting the use of technology in the rehabilitation of veterans with skeletal or neuromuscular handicaps. The Clinical Evaluation Service (CES) emphasizes the use of technology to improve the quality of life for home-living disabled veterans. The CES, located at the VA hospital in Castle Point, New York, is one of several Rehabilitation Engineering Services available within the Bioengineering Research Service, New York City.

Clinical Evaluation Service

Since 1973, the CES has been involved in developing the role of clinical rehabilitation engineering as an integral component of the rehabilitation team; evaluating prototypic and commercially available rehabilitation devices and processes; maintaining an inventory of devices used for patient evaluation and aiding in prescription; and compiling a library consisting of reports, videotapes, etc., on the numerous products of research, development, and manufacturing. In the process of transferring innovations from research and development to the "clinic" and evaluating products, the CES is involved daily with inpatients at Castle Point VAH and with home-living, disabled veterans within a 100-mile radius of Castle Point. Currently, the CES is directly involved with 27 severely disabled veterans living at home. This figure does not include those home-living, disabled veterans who participated in past evaluations or the many veterans and some nonveterans who tried technical devices before a prescription was completed or a purchase made.

In the process of evaluating technical devices, urgently needed information on safety, usefulness, and effectiveness is gathered, and prescription indications are formulated. This information is used to expedite the general use of these devices and ultimately define an array of technical aids which best service certain disabilities and functional losses. For example, the earlier evaluations of Environmental Control Systems have led to wide use of certain systems and accessories. Sixteen disabled veterans serviced by the CES have environmental control systems at home allowing them a level of independence and safety not before achievable. In addition, several systems have been approved and

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*Material for this section was provided by Saleem J. Sheredos, BBE Chief, Clinical Evaluation Service.

are being routinely prescribed and supplied to disabled veterans through standard VA Prosthetics Service's procedures throughout the country.* These systems enable the severely disabled person to operate appliances independently, e.g., operate electric bed functions; dial and answer a modified telephone; operate a TV or radio; observe, speak to, and if desired, let in a caller at the door; automatically summon assistance in case of medical or fire emergencies; operate an automated door, drapery, or window opener; use adapted tape recorders, etc. The types of equipment evaluated and deployed to the disabled by the CES covers mobility, transportation, body support systems, lifts and transfer aids, environmental controls, communication aids, activities of daily living, and "task" accomplishments (special desk, etc.). Once the safety and usefulness of a device is determined, it becomes readily available for other disabled veterans through the general prosthetics program.

In addition, disabled veterans are often referred to the CES to learn about and try devices before a prescription is filled. In some cases, a device is loaned to an individual for a short period of time, one week to one month, on a trial basis. In essence, the evaluation of equipment by patients serves two purposes: (1) gives needed information on the device's usefulness and effectiveness and increases prescription knowledge, and (2) allows the patient to try the device(s) to see if it fits his/her needs and determines what customization is needed for optimal results.

In addition to the above, the CES staff is frequently consulted by VA personnel, professionals in the field, and consumers from around the country in order to obtain pertinent information on using technical devices in rehabilitation.

Programs

The CES has several areas of responsibility: setting up a model rehabilitation engineering service delivery program for quadriplegic, home-living veterans; conducting evaluations of prototypic and commercially available devices, aids, and equipment; formulating a booklet and videotape on fire safety and the disabled, monitoring of development and evaluation contracts; and supporting the other BRS sections' clinical evaluation needs.

Model Service Delivery Program--The CES is presently providing rehabilitation engineering services to home-living, disabled veterans and concurrently formulating the basis of a VA Program Guide in this area. Although initial attention is directed at SCI quadriplegic individuals, it will include other disabilities. The following ingredients are receiving particular attention:

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*Veterans Administration Department of Medicine and Surgery Circular No. 10-78-27, Environmental Control Systems for Veteran Beneficiaries.

- Evaluation and prescription techniques: VA Form 10-2617, "Self-Care Activities--Functional Evaluation," in modified form, is presently being tried with the ultimate goal of allowing the trained evaluator to match an individual's needs with available products and services. The questionnaire covers activities of daily living, mobility, transportation, safety, home environment, vocational environment, community services, consumer services, and maintenance or repair of devices. The information obtained through the questionnaire will be used to prescribe and procure needed services and items. The evaluations are being conducted by a team, minimally consisting of a therapist and rehabilitation engineer.
- Procurement of equipment and services: The procurement of devices is relatively straightforward once appropriate funding has been obligated; however, the procurement of services, such as home modifications, installation of equipment, training on equipment, and maintenance and repair of same is an area lacking in resources. The CES will attempt over the next year to define explicitly the services needed, contract services where available to evaluate them, and promote the availability of services from manufacturers of rehabilitation devices and existing biomedical technical services.
- Delivery of services: The next phase includes equipment check-out, customization (as applicable), and fitting or installation as well as training (disabled person and family or attendants). This phase, as indicated above, lacks the necessary resources; however, the CES performs these services routinely and is continually searching for alternate commercial resources. (For example, during 1973, locating sources for adapting licensed vehicles for use by handicapped persons in the Castle Point area was fruitless. After working with several qualified mechanics and automotive services in this area, one particular company has dedicated a portion of its total operation to the adaptive automotive needs of the handicapped in this community. This was a result of working closely with them for evaluation, routine installation, and maintenance of adaptive automotive equipment.)
- Follow-up: The follow-up should be performed by the original evaluation team with an emphasis on the effective increases in safety and independence obtained. This is extremely important in order to best utilize technology for the benefit of the disabled person and to increase the knowledge of the persons prescribing equipment.

Evaluations of Technical Aids--Evaluations of technical aids are initiated either at the request of the developer or manufacturer of the particular device or by the VAPC. Once arrangements have been made to obtain the item(s), a protocol for its evaluation is formulated. In the meantime, laboratory photographs and a videotape on the device's use are made. The device then undergoes laboratory testing by the VAPC Testing and Development

Service and/or the CES Rehabilitation Engineering Laboratory staff to check for safety and compliance with standards. Once the laboratory tests are complete and no safety problems exist, the device is entered into clinical trials. This phase of the evaluation is extremely important because the device's usefulness and effectiveness are tested by those individuals for whom it is intended. During this phase of the evaluation, photographs and videotapes are taken of the device in actual use. All of the above information is reported in the VA Department of Medicine and Surgery's semiannual publication, "Bulletin of Prosthetics Research," and in VAPC Technical Reports. An evaluation report is sent to the developer/manufacturer and VA Supply Service with specific recommendations approving or disapproving the device for veteran beneficiaries and indicating prescription guidelines. This information is then disseminated throughout the VA system.

Fire Safety and the Disabled--This project is aimed at preparing a videotape and a brochure to educate and train the disabled person and family or attendants on fire safety, precautions, and emergency responses. Once approved, this information will be disseminated by the VA and others in the rehabilitation field to achieve the widest distribution to home-living, disabled persons and community fire departments.

Monitoring Contracts--The VAPC has many equipment development and evaluation contracts with various groups and organizations to promote the use of technology in aiding the physically disabled within the near future. The CES is monitoring and helping on contracts for the development of stand-sit-squat mobility systems both powered and nonpowered and the evaluation of devices for consumer groups.

Clinical Evaluation Support--The CES makes use of its hospital and home care resources to support the needs of other VAPC functions, e.g., finding test subjects for a device developed by one of the Bioengineering Research Service sections.

Summary

The VAPC Clinical Evaluation Service at the Castle Point VAH is evaluating technical devices to determine which ones are readily beneficial to home-living, disabled persons, to transmit positive and negative information on the devices to the developers/manufacturers, and to generate needed information on the safety, usefulness, and effectiveness of these devices for public knowledge. Concurrent with evaluating devices, the CES over the next year will attempt to define the best array of equipment and living environment arrangement for categories of disabilities with specific recommendations on prescription, installation, fitting, training, and maintenance and repair to optimize the benefits of technology to the disabled individual.

VII REHABILITATION TECHNOLOGY APPLICATIONS UNIT

VII REHABILITATION TECHNOLOGY APPLICATIONS UNIT

NASA's Technology Utilization (TU) program could serve as a model for the proposed Rehabilitation Technology Applications Unit. The primary mission of NASA's TU Office is the same as the objective of the suggested unit in the rehabilitation field. "... the widest practicable and appropriate dissemination of information..."

The specific objectives of the NASA program are:

(1) To increase the return on the national investment in aerospace research and development by encouraging additional uses of the knowledge gained in those programs.

(2) To shorten the time gap between the discovery of new knowledge and its effective use in the marketplace.

(3) To aid the movement of new knowledge across industrial, disciplinary, and regional boundaries.

(4) To contribute to the knowledge of better means of transferring new knowledge from its points of origin to all points of potential use.

The last three objectives could serve as a preamble to the proposed Technology Applications Unit.

The problems currently identified in rehabilitation have been addressed through the NASA program. Learning from NASA's mistakes and experience will help prevent duplication of effort. The retooling of these programs and experiences to fit the needs of rehabilitation will be accomplished through the arduous process of discussion and negotiation.

A major element in the rehabilitation plan of any physically disabled individual is equipment, assistive devices, or hardware. There is a dichotomy in the availability of assistive devices. Technological advances provide the context for potential improvement in the assistive devices needed by the disabled today; however, existing equipment does not embody these advances. The lack of technology transfer mechanisms and information dissemination needlessly hampers the rehabilitation community.

NASA has a major program in information retrieval and dissemination and has developed a number of approaches and solutions that are currently in use. This section outlines the scope of a program by examining several models provided by the NASA TU Program and other examples drawn from organizations committed to information utilization.

Technology Transfer Process

Basically, the technology transfer agent identifies public sector problems by interacting with key decisionmakers who can define these problems. For their solution, the transfer agent contacts scientists and engineers who bring their technology to bear on the problems. To complete the transfer, the transfer agent coordinates any required adaptive engineering and development program.

The various activities of a technology transfer can be outlined into a four-step program, as shown in Figure 7, with a risk-reducing GO/NO GO decision point between each step. Two levels of activity proceed simultaneously through the transfer process. The first, shown above the dashed line, is the problem-solution level; the second, shown below the dashed line, is the market-product level. Each box represents an activity to perform and each bar represents a decision point.

When the technology can be used directly (such as with a computer program or a welding technique), only the problem-solution level functional activities (i.e., problem survey, technology survey,* adaptive engineering and development, and technology application) are followed. (See Table 8.) However, if the transferring technology needs to be manufactured in a commercially available form before it can be used (as would be the case with a new material or instrument), market-product level requirements must also be satisfied before proceeding past each risk-reducing decision point. At these points, it must be asked: Is there a real problem (market)? Is there a potential solution (potential product)? Is there a real solution (business opportunity)? The terms in parentheses are the additional market-product level requirement.

In product-oriented transfers, the transfer agent not only is solving a technological problem but also is identifying a market. This type of transfer can be successful only when the business and technical aspects are pursued in parallel so as to reduce concurrently the risks associated with technical, market, and investment development.

It is with these commercial technology transfers that the early and active participation of the private sector is needed for an effective transfer of technology. Without it, the transfer agent's effort becomes relatively passive and little, if any sector interaction is achieved.

Barriers to the transfer of newly developed technologies are similar to those encountered in commercial development efforts: resistance to change, technical adaptation problems during development, the need for prototype qualification, and the accompanying refinements and design changes. Nevertheless, for a technology's utilization, it must be made

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*A technology survey outlines the state of the art of the relevant technology by surveying open literature, computer data bases, and individuals expert in the technology.

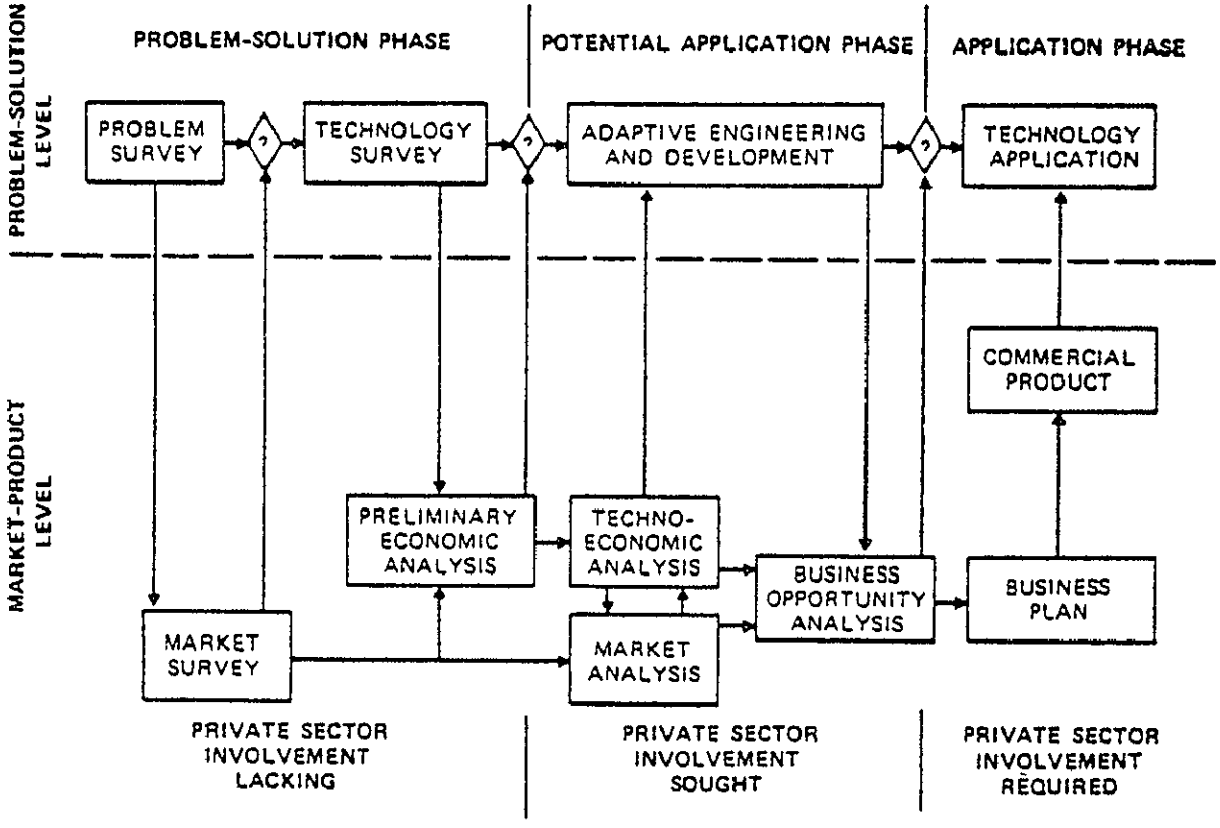

FIGURE 7 FUNCTIONAL ELEMENTS OF A TECHNOLOGY TRANSFER PROGRAM

Table 8

ANALYSIS OF A TECHNOLOGY TRANSFER PROGRAM

PROBLEM-SURVEY

- Problem definition
- Benefits from solving problem
- Consensus on nature and priority of problem
- Constraints on solutions
- Previous attempts at solving problem

MARKET SURVEY

- Commercial product requirement
- General market characteristics for this product
- Other products on the market
- Companies manufacturing these products
- Description, specifications, and price of each product
- Shortcomings of each product

TECHNOLOGY SURVEY

- Technology previously investigated
- Reasons for unsatisfactory results
- Technology relevant to the problem
  - Review open literature
  - Search appropriate data banks
  - Contact experts
  - Circulate a problem statement
- Proposed solution(s) worth pursuing

PRELIMINARY ECONOMIC ANALYSIS

- Projected production costs
- Cost comparison with available products
- Ways to reduce costs
- Potential savings due to
  - Extended product life
  - Lower maintenance costs
  - Product use
- Overriding non-economic benefits

MARKET ANALYSIS

- Product use
- Product procurement
- Appropriate communication and distribution channels
- Barriers and hurdles
- Size of market segments
- Product variation requirements
- Appropriate pricing schedule
- Expected future changes in the market
- Dynamics of the market in response to a new product introduction

TECHNO ECONOMIC ANALYSIS

- Performance spectrum for the new product
- Performance limitations imposed by new technology
- Cost-performance tradeoffs
- Important noneconomic considerations
- Scope of appropriate adaptive engineering and development program

ADAPTIVE ENGINEERING AND DEVELOPMENT (AED)

- Accomplish the engineering and development necessary to.
  - Reduce costs
  - Simplify operation
  - Improve performance
  - Meet all market-imposed requirements
  - Optimize product design for expected application
- Produce test, and demonstrate prototype(s) as appropriate
- Make necessary design changes

BUSINESS OPPORTUNITY ANALYSIS

- Changes in the techno-economic and market analysis based on the AED program and exogenous considerations
- Investment requirement to bring the developed technology to the market
- Expected risk/return relationship for the investment
- Does the adapted technology constitute a valid business opportunity

available to the consumer or user, the person with the need. This availability includes all the previously mentioned aspects of the developing and marketing of a commercial product. The technology must first become available; once it is developed, production, marketing, and distribution decisions must be made. Commitment of the product to the proper market need is key to its successful utilization.

According to the usual definition, technology transfer is a search for secondary uses for technology initially developed for a specific mission. In fact, second-generation versions of a given technology often find utilization more rapidly than the basic technology itself. This type of transfer can be carried out by both passive and active techniques.

Passive transfer is merely the dissemination of information related to the technology in question. This dissemination is usually nonspecific, with possibly only minimal direction toward potential interested users of the technology. Additional requests for information are rare, and determination of the ultimate use of the technology is seldom achieved.

In active transfer, the diffusion and implementation of newly developed technologies tend to be more assured by the involvement of a transfer agent. The transfer agent is capable of an overview of specific sector problems and can establish technological needs.

Working within the constraints of the usual definition of technology transfer, the transfer agent does not carry the emphasis on utilization as strongly as he might or should. We believe that without this emphasis, such an agent is not truly effective. Using the definition which states that transfer is achieved only when utilization occurs, one can see the transfer agent can be the developer of the technology, who also brings it to the commercial development and market stage; the user of a technology, who identifies it as fitting his need and then proceeds to develop a product; or the classically defined transfer agent--the third-party broker, who interacts with the source of the technology and its user to ensure its commercialization.

In any event, the transfer agent is the person who brings about the ultimate use of the technology. Someone who merely disseminates information or who merely acts as a broker cannot be considered to be a transfer agent. As will be often stated in this report, utilization of a technology is the determining factor in a transfer. The transfer process then can be best described as an activity in which a transfer agent solves a problem or a need by commercialization of a newly developed or advanced technology.

Information Retrieval and User Service

To promote technology transfer within the nation's industrial complex, NASA operates a network of Industrial Applications Centers (IACs). The responsibility of the IACs is to provide information retrieval

services and technical assistance to industrial clients. The network's principal resource is a vast storehouse of accumulated technical knowledge that is computerized for ready retrieval.

Through the IACs, industry has access to some 10 million documents, the world's largest repository of technical data. About 1.5 million of these documents are NASA reports covering every field of aerospace activity. In addition, the data bank includes the continually updated contents of 15,000 scientific and technical journals, plus thousands of published and unpublished reports compiled by industrial researchers and by government agencies other than NASA. Each month, another 50,000 documents are added to this wealth of technical information.

The IACs seek to broaden and expedite technology transfer by helping industry in finding and applying information pertinent to a company's projects or problems. The philosophy behind the IACs is that it is wasteful to "reinvent the wheel"--that is, there is no need to duplicate research already accomplished and thoroughly documented in the data bank. By taking advantage of IAC services, individual businesses can save time and money, and the nation benefits through increased industrial efficiency and productivity.

The seven IACs are located at university campuses across the country, each serving a geographical concentration of industry. The IACs also have off-site representatives serving industrial clients in many major cities and their surrounding areas. Additionally, six of the NASA field centers have technology coordinators who perform the important function of matching ongoing NASA research and engineering with client interests.

Staffed by scientists, engineers, and computer retrieval specialists experienced in working with companies, the IACs provide three basic types of services to industrial firms contemplating a new research and development program or seeking to solve a problem. They offer "retrospective searches"; they probe the data bank for relevant literature and provide abstracts or full-text reports on subjects applicable to the company's needs. IACs also provide "current awareness" services, tailored periodic reports designed to keep a company's executives or engineers abreast of the latest developments in their fields with a minimal investment of time. Additionally, IAC applications engineers offer highly skilled technical and interpretive assistance in applying the information retrieved from the data bank to a company's best advantage.

Needs of Researchers and Rehabilitation Engineers

Substantial information is being produced with respect to rehabilitation equipment. This information concerns available devices and the data generated from research and development. The information is being produced by NASA, as technology spinoff, colleges and universities in medical and engineering research, medical research centers, rehabilitation engineering centers, private research organizations and handicapped persons.

The engineers and researchers that were interviewed stressed the need for both a data bank with storage and retrieval capabilities and an applications team that could assist in the development of a device from the idea or technique to its ultimate availability in the marketplace. The following section covers the "passive" information transfer means of providing access to existing documented knowledge and suggestions for rehabilitation transfer agents. As was discussed in the information needs profile (Section IV) on rehabilitation engineers, the field is relatively new and could benefit from rudimentary communications links, such as a professional organization and training programs that directly address needs of the rehabilitation engineers. But to be informed about the forefront of technology and the possible secondary application of existing technologies to rehabilitation requires data bases and special publications.

Better information exchange among researchers needs to be approached from several directions, however, and not solely through a data base. One approach, which will be discussed later, is a network developed by computerized conferencing. The capability to contact co-workers across the country could be tied into a data base that is similar in capability to the existing NASA data base.

Proposed Task: Create and Maintain Data Base

The proposed information system would consist of a data base including but not limited to rehabilitation engineering information, biomedical engineering data, hardware and product information, rehabilitation program information, funding for rehabilitation programs, rehabilitation centers, and individuals. Abstracts of information entered in the data base would be subject-indexed and organized for convenient user retrieval. Biomedical engineers, rehabilitation engineers, and researchers would generally access the system directly by use of information searches. Information flowing into the data base would be reviewed, evaluated, and selected for preparation of special publications for dissemination to several user groups such as rehabilitation counselors, welfare agents, manufacturers of equipment and products, and consumers. The rehabilitation information system would provide a tool, not now available, that would increase the cost-effectiveness of providing rehabilitation services in the state of California, and if successful, nationally.

There are some problems in accessing information. First, information system capability is not available to the researchers located across the country, but who have timely in-depth access to present computer-based literature citations. Key-word searchers have sparse information on rehabilitation methodology, state-of-the-art knowledge bases, etc.

Second, access to rehabilitation research and technology developments in other countries is achieved only through international meetings attended by only a few Americans. Written reports on international research and development are available only after long reporting delays in conventional multilanguage journals and periodicals. Considerable duplication of work

done in other countries occurs in the United States. Similarly, foreign countries are unaware of the rehabilitation research being conducted in the United States.

Third, an interchange of information and coordination of research and development related to assistive devices in the workplace, home, and hospital are needed. In this way, the cost of developing assistive devices can be reduced, and more handicapped persons can benefit from using them. Quality of research can be rapidly improved, and unnecessary duplication can be minimized with ready access to better information and linkage with other researchers in the same field of inquiry at the time when dialogue and information are needed. Centralized information services should be established to augment the limited service of some facilities and to enable better communication to the public and professionals regarding the availability of technology and services. Many of the needs of the researcher and technician would be aided by a national computerized data bank on technology.

Fourth, a general-purpose data base and information could assist researchers in this field. The justification for this type of supportive service is found in the need for active communication among researchers because of the breadth and scattering of the research problems in rehabilitation; the widely differing numbers and kinds of researchers and others using research information; the need to have an accessible source of information on the numbers and the typical needs of disabled people who could benefit from the results of proposed research; and the need for a file of existing research activities and the state-of-the-art knowledge to assist researchers and rehabilitation engineers both individually and in groups. The quality of research and design of equipment could be improved and unnecessary duplication could be minimized by a communication system focused on the rehabilitation community. Access to an updated research inventory including the who, what, when, and where, and funding of research together with information on the state of the art in various fields of rehabilitation research are needed.

Fifth, several federal agencies are engaged in the research and development of assistive devices for daily living and the workplace. However, there is little or no coordination of this research effort to reduce overlap, minimize duplication of effort, and obtain maximum effectiveness from the money expended. After assistive devices are developed and proved feasible, there is no adequate follow-through effort to ensure final development and marketing of devices for use by the handicapped. In addition, a wealth of unused research results from the space and defense programs, and these data are potentially adaptable to the needs of disabled persons.

Each of these problems contributes to the unnecessary expenditure of funds and the continuing unavailability of needed assistive devices for handicapped persons.

One approach to setting up a data base for rehabilitation would be to classify the field into specific areas of rehabilitation engineering--that is, upper-limb prosthesis, lower-limb prosthesis, wheelchairs, kitchen aids, visual aids, and so forth. Thus, the system could grow in stages; be accessible during the growing period. The project personnel would accumulate, screen, abstract, and index one segment of the field before proceeding to another.

The suggested approach to system development would be to remain manual until the volume of data and client requests were of a sufficient size to warrant automation. The service delivery process and the information system supporting it should be working well before the whole system is automated into a data base. Even during the manual stage, all efforts should be compatible with the ultimate storage of data in a computer system. The computer data base configuration would be ideal to accommodate interactive inquiry by many of the parties in the rehabilitation community.

The Accent on Information system and the Information System for Adaptive and Rehabilitation Equipment computer-based systems should be explored for possible applicability. Any movement by NASA into this area should be to protect and augment existing systems and not have an adverse effect on programs created by dedicated individuals.

Publications for Accessing the Data Base

The following list summarizes various publications for accessing a data base for a computer network.

STAR

Scientific and Technical Aerospace Reports (STAR) is the principal announcement medium for the worldwide report literature on the science and technology of space and aeronautics. Each issue of this semimonthly publication announces, abstracts, and indexes more than 1,000 items. The informative abstracts are arranged in 34 subject categories, including: aeronautics and space research and development, basic and applied research, aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority. As a major component of NASA's information system covering aerospace and supporting disciplines, STAR announces current publication of NASA, NASA contractor and NASA grantee reports, reports issued by other U.S. Government agencies, domestic and foreign institutions, universities and private firms, NASA-owned patents and patent applications, and dissertations and theses.

STAR is issued twice each month, with cumulative index volumes published annually and semiannually. A special section entitled "On-Going Research Projects" is included in each issue. By arrangement

between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related "On-Going Research Projects" is inserted into each issue of STAR. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated NASA Research and Technology Operating Plans (RTOPs), and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by STAR divisions but are otherwise entirely separate from STAR. They are not indexed nor machine-searchable by NASA.

Figure 8 displays a sample cover for a proposed abstract journal that would be similar to NASA's STAR.

NASA Thesaurus

In addition to its regular publications containing information scientific report abstracts and references, NASA publishes an annual Thesaurus. The NASA Thesaurus contains the authorized subject terms by which the documents in the NASA scientific and technical information system are indexed and retrieved. Volume 1, "Alphabetical Listing," contains all subject terms currently approved for use. Volume II, "Access Vocabulary," contains postable terms, nonpostable terms, pseudoterms, and other entry terms to provide multiple access to the NASA Thesaurus terminology.

Patent Abstracts

Inventions resulting from NASA research and having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology, including many that have useful and valuable commercial application and are available to business through patent license. This type of service could aid rehabilitation engineers and manufacturers in the latest usable technology. Too often patents transferable to rehabilitation remain unused simply because no one knows about available technologies. To bring these licensable patents to the public's attention, a NASA "Patent Abstract Bibliography" (PAB) is published semiannually. PAB contains comprehensive abstracts and indexes of those NASA inventions originally published in NASA's STAR.

Other Suggestions for the Development of the Rehabilitation Data Base

Apart from existing models provided by the existing NASA TU Program, there are other suggestions that are applicable to the rehabilitation community. The following suggestions could all be used within the data base for increasing information exchange.

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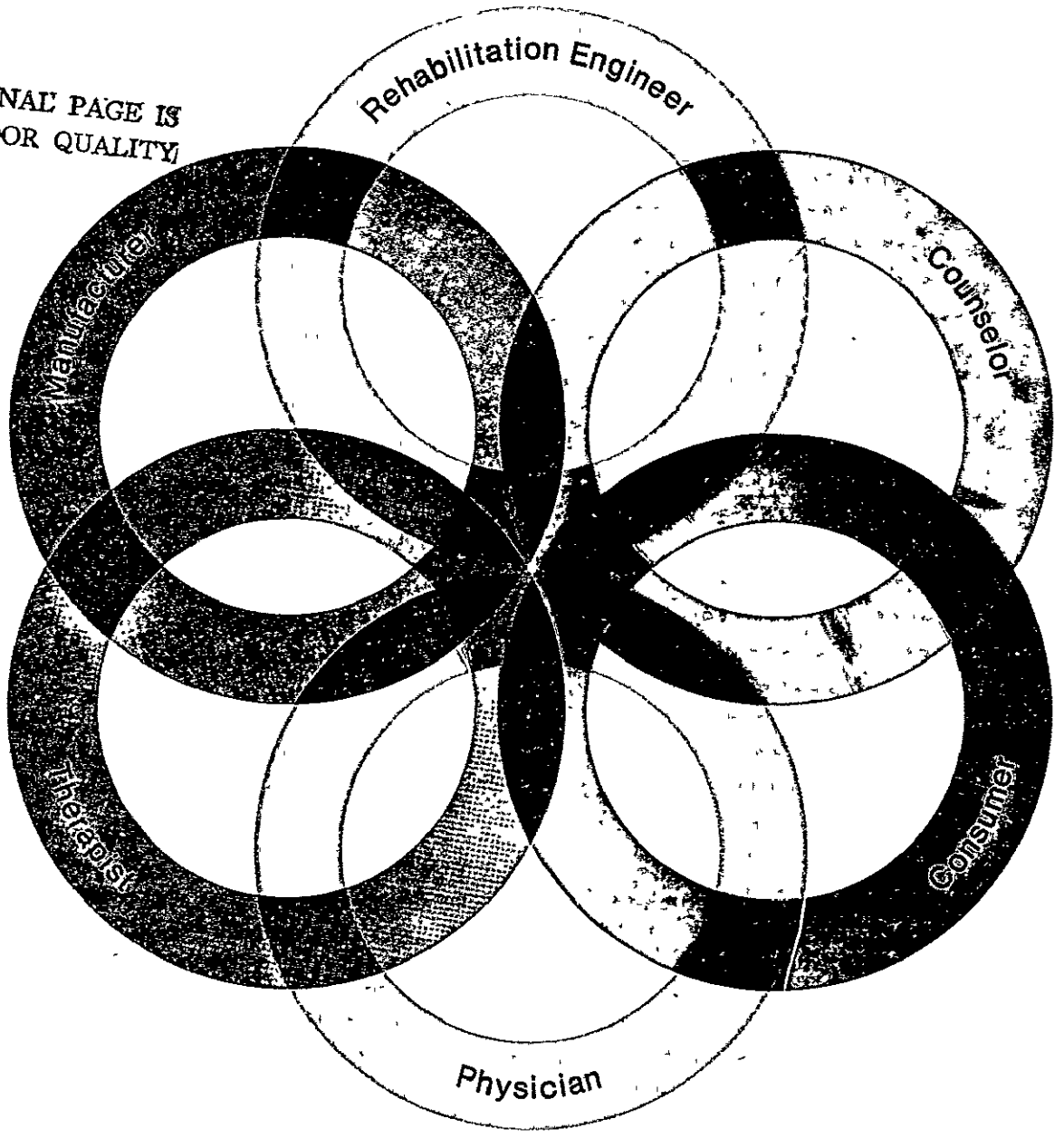
REHABSTRACT



A Monthly Abstract Journal with Index

FIGURE 8 PROPOSED COVER FOR AN ABSTRACT JOURNAL SIMILAR TO THE NASA STAR

Consumers and counselors recommended that a local directory of services and equipment be created. The directory might also include a list of individuals working in areas such as rehabilitation engineering and their speciality. This index should be cross-indexed and made available throughout the community to anyone who needed it. A similar index should be compiled at the state or regional level. The objective of these directories would be to make individuals aware of the existing community infrastructure. These directories would be especially helpful for the newly disabled. The directories could be part of the discharge briefing from the hospital. This information would be an invaluable aid for improving service delivery.

One system that could be either manual or computer-based would be an individualized research service. This service would be based on a consumer information profile that would list the specific interests of an individual. The profile would be used to match articles, books, and conferences with a person's interests, and the information could be automatically sent to the person. The suggestion of computerized conferencing would provide an ideal medium for an individualized research service.

One model for an information transfer system is now being developed by the National Library of Medicine (NLM). Practioners in the general health field as well as those in rehabilitation have neither the time nor access to sources to meet professional needs. In the attempt to translate new research findings into useful form, the NLM has designed a health care information system.

The library says the system will aim at providing a comprehensive bank of information that will: contain substantive answers to questions posed by practitioners; provide answers that are current and reflect the consensus of a group of experts; be immediately responsive to inquiries--i.e., reliable, ready access; and provide data supporting the answers as well as citations to primary publications for more detailed study, if desired. One area has been selected to serve as a test model for such an information transfer system.

Knowledge pertaining to aspects of a particular sickness important to the practitioner and/or academician has been synthesized into one body or bank of information derived from several reviews or syntheses on the subject previously published by experts. Relevant information has been selected, placed in an organized hierarchical arrangement to permit easy retrieval, and encoded into a minicomputer.

The data base, still in draft form, is arranged by topics (headings). For each heading, there is an accompanying heading--statement that synthesizes the state of knowledge about a subject. Each heading and heading-statement is supported by data elements--paragraphs taken from the previously published source documents. Citations included within the data element paragraphs refer to the primary publications cited by experts in their source document articles to back up their conclusions

or general statements. This draft data base can now be explored via terminals at NLM.

After the prototype computerized information bank is validated and brought up to date, methods of allowing users to access the information will be studied. Access may be direct via a computer terminal or through a trained intermediary using a toll-free, dial-access telephone number; users also may receive computer-generated printed material, either in response to specific queries or as a complete document on a given disease. The information bank also will be made available to professional societies and to other producers of health-related information products and services, ranging from scholarly monographs to multimedia instructional packages.*

Another service that the NLM provides is called MEDLINE. This service is a nationwide, on-line, bibliographic retrieval system provided for the biomedical community. An instantaneous, interactive searching of over 400,000 citations from the world's biomedical serial literature service is provided through a data communications network that allows access through a local data-phone call in major metropolitan areas. Both the NLM's information services as well as the NASA data banks should be further investigated for their applicability to rehabilitation.

Publications for Information Transfer

In addition to the publications for accessing computer-based data, other methods for the transfer of information provide models for consideration in establishing a technology applications unit. Current information systems within NASA provide a starting point for recommendations concerning formats for information dissemination. The following discussion touches on the existing publications that were developed for promoting and stimulating practical applications of government-sponsored aerospace technology. The models can be redirected specifically toward the needs and problems of handicapped individuals. An information dissemination plan should be designed to reach the maximum number of researchers, rehabilitation professionals, and handicapped persons.

In addition to the actions of the transfer agent in bringing together developers and potential users of technology, NASA's TU Program uses a variety of publications designed to further promote the accessibility of aerospace research-generated technology. Taken as a whole, this group of publications represents a comprehensive data base of information on NASA technology. Singularly, the various formats allow for ease of use and interpretation by particular audiences.

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*The person to contact for more information is Lionel M. Bernstein, Lister Hill Center, NLM, 860C Rockville Pike, Bethesda, MD 20014.

A relatively simple, but important transfer mechanism is the announcement and widest possible dissemination of new knowledge and technologies. The TU office uses this mechanism by issuing the NASA Tech Brief, a short abstract discussing a newly developed technology. Samples of NASA Tech Briefs are displayed in Figures 9(a) through 9(c) and a sample of a proposed rehabilitation publication cover is provided in Figure 10. More detailed information relevant to the Tech Brief is available in the form of a NASA Technical Support Package, a report discussing the new technology in greater detail and often containing test data, drawings, and specifications. To supplement these reports, special publications (SPs) are offered periodically on topics such as "Implantable Biotelemetry Systems," "Human Factors Engineering," and "Technology and the Neurologically Handicapped."

Tech Briefs--NASA requires written reports of technical information representing invention, improvement, or innovations made during contracted research and development projects. Such information is announced in the quarterly publication, NASA Tech Briefs. Each issue contains information on more than 100 innovations distilled to straightforward, single-page technical descriptions, often with illustrations. The briefs emphasize information likely to be transferable across industrial, regional, or disciplinary lines and are issued to encourage commercial application. A special feature of Tech Briefs is a section on "New Product Ideas," innovations stemming from NASA research that appear to have particular promise for commercial application. One of the most requested items in the information needs survey of the rehabilitation community was to be informed concerning new products and ideas that would lead to future devices. If a Rehab Brief were formed within an applications unit, it should include a new products section.

Each issue contains a comprehensive index, and a cumulative index is published annually. Subscription to Tech Briefs is free to engineers in U.S. industry, business executives, state and local government officials, and other potential users of aerospace technology, such as rehabilitation engineers.

Tech Briefs in the form of a Rehab Tech Brief* would benefit many segments of the rehabilitation community by increasing the amount and quality of technical information. Manufacturers, researchers, and rehabilitation engineers would be the primary benefactors of Rehab Tech Briefs. The format of NASA Tech Briefs is shown in Figure 9.

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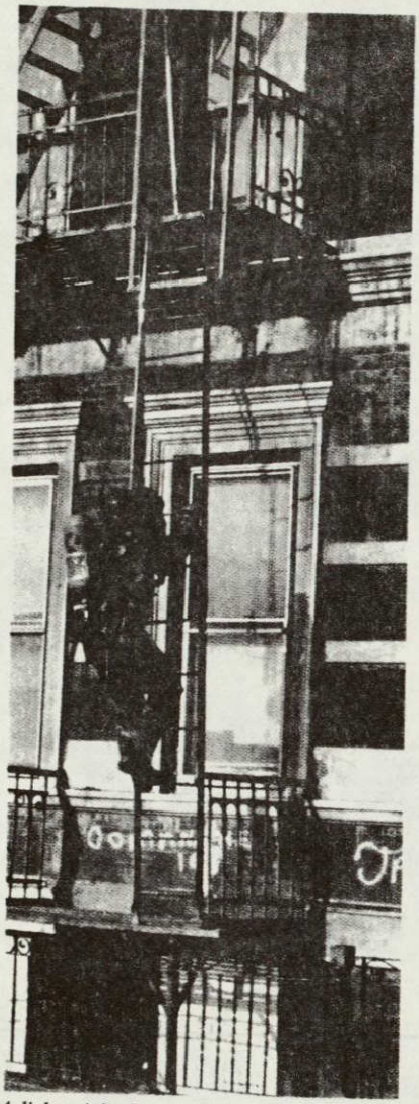
*It should be noted that "Rehab Briefs" is the name of a publication from the University of Florida. University of Florida produces 12 to 15 briefs per year on timely topics--each 2 to 4 pages long and distributed to 25,000 to 30,000 readers.

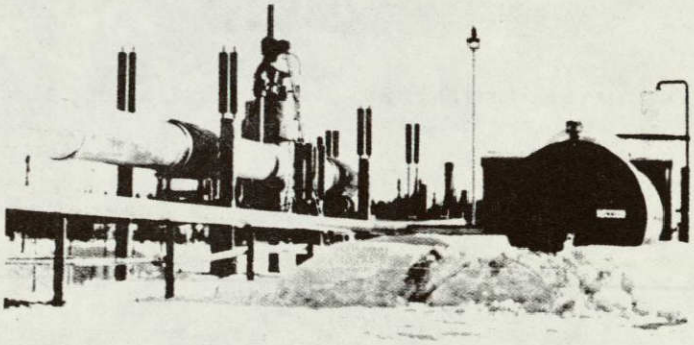
NASA Tech Briefs

National
Aeronautics and
Space
Administration



A lightweight fireman's air tank and breathing system are based on technology developed for astronauts' equipment.

Aluminized Mylar, aeveloped originally as reflectors for satellites, is used for jackets, parkas, blankets, sleeping bags, and other consumer products.



Heat pipes, similar to those used to cool equipment in spacecraft, keep the permafrost frozen around sections of the Alaskan pipeline to prevent frost-heaving damage.

Vol. 1, No. 2

SUMMER 1976

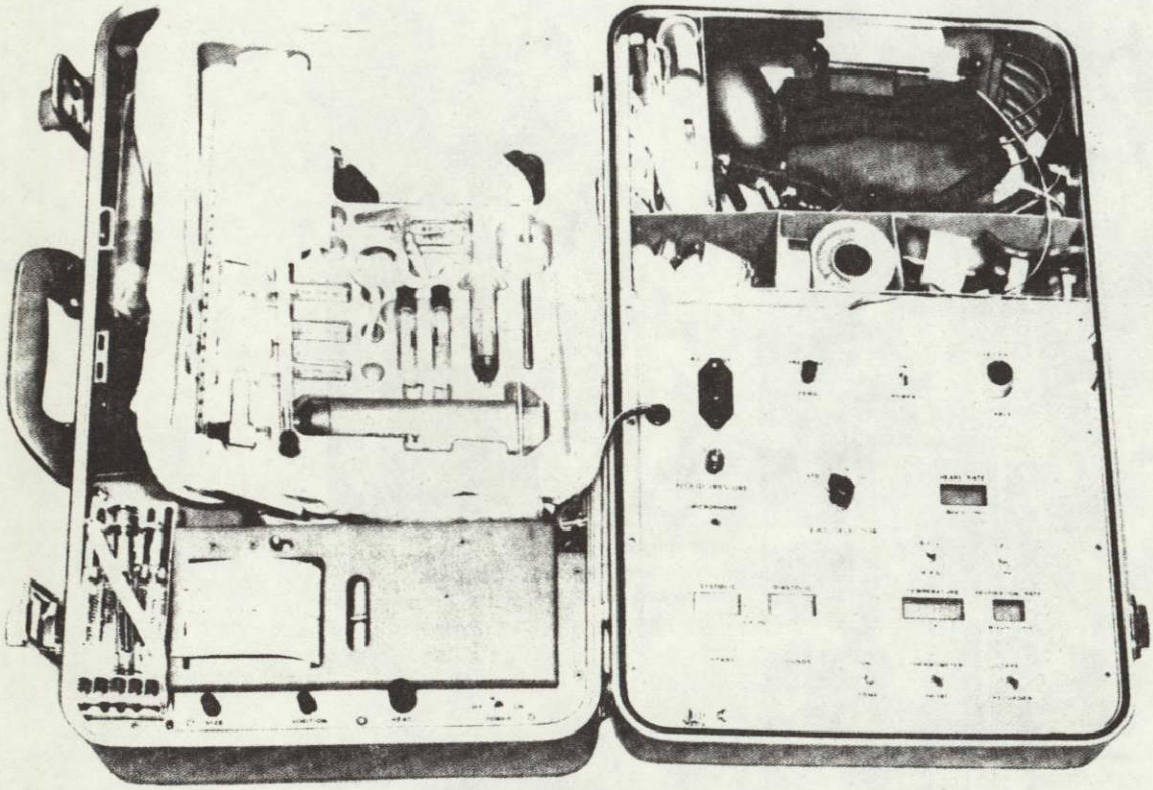
(a) COVER

FIGURE 9 NASA TECH BRIEFS SAMPLES

Physician's Modern "Black Bag"

A compact medical kit contains most of the instrumentation of a well equipped physician's office.

Lyndon B. Johnson Space Center, Houston, Texas



The **Physician's Modern "Black Bag"** is a lightweight, compact package that contains practically all the instrumentation of a well-equipped medical office.

Physicians on house and emergency calls usually carry a familiar "black bag." The bag contains instruments and drugs necessary for on-site diagnosis and treatment. Heavier, more sophisticated equipment is kept in hospitals and doctors' offices to examine the patients more thoroughly. A physicians capabilities for on-site treatment are greatly extended by a new "black bag" that contains practically all the instrumentation of a well-equipped medical office. The entire unit which is packed in a suitcase weighs less than 14 kg (30 lb).

The unit includes the electronic equipment, drugs, bandages, and instrumentation necessary for relatively thorough diagnosis and treatment. It is packed into an 18-cm by 56-cm by 36-cm (7-in. by 22-in. by 14-in.) suitcase for hand carrying.

The electronic components include an electrocardiograph (ECG) and electroencelphalograph (EEG). Data are recorded either on a built-in strip-chart recorder or on a cassette tape recorder, and a built-in telephone coupler can be used for data transmission over a standard telephone line. A single printed-circuit card is used to

FIGURE 9a

control the measurement and display of vital data, such as heart rate, respiration rate, temperature, and blood pressure. The card is also used to precondition ECG and EEG signals for the strip-chart recorder or the telephone.

A small self-contained rechargeable battery pack supplies power for all the electronics. The battery can be used for 12 hours and may be recharged from a standard ac outlet. Battery life is enhanced in this system because the instrument data are displayed with power-saving liquid crystals.

In addition to the electronic equipment, the kit contains nearly 50 other diagnostic instruments and supplies. These include a combination laryngoscope-otoscope-ophthalmoscope, a stethoscope, an emergency supply of drugs, hypodermic syringes, thoracentesis, and spinal-puncture trays. All of this equipment is compactly packaged within the "black bag."

The advantages of the new "black bag" are many: It extends the quality of treatment a physician can administer on emergency and house calls and helps obtain more complete diagnosis prior to hospital admission. Furthermore the electronic instrumentation is sophisticated enough to be used as part of the standard equipment in the physicians office.

This work was done by C. K. LaPinta and J. L. Day of **Johnson Space Center** *and A. E. Schulze and G. A. Zivley of Telecare, Inc. For further information, Circle 63 on the TSP Request Card.*
MSC-14936

Fraction-Storage Unit for Drug-Identification System

In a drug-identification system which simultaneously identifies several drugs via separate, parallel gas chromatographs followed by IR analysis, one of the chromatographs may elute at a faster rate than others. A fraction-storage unit which connects to each chromatograph output and buffer stores the samples until the infrared spectrometer is ready to accept them. It controls storage column input and output and backflushes each after use to clean the column.
(See page 208.)

Precolumn for Extract Concentration

An automated drug-identification system requires that test samples be separated into families of organic compounds for subsequent insertion into several parallel gas chromatographs. A sample is first extracted by selective organic solvents. Solvent is then removed from the extract to increase the extract-to-solvent ratio. This step, which increases system sensitivity, is used with each chromatograph.
(See page 207.)

Automated Solvent Concentrator

When used in an automated drug-identification system, the concentrator reduces the solvent-to-specimen ratio by 100:1. It feeds input material to the analysis subsystem where each sample undergoes filtration in an extraction tube. The filter simultaneously removes particulate contaminants and reduces the sample water content. The sample is extracted from the filtered residue by a specific solvent.
(See page 206.)

FIGURE 9a (Concluded)

Omnidirectional Wheel

Wheel with rotating rim elements maximizes the directional driving capability of a vehicle.

Marshall Space Flight Center, Alabama

A specially built wheel provides mobility in any direction for a ground vehicle, without requiring any change of orientation relative to the vehicle. Such wheels will enable a car to get in and out of tight parking spaces, a crane to maneuver directly sideward, or a Moon rover to travel easily over difficult terrain.

Figure 1(a) illustrates the principle of the omnidirectional wheel: It travels forward or backward by turning on its axle, just like any other wheel, and it travels sideward (i.e., in the direction of its axle) by the rotation of a roller-like rim element about an axis in the plane of the wheel.

The rim elements (or rim wheels — sort of wheels on a wheel) are rigid bodies shaped so that their outer contours form parts of the circle defining the wheel diameter. Figure 1(b) shows how they are mounted on rim axles at the outer ends of the spokes of the wheel. Power to drive the rim elements is applied via the rim axles by electric gearmotors or by hydraulic or pneumatic devices.

Simultaneous rotations of the wheel and of the rim segments allow a ground vehicle to move in any direction from a given spot, as depicted in Figure 2. Varying one of the two rotational speeds steers the vehicle along a curved path.

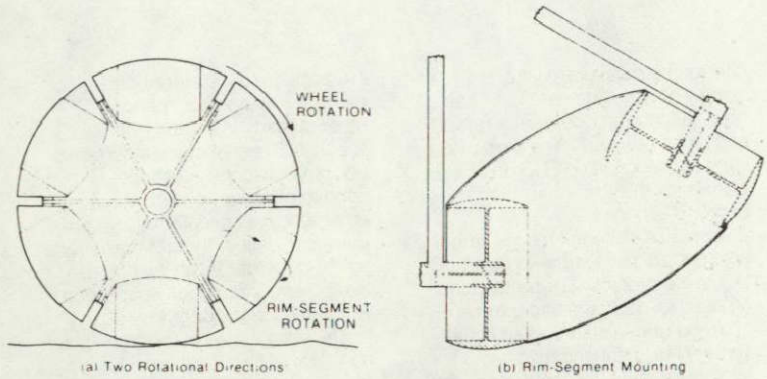


Figure 1. Omnidirectional wheel **Rolls in Two Orthogonal Directions** at once, as roller-like rim segment turns about axle in plane of wheel while entire wheel revolves on its hub. The two rotations are shown in (a); mounting of the rim segments is shown in (b).

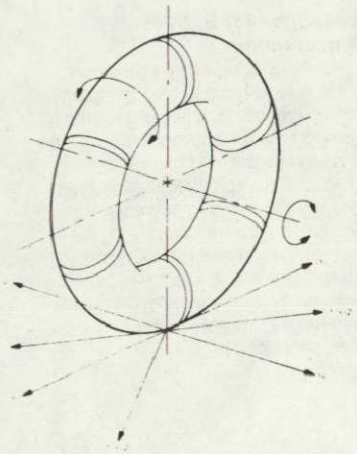


Figure 2. The wheel is **Steered Without Orientation Change** by varying one of the two rotation rates. A vehicle equipped with such wheels can move in any direction from a fixed spot.

This work was done by J. F. Blumrich of **Marshall Space Flight Center.** *For further information including the details of construction and powering of the rim segments, Circle 77 on the TSP Request Card.*

This invention has been patented by NASA [U.S. Patent No. 3,789,947]. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Marshall Space Flight Center [see page A8]. Refer to MFS-21309.

FIGURE 9c

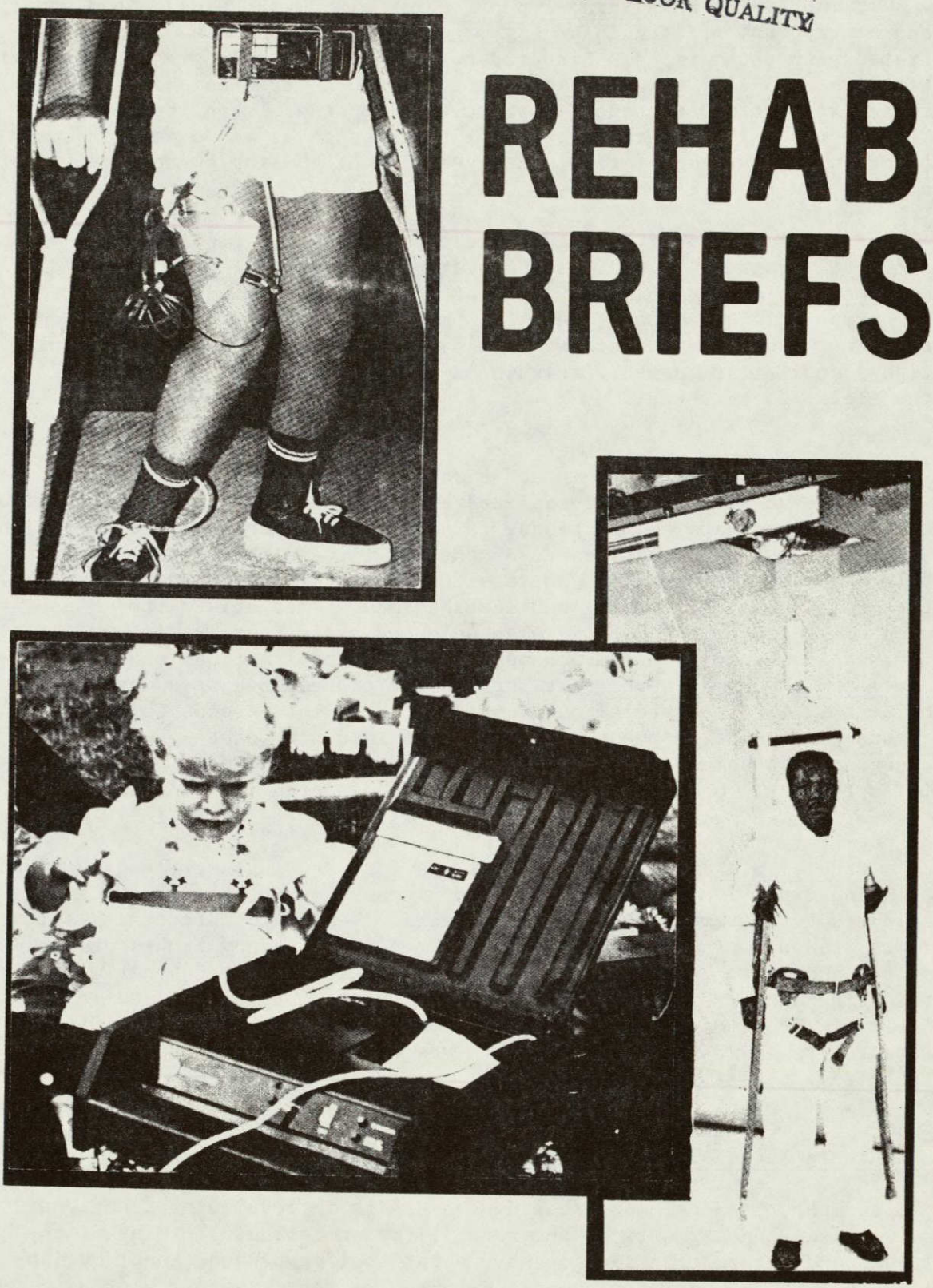


FIGURE 10 PROPOSED COVER OF A "TECH BRIEF" FOR REHABILITATION

Spinoff--The NASA Spinoff publications may best be described an annual reports, printed in glossy magazine style format and well illustrated with photographs. Directed to the interested lay reader, Spinoff highlights NASA's year with informative feature articles about ongoing space exploration, research programs, and successful application of NASA technology to areas of public interest such as medicine, land use, aviation, weather monitoring, energy-efficient housing systems, vehicle safety, and food technology.

A similar Spinoff for rehabilitation could be a report to the nation about the progress in devices and systems benefiting the handicapped. Many members of the community request a new products and idea listing. This type of magazine can instill hope in the disabled and provide confidence in the service network that serves them. Most consumers would find a newsletter format, including a listing of the latest advances in the field, to be useful.

Special Publications--In addition to these regular publications, NASA issues a variety of specialized material, such as reports, technical handbooks, and data calculations, to acquaint the nonaerospace user with NASA advances in various states of the art. Examples include: "Implantable Biotelemetry Systems," "Optical Devices: Lasers," and "Human Factors Engineering." Special publications many times arise after NASA sponsors a conference dealing with selected areas that are in need of improved communication. An example of such a publication is Neurophysiology and the Handicapped that reports the proceedings of a conference held in 1974. The special publication of NASA corresponds to the requests for the development of a series of in-depth, state-of-the-art monographs on domestic and international research and development activities that have or could have an impact on disabled individuals.

Problem Statement--One of the tools for matching user needs with the existing expertise is to write up and circulate problem statements on selected topics among the NASA scientists. Personal contact with scientists produces results because ongoing research is many times not documented and would be inaccessible for a time without the contact with the researchers themselves. A sample problem statement is provided in Table 9. Problem statements similar to these would make rehabilitation researchers aware of certain valid needs of the disabled and aid in the technology transfer process.

Building a National Communications Network

Computerized teleconferencing can assist in developing a national network linking segments of the rehabilitation community. Many of the issues and information sources have a national scope and cannot be isolated within the California model service delivery system. Linking participating organizations within California to other national resources

Table 9 (Continued)

The seat cover fabric must self-extinguish when tested vertically in accordance with FAA Regulation 25.853, Appendix F (b), with the following changes. the average burn length may not exceed 6 inches, and the average flame time after removal of the flame source may not exceed 5 seconds. Flaming of any drippings shall not be allowed. Furthermore, the samples of material shall, after 15 minutes immersion in water and thorough drying, still conform to this test.

The combustible materials must be tested for smoke emission in accordance with the National Bureau of Standards Technical Note 708, "Interlaboratory Evaluation of Smoke Density Chamber," December 1971, Appendix II, "Test Method for Measuring the Smoke Generation Characteristics of Solid Material," dated September 1971. The specific optical density, D_s, determined in accordance with the test may not exceed 100 within 90 seconds after the start of the test, and may not exceed 200 within 4 minutes after start of the test. The only material excepted is neoprene foam cushioning. (Department of Transportation Guidelines for Flammability and Smoke Emission Specifications - TSC-74-LFS-2).

Further Questions Should Be Directed To:

James P. Wilhelm, SRI Technology Applications Team, 333 Ravenswood Ave. Menlo Park, California 94025. Telephone: (415) 326-6200, extension 3520.

This Problem Statement calls to your attention significant technological needs in an important area of concern in the public sector. We hope to bring to bear on this problem the information and expertise that resides in NASA. If you feel you can contribute, please relate your ideas to the Technology Utilization Officer at your installation, or to the team representative named in the statement.

Table 9 (Continued)

CURRENTLY USED MATERIALS (BY PART) AND FIRE RESISTANT CHARACTERISTIC

PART/MATERIAL	FIRE-RESISTANT CHARACTERISTIC
Thermal and acoustic insulation	
A walls - fiberglass	
walls - closed cell neoprene foam	meets NFPA standards
roof, floor - urethane foam	meets NFPA standards
between roof and side - closed-cell flexible polyurethane foam	burn rate $\cong$ 1.5 in./min. in horizontal bar test
B. fiberglass	permanently fire resistant
C. fiberglass (Gustin Bacon, type #75 Ultralite	flame spread index $I_s < 50$ (ASTM E-162)
Wall and ceiling panels	
A. polyester reinforced fiberglass	
B. melamine (Textolite TX 4300)	
melamine (Consoweld Dusky Walnut VT-W-48)	
window masks - fiberglass	permanently fire resistant
C. fiberglass	
melamine	
Floor covering	
A. heavy weight wool velvet weave with level loop pile	flame spread class 75 (ASTM E-84)
lead impregnated vinyl and polyurethane foam carpet pad	
B. RCA Rubber Co. Transit Flor (vinyl asbestos)	
C. wool carpet	flame spread < 75 (ASTM E84-61)
polyester back	
Seat cushion	
A resilient molded foam	
B neoprene foam padding	flame spread 25 or less (ASTM E166-67)
C. resilient foam of latex urethane (SPI Type II base)	exceeds values stipulated by Boston Fire Code and DOT FHWA Standard #302
Seat covers	
A. vinyl and fabric	meets NFPA standards
B. vinyl coated knit nylon (Uniroyal Naugahyde Decor Polymeric Vinyl, Supreme Grade DC-16)	meets Federal Specification CCC-A-680, latest issue, Treatment A-I

Table 9 (Concluded)

Seat covers (continued)		
C. plastic coated fabric and woven upholstery fabric	exceeds value of Boston Fire Code and DOT FHWA Standard #302	
Seat frame		
B. fiberglass (glass reinforced polyester)		
Weathering strips and door seals		
A. elastomeric material		
Door guide		
A polyvinyl chloride		
Hand grip		
A. polyvinyl chloride		
Side windows		
A. laminated safety glass		
B. laminated safety glass		
C. laminated safety glass		

such as the Veterans Administration and the Rehabilitation Service Administration's Engineering Centers will aid in the implementation, operation, and deployment of the California Rehab-Engineering Service Delivery Model.

Under a grant from the National Science Foundation (NSF), Innovative Systems Research Inc. (ISR) is assessing the potential of computerized conferencing techniques in meeting the communication needs of the rehabilitation engineering communities.* Computerized conferencing uses computers to structure and facilitate communication. The technique relies on the information storage and processing capabilities of the computer conferencing system to eliminate time and geographic barriers. During the project, IRS will assess how well a particular conferencing system meets the rehabilitation community's needs for greater accessibility of information, timely feedback, and more efficient means of communication among those engaged in device research and development.

The system being evaluated is Electronic Information Exchange System (EIES) developed by the New Jersey Institute of Technology (NJIT). The study participants are a cross section of persons and agencies in the rehabilitation device professions, including those in basic and applied research, marketing, production, distribution, and consumption. EIES is maintained on a minicomputer at NJIT. For 12 months, participants send and receive information via personal computer terminals with acoustic couplers that accommodate their telephones.

The EIES has a number of capabilities. These include:

- Messaging--messages can be sent directly to anyone with access to the system. Recipients are alerted to waiting messages when they sign on to the system, and senders receive confirmation when their messages have been received.
- Conferencing--this can be used for topic-oriented discussions over any period of time. The system maintains a permanent transcription of comments that is available to conferees at any time.
- Notebooks--personal storage space for text composition and editing is provided. Notebooks can be shared with other members for joint authorship of papers or comments.
- Bulletins--public communication space for use as an on-line newspaper or electronic journal.

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*The project entitled, "Electronic Information Exchange in Research on Devices for the Disabled" is supported by the Access Improvement Program, Division of Science Information, NSF.

The project has few controls other than general monitoring by IRS project leader Jane McCarroll. It is hoped that the best network organization for the individuals will evolve as the experiment continues. The participants are encouraged to use EIES capabilities to support their work, share product evaluations, exchange ideas, discuss information and research results, communicate conference plans and schedules, communicate with remotely located developers and users of specific devices, and explore different methods and techniques for making use of the system. For example, one system member organization is working on a software linkage between EIES and an automated data base of devices that would essentially establish the data base as a system member and enable everyone else in the system to query it on-line for device data.

Ultimately, ISR intends to use the techniques and methodology used in the current effort in the development of further applications of computerized conferencing. The primary objective will be to assist other organizations and agencies in rehabilitation technology and services for the disabled to adapt the medium to their needs.

NASA Technology Applications Teams

A primary difference in the operation of a technology applications team (TAT), as contrasted to the other program elements briefly described in this section, is that the team actively seeks out new problems (through personal visits, telephone calls, attendance at conferences) that display potential for solution by the application or adaptation of aerospace-derived (NASA) technology.

The overall technical approach and methodology of a TAT is to field an interdisciplinary corps of experts to identify and validate public sector problems; to then identify and locate the source of the NASA technology most closely addressing that problem; and by means of adaptive engineering efforts, if necessary, at NASA centers or in the private sector, to modify that technology to obtain the closest fit possible with the problem. The team also involves private sector vendors or manufacturers as early as possible in the transfer operation to ensure the commercialization and availability of the technology in question.

The primary functions of a TAT are to plan, implement, coordinate, control, and evaluate a program for optimizing the match between user (public sector) problems and potential solutions in the NASA-derived aerospace knowledge bank. The team operates primarily as a broker or linker between the suppliers/offerers of technology and the users of products, processes, and services, based on new technologies.

A key function of the TAT is the selection and validation of problems. Operationally, the first step of this process occurs during initial contacts or visits with the user. After the NASA TU Program, its objectives, and the role played by all its parts has been described, the team member solicits information about the user's technological problems,

focussing on those potentially soluble by an advanced (i.e., NASA-derived) technology. The types of problems usually obtained as a result of this type of solicitation fall into three general categories:

- Technically valid problems--i.e., problems for which a technical solution appears feasible, but whose cost has not been estimated.
- Technically and economically valid problems--i.e., problems for which a technical solution appears feasible and cost constraints are such that a product, process, or service implementing this solution would be used even if it cost more than the product, process, or service it is to replace.
- Technically valid and economically invalid problems--i.e., those that are labeled "wish list" problems. These are usually preceded by: "Wouldn't it be nice if we had a ..." These problems are usually poor in technical content and their implementation is obviously constrained by cost.

Should a solution be found, it is fostered to the prototype stages of development in the hope that a private commercial manufacturer will be interested enough to market it and thus make it available to the consumer. Unfortunately, the commercialization of NASA technology and other government-funded programs has not progressed to the point of being felt by large numbers of disabled consumers. The process of technology transfer seems to be restricted at the prototype stage; ideas are generated about problems related to rehabilitation, but not all equipment problems are being considered, and few ideas are translated into marketed products for general consumption.

Proposed Rehabilitation Technology Applications Unit*

Many of the present research results and technical developments that can benefit the lives of the handicapped are currently not made available to them. The development effort ceases when the technical research is completed, and its potential application is either neglected or fails to materialize because the research did not start with a sound handicap-oriented goal or there are no means of distribution. Research to develop solutions should be more appropriately balanced with research on alternative ways to make these solutions available to consumers.

Requests for information and literature searches may result in research utilization, but only if they are accompanied by sufficient consultation and follow-up. The necessary follow-through can be

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*Clarence Nicodemus, a rehabilitation engineer, proposed a rehabilitation technology applications unit in 1976 under the name of Secondary Technology Applications and Rehabilitation Team (START). His concept paper was helpful in writing this section.

accomplished by an efficiently run Technology Applications Unit. An effective Applications Unit can substantially reduce the time span between knowledge acquired and knowledge applied. The ultimate objective of this office is to assist in the research, development, demonstration, and distribution of the accomplishments of science and technology for handicapped people.

The technology utilization process could assist in mission-oriented research programs by making available necessary technical support for communication and information processing. The research efforts for such a program should be based on problems and needs of the handicapped which, if solved, would decrease dependence on public financial assistance. Breaking this cycle of dependence through properly designed and manufactured equipment could increase personal independence, vocational and economic productivity, and educational self-development for the handicapped.

The primary functions of the unit would be to plan, implement, coordinate, control, and evaluate a program for optimizing the match between public sector user problems and potential solutions in the NASA-derived aerospace knowledge bank. A technology applications team would operate primarily as a broker or linker between the suppliers/offerers of technology and users of products, processes, and services based on new technologies.

Some primary objectives of the proposed applications unit program should be:

- A better needs determination of the disabled consumer and the rehabilitation network.
- Identification of state-of-the-art knowledge in specified areas (both foreign and domestic).
- Applied research for prevention of disabilities with an emphasis on public safety.
- Identification and ranking of problem areas by priority that require further research development.
- Aid in the development of systems and devices for the handicapped.
- The matching of problem areas with available scientific solution(s).
- Identification of barriers to effective service delivery and transfer of technology to the handicapped.
- Distribution and marketing studies that ensure more rapid application and acceptance of new techniques by practitioners and consumers.
- Arrangement for clinical trials, technology testing, prototype production, where applicable.

- Linkage of research outcomes to production entities and allocation of the necessary incentives to ensure the production of such entities.

The purpose of the application team discussed above would be to complete the transition from basic and applied research to production and marketing. The applications unit would act as a liaison to improve contact with all three surfaces of the rehabilitation services interface--technology, consumer, and provider. The office could offer a unique solution and secondary technology application and rehabilitation. Generally, the overall objective would be to facilitate the transfer rate in volume of advanced technology in materials systems analysis, engineering design processes, and medical developments as they relate to rehabilitation equipment services for the consumer and consumer provided.

An existing model for technology utilization in rehabilitation is supplied by the Innovative Matching of Problems to Available Rehabilitation Technology (IMPART) program in Texas. IMPART functions in a similar manner to the NASA application teams.

IMPART was established by the Texas Rehabilitation Commission in collaboration with Southwest Research Institute. The project was funded by a grant from the Research Utilization Office of the Rehabilitation Services Administration. The purpose of the program is to make the prescriber and the user segments of the rehabilitation community aware of available equipment, devices, and technological information related to rehabilitation and everyday living. IMPART is a public service and is available to anyone who has a work-related problem. It is open to handicapped persons and employers, counselors, and doctors working with handicapped. The primary emphasis is on the rehabilitation counselors in the field and the problems that they encounter.

To input a problem, an individual submits a problem statement form (see Figure 11) describing the situation. Usually the problem originator is contacted by a rehabilitation engineer who discusses the problem before and during the search for alternative solutions. (See Figure 12 for a sample problem area checklist.) Problem solutions come from personal knowledge of the rehabilitation engineering area, catalog searches, data bank searches, and direct contact with rehabilitation engineering and devices design personnel.

Problems received are categorized into three classes:

Class I: those for which a suitable technology exists (most fall into this category).

Class II: those on which research is in progress and for which a suitable technology is being developed and tested.

Class III: those currently beyond the state of the art. They may suggest areas for future research and technical development.

Problem Statement

Fill out this form and mail to the address shown below.

IMPART

INNOVATIVE MATCHING OF PROBLEMS TO AVAILABLE REHABILITATION TECHNOLOGY

Title: _____ Date _____

Originator. Name _____ Position _____

Firm or Agency _____

Address _____

City, State _____ Tel. _____

What Is Needed: _____

Check 3 descriptive words on the back of this page which best describe this need.

Disability: _____

Specific Physical Limitations: _____

Is Condition Progressive? _____

Other Information/Constraints, Specifications, Etc.: _____

_____

_____

For Project Personnel Use Only

Date: Received _____ Closed _____

IMPART Personnel: TRC _____ SwRI _____

UTA _____ Other _____

Descriptors: _____ Disability _____ Area _____

Strict confidentiality will be observed at all times.

Frederick O. Bohls, Ph D
Project Coordinator
Texas Rehabilitation Commission
118 East Riverside Drive
Austin, Texas 78704
512 - 447-0100

Charles J Leenger, Sr.
Rehabilitation Engineer
Southwest Research Institute
6220 Culebra Road
San Antonio, Texas 78284
512 - 684 5111

FIGURE 11 SAMPLE IMPART PROBLEM STATEMENT FORM

DAILY LIVING
___ Eating/Drinking/Feeding
___ Bathing
___ Toilet
___ Dressing/Clothing
___ Grooming
___ Sleeping
___ Safety/Security
___

HOME MANAGEMENT AND ADAPTATION
___ Food Preparation and Serving
___ Child Care
___ Cleaning/Laundry
___ Other Home Maintenance
___

FURNITURE (Home/Office)
___ Chair
___ Table/Desk
___ Bed
___ Couch
___

MOBILITY AIDS
___ Wheelchair
___ Wheelchair Accessories
___ Walkers
___ Canes, Crutches
___ Orthotics
___ Prosthetics
___ Lifts, Transfers, Elevators
___ Other Stabilization or Positioning Aids
___ Electronic, Ultrasonic, Laser, etc.
___ Personal Vehicle, Specialized, Unlicensed
___

TRANSPORTATION
___ Automobile/Automotive Hand Controls
___ Adapted Van
___ Transfers/Lifts
___ Personal Vehicle, Specialized, Licensed
___ Wheelchair Restraints
___ Automotive Power Assists
___ Emergency, Safety Equipment/Automotive
___ Buses, Minibuses, Ambucabs
___

COMMUNICATION
___ Amplification Devices
___ Speech Producing Devices
___ Telephoning
___ Braille/Braille Writing
___ Writing
___ Typewriting
___ Reading
___ Communication Boards/Electronic
___ Special Signaling Devices
___ Sensory Conversion Devices
___ Command/Control

MEDICAL THERAPY
___ Surgical
___ Diagnostic and Testing
___ Exercise
___ Therapy Devices
___ Muscle/Nerve Stimulation
___
___

RECREATION
___ Crafts
___ Sports
___ Games
___ Devices
___

FIGURE 12 IMPART PROBLEM AREA CHECKLIST

IMPART's methodology is to identify:

- Appropriate methods, materials, and devices already developed or in development.
- A commercial source or established method.
- Modification of a commercially available device or fabrication of special apparatus will be recommended.

To date, IMPART has acquired more than 100 problem submissions. Most of these have been submitted by rehabilitation counselors. Titles for some of these problems are as follows:

- Alert for Deaf Restaurant Worker
- Communication System for Athetoid Cerebral Palsied Client
- Telephone Capability for Deaf
- Deaf Alert--Telephone, Baby Cry, Smoke, Emergency Vehicle
- Margin Alarm for Deaf (Typewriter)
- Extend Usefulness of Hearing Aid
- Large Field, Low Power Lens
- Lamp Identifier for Blind
- Sewing Fixture for Blind
- Bottom Margin Alarm for Blind (Typewriter)
- Recording Cuing for Blind Disc Jockey
- Heliarc Machine Control for Quadriplegic
- Writing Aids for Paralyzed Clients
- Carrier for Electric Wheelchair
- Stability Assist for Bus Egress
- Proportional Control "Trainer" for Electric Wheelchair
- One Hand Typewriter
- Elevating Wheelchair for Cerebral Palsied Office Worker
- Female External Urinary Collection Device
- Mobility Aid for Osteogenesis Imperfecta
- Housework Aid for Paraplegic
- Tire Cutter for Sheltered Workshop
- Protected Environment for Woodworker
- Portable Suction/Support Bars

In conclusion, therefore, the establishment of a Rehabilitation Technology Applications Unit could serve as a clearinghouse for problems and ideas. This would entail creating a central idea bank. The purpose would be to clear the ideas against existing lists of equipment and have a functional cross-referencing basis that would facilitate access to information from a variety of perspectives.

Appendix A

IDENTIFICATION OF THE TYPES AND SCOPE
OF INFORMATION RELATING TO THE HANDICAPPED/DISABLED

Table A-1

LIST OF REHABILITATION ENGINEERING CENTERS

RSA Rehabilitation Engineers Centers

Dr James B Reswick
Project Director
Rehabilitation Engineering Center
Rancho Los Amigos Hospital
7601 East Imperial Highway
Downey, California 90242
Telephone 213-922-7167
Core Area "Functional Electrical Stimulation of Paralyzed Nerves and Muscles"

Mr A. Bennet Wilson, Jr.
Project Director
Rehabilitation Engineering Center
Krusen Research Center
Moss Rehabilitation Hospital
12th Street and Tabor Road
Philadelphia, Pennsylvania 19141
Telephone 215-329-9580

Dr. William Berenberg
Project Director
Rehabilitation Engineering Center
Children's Hospital Medical Center
300 Longwood Avenue
Boston, Massachusetts 02115
Telephone 617-734-6000, Ext. 2866
Core Area: "Neuromuscular Control Using Sensory Feedback Systems"

Dr. William A. Spencer
Project Director
Rehabilitation Engineering Center
Texas Institute for Rehabilitation and Research
1333 Moursund Avenue
Houston, Texas 77025
Telephone 713-797-1440
Core Area: "Effects of Pressure on Tissue"

Dr. Clinton L. Compere
Project Director
Rehabilitation Engineer Center
Northwestern University
345 East Superior Street
Room 1441
Chicago, Illinois 60611
Telephone 312-649-8560
Core area. "Internal Total Joint Replacement"

Dr. Carroll B. Larson
Project Director
Rehabilitation Engineer Center
University of Iowa
Orthopedics Department
Dill Children's Hospital
Iowa City, Iowa 52242
Telephone 319-356-3468
Core Area: "Low Back Pain"

Dr. Lawrence A. Scadden
Project Director
Rehabilitation Engineer Center
Smith-Kettlewell Institute of Visual Sciences
2232 Webster Street
San Francisco, California 94115
Telephone 415-563-2323
Core Area: "Sensory Aids Blind and Deaf"

Dr. Robert E. Tooms
Project Director
Rehabilitation Engineer Center
The University of Tennessee
Department of Orthopedic Surgery
1248 LaPaloma Street
Memphis, Tennessee 38114
Telephone 901-525-2531
Core Area: "Mobility Systems for Severely Disabled:

RECs Con't.

Dr. Charles H. Herndon
Project Director
Rehabilitation Engineering Center
Case Western Reserve University
School of Medicine
2219 Adelbert Road
Cleveland, Ohio 44106
Telephone 216-791-7300
Core Area: "Upper Extremity Functional Electrical Stimulation"

Prof. J. Raymond Pearson
Project Director
Rehabilitation Engineering Center
The University of Michigan
College of Engineering
225 West Engineering
Ann Arbor, Michigan 48109
Telephone 313-764-8464
Core Area: "Automotive Transportation for the Handicapped"

Mr John F. Jonas, Jr.
Project Director
Rehabilitation Engineering Center
Cerebral Palsy Research Foundation of Kansas, Inc.
4320 East Kellog Street
Wichita, Kansas 67218
Telephone 316-683-5627
Core Area: "Vocational Aspects of Rehabilitation"

Dr. Warren G. Stamp
Project Director
Rehabilitation Engineering Center
School of Medicine
Universtiy of Virginia
P.O Box 3368, University Station
Charlottesville, Virginia 22903
Telephone 804-977-6730
Core Area: "Spinal Cord Injury"

Rehabilitation Engineering at RSA Research and Training Centers

RT-1

Dr. Howard A. Rusk
Project Director
Medical Rehabilitation R&T Center
New York University
400 East 34th Street
New York, N ew York 10016
Telephone 212-679-2300
Core Area "Evaluation of Functional Performance of Devices for Severely Disabled Individuals"

RT-7

Dr. Paul Corcoran
Project Director
Medical Rehabilitation R&T Center
Tufts University
171 Harrison Avenue
Boston, Massachusetts 02111
Telephone 617-956-5625
Core Area: "Communication Systems for Individuals with Nonvocal Disabilities"

RSA Rehabilitation Engineering Centers

International

Dr Salah Hommossani
Undersecretary of State for
Rehabilitation
Ministry of Social Affairs
Mugamaa Building, Tahrir Square
Cairo, Egypt
Project Director
Rehabilitation Engineering Center
Wafa Wa Amal
Core Area. "Architectural Barriers"

Prof. A Senger, M D.
Institute of Orthopedic Surgery and
Rehabilitation
Academy of Medicine
Dzierzynskiego 135, 61 545 Poznan
Poland
Project Director
Rehabilitation Engineering Center
Core Area: "Upper Extremity
Disabilities"

Dr. Lojze Vodovnik
University of Ljubljana
Faculty of Electrical Engineering
61001 Ljubljana, Trzaska 25
Yugoslavia
Project Director
Rehabilitation Engineering Center
Core Area: "Functional Electrical
Stimulation"

Rehabilitation Engineering Centers

in the Veterans Administration

Anthony Staros
Director
VA Prosthetics Center
252 Seventh Avenue
New York, New York 10001
Telephone 212-620-6636

Dr. Wilton Bunch
Acting Director
Hines Rehabilitative Engineering
R&D Center
VA Hospital
Hines, Illinois 60141
Telephone 312-531-3280

Table A-2

A CROSS SECTION OF LABORATORIES, UNIVERSITIES, AND COMPANIES ENGAGED IN REHABILITATION ENGINEERING

Bell Laboratories, Inc.
Murray Hill, New Jersey

Children's Hospital at Stanford University
Palo Alto, California

Children's Hospital of Boston
Boston, Massachusetts (Boston air project)

Fidelity Electronics, Ltd.
Chicago, Illinois (electric hands & hooks, environmental controls)

General Teleoperators, Inc.
Downey, California (powered wheelchairs and environmental controls)

H C. Electronics, Inc.
Mill Valley, Calif.

Hingsley Manufacturing Co.
Costa Mesa, California (prosthetic components)

Innovative Systems Research, Inc.
Cleveland, Ohio (teleconferencing)

Johns Hopkins University
Applied Physics Laboratory
Fleet Systems Department
Laurel, Maryland (powered medical manipulation systems, electrical wheelchair controls)

Kurzweil Computer Products, Inc.
Cambridge, Mass. (Reading machines for the blind)

M I.T and C.S. Draper Lab.
Center for Advanced Rehabilitation Engineering
Mechanical Engineering Department
Cambridge, Mass.

McMaster University
Department of Bioengineering
Chedoke Rehabilitation Centre
Ontario, Canada

Northwestern University School and
Rehabilitation Institute of Chicago
Chicago, Illinois

Prentke-Romich, Inc.
Shreve, Ohio (electronic devices for severely handicapped in non-verbal communication and environmental control)

Southwest Research Institute
Department of Engineering and IMPART Program
San Antonio, Texas (Pressure on Tissue)

SRI International (formerly Stanford Research Institute)
Menlo Park, CA (information systems for rehabilitation, engineering services for the disabled)

Telesensory Systems, Inc.
Palo Alto, Calif. (Aids for the Blind)

Texas A&M University
College of Engineering
College Station, Texas
(automative adaptive equipment)

TRACE Research and Development Center
University of Wisconsin
Madison, Wisconsin (communication aids for the non-vocal severely handicapped)

University of Calif. at Berkeley
Biomechanics Laboratory
Dept. of Mechanical Engineering
Berkeley, Calif. (Mobility Aid
Project, Artifical
Limb Project)

University of Calif. at Davis
Dept. of Rehabilitation Engrg.
Davis, Calif.

University of Calif. at Santa Barbara
Dept. of Electrical Engineering and
Computer Science and Computer Systems
Laboratory
Santa Barbara, Calif

University of Texas at Austin
Dept. of Electrical Engineering
Austin, Texas

University of Utah
Mechanical Engineering Department
Salt Lake City, Utah

University of Wisconsin
Trace Center
Madison, Wisconsin (U.S manufacturing
company, prosthetic
and orthotic components)

Appendix A

PROFILES OF INFORMATION AND RESEARCH SOURCES IN BIOENGINEERING

Communications Foundation
National Institute for Rehabilitation Engineering
National Aeronautics and Space Administration
Science for the Blind Products
Trace Research and Development Center for
the Severely Communicatively Handicapped

COMMUNICATIONS FOUNDATION
600 New Hampshire Avenue, N.W.
Washington, DC 20037
PHONE. 202-333-0800

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments; in the future, sensory impairments in general*.

SCOPE OF ACTIVITIES: The Communications Foundation is dedicated to the application of modern technology to handicaps in human communications. Through technology, it seeks to increase the learning potential and participation in society of people with communications handicaps. The Foundation has two missions: 1) to research the need for special Communication aids (principally among the physically and socioeconomically handicapped) and 2) to encourage the development and distribution of such aids, free or at low cost, to those with communications handicaps. Currently, the Foundation is engaged in several research and planning activities. Its largest research program has been sponsored by the Rehabilitation Services Administration of the Department of Health, Education, and Welfare. In this program, the Foundation is: 1) identifying, examining and testing some of the more promising technological aids designed for blind and partially sighted persons, 2) developing hard data on employment circumstances, prospects and problems of blind and partially sighted individuals and 3) planning to establish, in cooperation with large corporations, pilot and demonstration projects involving the training and placement of blind and partially sighted persons in competitive industry through the use of appropriate technological aids. Other research projects in the planning or development stages will: 1) examine the application of technological aids to the education of visually handicapped children, 2) analyze the costs and the benefits, both economic and social, of providing compensatory aids for those whose handicaps limit their employability and 3) establish pilot and demonstration projects to test the effectiveness of various approaches and technological aids in improving the education, the employability and the personal lives of those with communications handicaps.

SERVICES: The Foundation provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) makes inquiries of other organizations on the inquirer's behalf and 4) sends brochures, pamphlets or fact sheets. A newsletter is in the planning stage.

Notes. The Communications Foundation was chartered in March 1973. In the future, the Foundation plans to: 1) institute a comprehensive plan for the provision of technological aids and services, free or at low cost, to persons with communications handicaps, 2) publish a periodical, monographs and full-length books dealing with human communication and communications handicaps.

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*Much of this information is derived from Directory of National Informational Sources on Handicapping Conditions and Related Services, Clearing House on the Handicapped, Office for Handicapped Individuals.

NATIONAL INSTITUTE FOR REHABILITATION ENGINEERING
Consumer Advisory Service
97 Decker Road
Butler, NJ 07405
PHONE: 201-838-2500

HANDICAPPING CONDITIONS SERVED: Sensory impairments (including, hearing, visual acuity and visual field), speech impairments, musculoskeletal/orthopedic conditions in general, neurological disorders in general, respiratory conditions in general, disfigurement, genitourinary disorders in general, autism, learning disabilities, mental retardation, multiple handicaps and disabling cancers and genetic disorders.

SCOPE OF ACTIVITIES: The National Institute for Rehabilitation Engineering (NIRE) was founded to utilize current technology to help severely and multiply handicapped persons lead a better life through social and vocational rehabilitation. It strives to help people who are permanently disabled and cannot be cured of their disabilities by medical, surgical or therapeutic means. The Institute is composed of medical professionals and engineers devoted to the design and construction of devices which help many types of handicapped people to live and function despite their disabilities. It uses multidisciplinary human factor engineering and time/motion human performance efficiency methods. NIRE provides information on equipment and aids to assist severely handicapped persons in the following areas. 1) employment, 2) housing, 3) transportation, 4) homemaking, 5) overcoming architectural barriers, 6) recreation/physical education, 7) activities of daily living and 8) maintenance (health) NIRE also has some information on civil rights/legislation, such as the right of a physically handicapped person to obtain a driver's license, and on education and training for professionals in the field of rehabilitation engineering.

SERVICES. NIRE provides the following information services to lay and professional inquirers 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets, 5) sends previously prepared bibliographies, indexes or abstracts, 6) provides films or other audiovisuals, 7) sends the Institute's newsletter, 8) prepares bibliographies, abstracts or indexes in response to certain individual requests and 9) permits on-site use of its holdings. NIRE's consumer advisory service emphasizes information on equipment and its availability and suitability in a particular situation. Materials published by NIRE for distribution are primarily descriptive of the Institute's direct services and the application of technology to difficulties caused by disabilities.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Technology Utilization Program
600 Independence Avenue, S.W.
Washington, DC 20546
PHONE 202-755-3140

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general

SCOPE OF ACTIVITIES: The Technology Utilization (TU) Program of the National Aeronautics and Space Administration (NASA) offers a variety of services to facilitate the transfer of aerospace technology to non-aerospace applications. To assist engineers, industrial researchers, business executives, city officials and other potential users in applying space technology to their problems, NASA sponsors six Industrial Applications Centers An extensive library of computer programs is also available through COSMIC, the TU Program's outlet for NASA-developed software.
NASA TU Applications teams, staffed by professionals from a variety of disciplines, work with Federal agencies, local governments and health organizations to identify critical public sector problems in areas such as safety, health, transportation and environmental protection, which are amenable to technical solutions. Various innovations in medical technology and aids for handicapped persons are an outcome of the TU Program

SERVICES. NASA is able to respond to specific technical inquiries pertaining to their technology from professionals by letter or phone. The Technology Utilization Office has also developed a number of publications of information value. SPINOFF 1976· A BICENTENIAL REPORT discusses some of the technical developments resulting from the space program. SPACE BENEFITS: THE SECONDARY APPLICATION OF AEROSPACE TECHNOLOGY IN OTHER SECTORS OF THE ECONOMY provides integrated resource information on the transfer of aerospace technology to other sectors of the U S economy NASA TECH BRIEFS, published quarterly, is a current awareness and problem-solving tool with reviews of new developments in various areas of interest and highlights of a few of the potential new products

Notes: The National Aeronautics and Space Act of 1958 requires that the Administration provide for the widest practicable and appropriate dissemination of information concerning its activities and their results. To help carry out this objective, the NASA Technology Utilization Program was established in 1962. For information, contact Donald J. Vargo, Manager, Rehabilitation Programs, Biomedical Applications Division, Technology Utilization Office, Code KT, at address above

SCIENCE FOR THE BLIND PRODUCTS
221 Rock Hill Road
Bala-Cynwyd, PA 19004
PHONE: 215-664-9429

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments.

SCOPE OF ACTIVITIES: Science for the Blind Products (SFB) is a profit-making company with several functions: 1) the development and manufacture of special instruments for blind persons, 2) the sale of these instruments and other special aids and materials for blind and visually limited individuals and 3) the sale of general mail-order merchandise through sound sheet or audio catalogs, which allow persons unable to read print to have access to items available to sighted persons by mail-order.

SERVICES: Science for the Blind Products provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter and 2) sends brochures, pamphlets or fact sheets. Information disseminated is primarily on the services and products of the organization. Free listings of products are available on request. Instruments for sale may be applicable to business, profession, hobby or home use.
Examples of products available are: audicators (a sound source which performs a variety of operations including alerting a blind individual to flashing phone lights, liquid levels, etc.), aud-a-balls, calcu-tacs (calculators with braille printouts), braille clocks and other items. SFB is often called upon to assist with fabrication or adaptation of tools or instruments for specific job applications. Often an instrument can be modified, or standard industry tools can be brailled or adapted for use by visually limited persons.
A bound, comprehensive print catalog containing abridged instructions and complete specifications for all special instruments, and descriptive material on all items sold by SFB is available. It is intended as a reference guide for agency and library use.

Notes: Science for the Blind Products was established in 1955 as a nonprofit organization. In 1973, it became a profit-making company, and its volunteer services were taken over by Volunteer Services for the Blind.

TRACE RESEARCH AND DEVELOPMENT CENTER
FOR THE SEVERELY COMMUNICATIVELY HANDICAPPED
1500 Highland Avenue, Room 314
Madison, WI 53706
PHONE: 608-262-6966

HANDICAPPING CONDITIONS SERVED: Severe speech impairments.

SCOPE OF ACTIVITIES: The goal of the Trace Research and Development Center for the Severely Communicatively Handicapped is to provide severely physically handicapped speech impaired individuals with efficient and meaningful channels of communication.
Its mission is to: 1) define the communication needs, as well as language acquisition and language development problems of individuals whose speech and writing are severely impaired, 2) locate, develop and evaluate communication techniques and aids which augment the existing communication modalities of individuals whose speech and writing skills are severely impaired, 3) explore and evaluate techniques to facilitate language development for individuals whose language development has been affected by their severe physical disability, 4) disseminate information on communication aids and techniques generated by the Trace Center and by researchers and institutions to interested professionals, centers, individuals and parents in the United States and abroad, 5) advance the training of professionals, parents and students in areas related to the communication alternatives for the nonvocal, 6) facilitate the development and commercial production of special materials and aids so that they will be available for those individuals who require them and 7) help coordinate research efforts in this field in order to eliminate duplicated effort and promote compatible materials and aids. Information is particularly strong in the area of research and clinical programs (international coverage) for severely speech impaired (nonvocal) individuals.

SERVICES: The Trace Center provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) sends brochures, pamphlets or fact sheets, 4) sends previously prepared bibliographies, indexes or abstracts, 5) provides films or other audiovisuals and 6) permits on-site use of its holdings which include files on specific topics and some literature. An international newsletter is being initiated by the Center.
Several publications of the Center are also valuable information sources. The MASTER CHART AND LISTING OF NON-VOCAL COMMUNICATION AIDS provides a table of information about existing communication aids. The ANNOTATED BIBLIOGRAPHY OF COMMUNICATION AIDS was compiled to make available summary information in this field. It describes some of the communication techniques and aids for the severely physically handicapped currently being designed, developed or manufactured in the United States, Canada or abroad. A complete list of materials available from the Center is provided on request.

Notes: The Trace Research and Development Center for the Severely Communicatively Handicapped, formerly known as the Cerebral Palsy Communication Group, is located at the University of Wisconsin. As part of its mission, the Center maintains files on ongoing research projects at other institutions, particularly in the areas of nonvocal communication techniques and aids, communication development programs, special symbol systems and training materials. Efforts are made to coordinate research activities in the field. The Center also conducts workshops and inservice training.

Appendix A

PROFILES OF INFORMATION
AND RESEARCH SOURCES OF REHABILITATION EQUIPMENT

Accent on Information
American Alliance for Health, Physical Education and Recreation
American Occupational Therapy Association
American Physical Therapy Association
National Easter Seal Society for Crippled Children and Adults
National Paraplegia Foundation
People to People Committee for the Handicapped
Library of Congress Division for the Blind and Physically Handicapped
National Technical Information Service, Department of Commerce
National Library of Medicine/National Institutes of Health, Public Health Service, Department of Health, Education, and Welfare
Rehabilitation Services Administration/Office of Human Development Department of Health, Education, and Welfare

ACCENT ON INFORMATION
Gillum Road & High Drive
P.O. Box 700
Bloomington, IL 61701
PHONE: 309-378-4213

HANDICAPPING CONDITIONS SERVED: All physical handicaps.

SCOPE OF ACTIVITIES: Accent on Information (AOI) is a computer automated retrieval system operated by Accent on Living, Inc. The system contains information designed to help persons with disabilities live more effectively by providing them with information in the following subject and problem areas: 1) products and devices, 2) mobility aids, 3) mobility problems, 4) vocations, 5) employment, including vocational rehabilitation and training and rights, hiring regulations and special needs of the handicapped employee, 6) social change, 7) housing and architectural barriers, 8) private and government assistance, 9) organizations, 10) special facilities, 11) special laws and legislation, 12) furniture, 13) business machines, 14) using tools, 15) remote controls, 16) voting (e.g. accessibility of voting booths), 17) formal education of handicapped individuals, 18) activities of daily living, 19) communications, 20) recreation and 21) physical education. The information service is particularly strong in the areas of activities of daily living and equipment/special devices/aids. AOI does not include a large amount of information on research; however, it does include isolated pieces of information on research of specific importance to disabled people, e.g. spinal cord injury research, new mobility aids, etc.

SERVICES: To request information, an individual should write AOI specifically describing the subject or problem area of interest and his/her disability in as much detail as possible. Presently, searches are made manually from indexed computer printouts of the AOI files. An AOI staff member reviews the results of the search and prepares a final answer (frequently abstracts) which is sent to the individual. Because of the growing number of items in the AOI files, in the near future AOI expects to begin making the searches by computer.

Notes: Accent on Living, Inc., of which AOI is a part, was founded by Raymond C. Cheever over 20 years ago. It publishes ACCENT ON LIVING MAGAZINE.

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ACCENT ON INFORMATION SEARCH REQUEST FORM
P.O. Box 700, Bloomington, Illinois 61701

(use a separate form for each question)

Name_____ Age_____ Sex_____

Street_____

City_____ State_____ Zip_____

ACCENT ON INFORMATION is a computerized retrieval system containing information needed to help persons with disabilities to help themselves and live more effectively. AOI files are continually being updated from information being received daily from many sources. Let the resources of AOI do the searching for you and provide you with the kind of information that can help solve problems.

I. Explain your question in your own words. Make your question as specific as possible. Use as much detail as needed to make your question clear.

_____

_____

_____

_____

_____

II. To help us to make a search for the best answers for you, please check one of the following which most closely applies to your question as you have stated it above. Be as specific as possible. Check a main category (in all caps) unless a sub-category better fits your situation.

__EATING
__Eating Utensils
__Feeding (Plate to mouth)
__DRINKING
__Containers
__TOILET
__Bladder
__Bowel Care
__Catheter & Incontinent Devices
__Toilet Seats
__Protective Clothing
__Urinals
__Types of Toilets
__Safety Devices
__BATHING
__Types of Bath Tubs
__Bath Lifts
__Bath Aids
__Safety Devices
__GROOMING
__Teeth
__Hair Care
__Nail Care
__Shaving
__Personal Hygiene
__DRESSING
__Devices to Help Dress
__Fasteners
__CLOTHING (Inner & Outer Garments, Shoes)
__TRANSFER

__HOUSING & ARCHITECTURAL BARRIERS
__Ramps
__Lifts & Elevators
__Stairs & Steps
__Relating to Safety
__Home & Apartment (plans)
__Office (plans & designs)
__Public & Business Buildings
__Lodging (motels, hotels)
__Curbs
__Laws & Legislation
__FURNITURE
__Bed
__Table or Desk
__Chair
__HOME MANAGEMENT
__Food Preparation (cooking aids, methods)
__Food Serving (devices for holding, serving trays, serving utensils)
__Opening Containers
__Cleaning (housecleaning, dishwashing)
__Laundry (washing & drying, ironing)
__Bedmaking
__Shopping
__Child Care
__Sewing

__READING
__Talking Books & Magazines
__Reading Aids
__Braille
__WRITING (writing aids)
__TELEPHONING
__REMOTE CONTROLS
__GAMES
__HANDICRAFTS
__SPORTS
__GARDENING
__EDUCATION
__Correspondence & home training
__Elementary
__High School
__Trade
__College & University
__MARRIAGE & FAMILY
__Marriage
__Birth Control
__Sexuality
__Adoption
__Pregnancy & Having Children
__VOTING
__LAWS & LEGISLATION
__VOCATION
__Home Operated Business
__PRIVATE OR GOVERNMENT ASSISTANCE ORGANIZATIONS
__PERSONAL ADJUSTMENT

__MOBILITY AIDS
__Prosthetics
__Orthotics
__Wheelchairs
__Wheelchair Parts
__Canes & Crutches
__Patient Lifts
__Motorized Wheelchair Power Units
__Walkers
__AUTOMOBILE TRAVEL
__Type of Vehicle
__Testing & Licensing
__Driver Training
__Emergency Assistance
__Getting In
__Insurance
__PUBLIC TRANSPORTATION
__Trains
__Planes
__Cabs
__Buses
__Subways
__AUTOMOBILE CONTROLS
__Steering
__Brake
__Lights & Horn
__Accelerator
__Starter
__Door Locks & Handles
__TRAVELING & TOURING (vacations, tours, etc)

Turn this page over to answer questions on other side

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Because of AOI's classification system, the following information is requested to help us locate the best answers for you.

III. In your own words, describe your disability and your specific physical limitations.

_____

_____

_____

_____

_____

IVa. Check below those parts of your body that are affected by your disability.

____neck and head movements
____one hand
____both hands
____one arm
____both arms
____one leg
____both legs
____other, explain_____

IVb. Which best describes your disability?

____Some loss of movement
____Total loss of movement
____Little or no control of movement
____Loss of limb or limbs
____Other, explain_____

V. ☐ Enclosed is $6.00 for basic search which includes up to 25 most recent references. Bill me for photocopies, if any (25¢ for each photocopy page supplied).

☐ When making the above search, send me additional references, if available. ____up to 25 more; ____up to 50 more; ____no limit; to be billed at 4¢ per reference.

Your $6.00 will be returned if AOI has no information on the subject.

These charges are waived for disabled individuals who cannot afford to pay. An important philosophy of Accent On Information, Inc., founded in 1956, is that never should the lack of money make it difficult or impossible for any disabled person to be able to get the kind of information that could help that person live more effectively.

AMERICAN ALLIANCE FOR HEALTH, PHYSICAL EDUCATION AND RECREATION
Physical Education and Recreation for the Handicapped:
Information and Research Utilization Center
1201 16th Street, N.W.
Washington, DC 20036
PHONE: 202-833-5547

HANDICAPPING CONDITIONS SERVED: Sensory impairments in general, communicative impairments in general, musculoskeletal/orthopedic conditions in general, neurological disorders in general, blood disorders in general, cardiovascular disorders in general, respiratory conditions in general, metabolic/nutritional disorders in general, mental/emotional disorders in general and all combinations of the above.

SCOPE OF ACTIVITIES: Physical Education and Recreation for the Handicapped: Information and Research Utilization Center (IRUC) is designed to collect, categorize, interpret, package/repackage and disseminate information and materials about activities, methods, ongoing programs, personnel preparation, promising practices, research, demonstration and other pertinent data on physical education/adapted physical education recreation/therapeutic recreation and related areas for individuals with various handicapping conditions. In addition, IRUC has general information on disabling conditions, as well as information on: 1) education and employment of personnel dealing with handicapped individuals, 2) health, including diagnostic evaluation and rehabilitation, 3) psychosocial services, 4) activities of daily living and 5) equipment/special devices/aids.

SERVICES: IRUC offers a variety of special services to interested inquirers. These include: 1) abstracts with information about publications, books, curriculum guides, program descriptions, child use materials, research studies, audiovisual materials, demonstration projects, diagnostic instruments and project reports, 2) reprints of hard to find or out-of-print materials, 3) special customized searches of titles, library and other sources providing detailed information and materials about an inquirer's topic, 4) guides, information sheets and previously prepared bibliographies and 5) books and other publications of the American Alliance for Health, Physical Education and Recreation. IRUC also makes available mailing labels or listings of organizations, agencies, resource people and ongoing programs to interested inquirers, distributes materials, fliers, brochures, announcements and other materials to the IRUC mailing list and provides consulting services for all types of programs at all levels.

Special Information Services. IRUC has developed a computer automated retrieval system containing information on resources, programs and personnel. The data base is updated several times a year and is available for IRUC staff use and for purchase. The base price is $30.00/ 1,000 retrievals, with additional costs for special searches.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION
6000 Executive Blvd.
Rockville, MD 20852
PHONE: 301-770-2200

HANDICAPPING CONDITIONS SERVED: Musculoskeletal/orthopedic conditions in general, neurological disorders in general, mental/emotional disorders in general, end stage renal disease, sensory motor dysfunction, stroke, cardiological disorders, cancer and similar conditions.

SCOPE OF ACTIVITIES: The American Occupational Therapy Association (AOTA) is the professional organization for occupational therapists and occupational therapy assistants. Its purposes are to: 1) improve and advance the practice of occupational therapy, 2) improve and advance education and qualification in occupational therapy, 3) establish standards of performance, certification and accreditation, 4) foster research and study of occupational therapy and 5) engage in other activities to further the dissemination of knowledge on the practice of occupational therapy. Areas of coverage relative to occupational therapy and the handicapping conditions it serves include: 1) education of occupational therapists, 2) employment, including the special needs of the handicapped employee and employment of occupational therapists, 3) health, including diagnostic evaluation, treatment and rehabilitation, 4) architectural barriers, 5) activities of daily living, 6) equipment/special devices/aids and 7) research. AOTA is particularly strong in providing career and practice information in occupational therapy.

SERVICES: AOTA provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) sends brochures, pamphlets or fact sheets, 4) provides films or other audiovisuals and 5) sends the organization's newsletter. The Association also permits professionals on-site use of its reference and thesis libraries and sends them previously prepared bibliographies, indexes or abstracts; individual bibliographies, indexes or abstracts are also prepared in response to certain professional requests.
Several publications are also important information sources. Included among these are the AMERICAN JOURNAL OF OCCUPATIONAL THERAPY and a pamphlet OCCUPATIONAL THERAPY EDUCATIONAL PROGRAMS. A multimedia catalog of publications and audiovisuals is available on request.

Note: Occupational therapy is a health profession providing services to people with physical injuries or illness, developmental problems, social and psychological difficulties and to elderly persons. Occupational therapists (OTs) help communities and agencies and use selected educational, vocational and rehabilitative activities to help individuals become self reliant and build a balanced life style of work and leisure. OTs work in hospitals, clinics, schools, rehabilitation centers, home care programs, private practice, community health centers, nursing homes, day care centers and psychiatric facilities and are part of the health care team which includes physicians, physical therapists, vocational counselors, nurses, social workers, speech pathologists, teachers and other specialists.

AMERICAN PHYSICAL THERAPY ASSOCIATION
1156 15th Street, N.W.
Washington, DC 20005
PHONE: 202-466-2070

HANDICAPPING CONDITIONS SERVED: All physical handicaps and mental retardation.

SCOPE OF ACTIVITIES: The American Physical Therapy Association (APTA) fosters the development and improvement of physical therapy service and education through the coordinated action of physical therapists, allied professional groups, citizens, agencies and schools. The Association evaluates educational programs and curricula, directs the maintenance of professional standards and promotes scientific research. The national office provides current information on all aspects of the profession. Specific areas of interest include: 1) education of personnel dealing with handicapped individuals, 2) employment of personnel dealing with handicapped individuals, 3) health, including treatment and rehabilitation, 4) recreation/physical education, 5) equipment/special devices/aids and 6) research.

SERVICES: The national office provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers (mostly local APTA chapters), 3) sends brochures, pamphlets or fact sheets and 4) permits on-site use of its holdings. In addition, APTA provides professional inquirers with the following services: 1) refers inquirers to direct service providers, 2) sends previously prepared bibliographies, indexes or abstracts, 3) sends the organization's newsletter and 4) makes inquiries of other organizations on the inquirer's behalf. APTA operates a placement service for professionals, both members and nonmembers, and conducts an annual meeting and periodic symposia.

NATIONAL EASTER SEAL SOCIETY FOR CRIPPLED CHILDREN AND ADULTS
2023 W. Ogden Avenue
Chicago, IL 60612
PHONE: 312-243-8400

HANDICAPPING CONDITIONS SERVED: All physical handicaps with emphasis on sensory impairments, communicative impairments, musculoskeletal/orthopedic conditions, cerebral palsy, epilepsy, multiple sclerosis, spinal cord injuries, stroke, autism and learning disabilities.

SCOPE OF ACTIVITIES: The National Easter Seal Society for Crippled Children and Adults (NESSCCA) is the nation's largest and oldest voluntary health agency providing direct rehabilitation services to the disabled persons. The Society conducts a nationwide program of treatment, education and research. Some 2,000 facilities and programs, organized on a State basis and in the District of Columbia and Puerto Rico, provide direct Services.

Information is provided in the following areas: 1) general information about handicapping conditions, 2) education, including the formal education of handicapped individuals and the education and training of personnel dealing with them, 3) employment, including vocational rehabilitation and training and the rights, hiring regulations or special needs of handicapped employees, 4) housing, 5) transportation, 6) health, including prevention, treatment and rehabilitation, 7) psycho-social services, 8) recreation/physical education, 9) activities of daily living, 10) equipment/special devices/ aids, 11) civil rights/legislation and 12) barrier-free design.

SERVICES: NESSCCA maintains an Information Center at its national headquarters which provides extensive information to the general public, handicapped persons and professionals. The Society provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) sends brochures, pamphlets and fact sheets, 4) sends previously prepared bibliographies and checklists, 5) sends the organization's newsletter, 6) prepares bibliographies, abstracts or indexes in response to certain individual requests and 7) permits on-site use of the Library's holdings. Lay and handicapped persons are also provided with referral services to direct service providers.

In addition to these services, the Society engages in a publications program coordinated by the Information Center and distributes a wide variety of pamphlets, reprints and other publications directed to both lay and professional audiences. The PUBLICATIONS CATALOG is available upon request and is strong in the following areas: advocacy, barrier-free design, careers, minimal brain dysfunction, occupational therapy, recreation and camping and stroke. The Society also publishes a monthly interdisciplinary journal, REHABILITATION LITERATURE. Reprints of original articles are available for distribution.

The Easter Seal Research Foundation awards grants to universities, medical schools, hospitals and other research institutions to finance investigation in fields directly relating to the needs of their clients.

The Easter Seal Library and Information Center houses a major collection of informational and educational materials related to handicapped persons. The collection consists of over 4,000 monographs and 40,000 reports, pamphlets, reprints and miscellaneous items arranged by subject in over 100 pamphlet file drawers. The Library regularly receives 600 periodicals, including 250 substantive journals. The resources of the entire collection are utilized in responding to requests for information and photocopies of appropriate materials are distributed without charge.

NATIONAL PARAPLEGIA FOUNDATION
333 N. Michigan Avenue
Chicago, IL 60601
PHONE: 312-346-4779

HANDICAPPING CONDITIONS SERVED: Spinal cord injuries and disease.

SCOPE OF ACTIVITIES: The National Paraplegia Foundation (NPF) is a voluntary health agency concerned with the total problem of paraplegia. Its goals are to: encourage basic scientific research to liberate paraplegics from their wheelchairs; bring about the best medical care and rehabilitation for paraplegics; and help individuals who are paraplegics achieve their own goals. To achieve these goals, NPF: 1) promotes and facilitates the exchange of scientific information, 2) fosters better immediate and long-term care and treatment for paraplegics, 3) advocates the implementation of a national network of regional spinal cord injury systems to provide high quality care, rehabilitation and research and coordinates efforts in this area, 4) refers individual paraplegics to the best available sources of care, 5) publishes and distributes literature on paraplegia to hospitals, members of the medical profession, individuals and others and 6) provides information to paraplegics and others directly concerned on self-help devices, equipment, personal care and other matters of special interest to paraplegics. The Foundation also has some information on architectural barriers.

SERVICES: NPF provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets, 5) sends previously prepared bibliographies, indexes or abstracts, 6) prepares bibliographies, indexes or abstracts in response to certain individual requests, 7) sends the organization's magazine, on request and 8) permits on-site use of its holdings.

In addition to other services, NPF: 1) identifies research problems needing investigation and informs scientists as appropriate, 2) makes small incentive grants in support of research and helps selected scientists obtain funds, 3) sponsors spinal cord injury conferences and seminars and 4) keeps paraplegics and others informed of progress and enlists their support.

PEOPLE TO PEOPLE Committee for the Handicapped
LaSalle Bldg.
Suite #610
Connecticut Avenue & L Street
Washington, DC 20036
PHONE: 202-785-0755

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The Committee for the Handicapped of the People to People Program was formed to supply United States information about handicapping conditions and programs for handicapped individuals to persons overseas. In addition, the Committee undertakes tasks for the White House and works closely with other Federal Government agencies and private organizations serving handicapped individuals. The Committee provides information in the following areas: 1) general information about disabling conditions, 2) education, including formal education of handicapped individuals and education of personnel dealing with them, 3) employment, including vocational rehabilitation and training and rights, hiring regulations and special needs of the handicapped employee, especially affirmative action, 4) transportation, 5) rehabilitation (health), 6) recreation/physical education, 7) equipment/special devices/aids and 8) civil rights/legislation. The Committee is particularly interested in sharing information internationally among countries and in providing U.S. organizations with information needed to help them comply with affirmative action programs.

SERVICES: The Committee provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) makes inquiries of other organizations on the inquirer's behalf, 3) sends brochures, pamphlets or fact sheets and 4) sends the organization's newsletter. Lay inquirers are also referred to other information centers or direct service providers.

LIBRARY OF CONGRESS Division for the Blind and Physically Handicapped
Taylor Street Annex
1291 Taylor Street
Washington, D.C. 20542
PHONE: 202-426-5100

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments, deaf-blind and physical handicaps that restrict a person's ability to use a conventional book.

SCOPE OF ACTIVITIES: The Division for the Blind and Physically Handicapped (DBPH) of the Library of Congress is charged with providing specialized materials and services for the blind and physically handicapped population of the United States unable to read ordinary print. With copyright permission granted by authors and publishers, DBPH selects and produces full-length books and magazines in braille and on recorded disc and cassette. These books and magazines are then distributed to a cooperating network of 54 regional and 96 subregional (local) libraries that circulate them to eligible borrowers. Reading materials are sent to readers and returned to libraries by postage-free mail. Braille music scores (some also in large type or recorded form) are also available from DBPH. In addition, DBPH trains volunteer braille transcribers, sets standards in this area and certifies those qualified. The DBPH Reference Department collects and organizes information on blindness and physical handicaps (except legal and medical information) and offers reference and referral services. Materials from specialized sources, such as producers of catalogs and manufacturers of appliances and equipment are also available. Information is provided in the following areas relative to blindness and physical handicaps: 1) education, including formal education of handicapped individuals and education of personnel dealing with them, 2) health, including rehabilitation and maintenance, 3) psycho-social services, 4) recreation/physical education, 5) activities of daily living, 6) equipment/special devices/aids, 7) civil rights/legislation and 8) some research. Information is particularly strong in the areas of aids and appliances and programs and services available on the national level for handicapped individuals.

SERVICES: While DBPH provides a variety of reference and referral services, its primary function is to provide reading services to blind and physically handicapped persons.

NATIONAL TECHNICAL INFORMATION SERVICE Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
PHONE: 703-557-4600

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The National Technical Information Service (NTIS) is the central source for the public sale of Federal Government-sponsored research, development and engineering reports and other analyses prepared by Special Technology Groups (groups providing inquiry services, data books and research reports and newsletters in a specific technical area).
NTIS also is a central source for Federally generated machine processable files. NTIS ships about 20,000 information products daily as one of the world's leading processors of specialty information. It supplies its customers with about four million documents and microforms annually. The NTIS information collection exceeds 900,000 titles and all are available for sale.
Timely and continuous availability of reports from NTIS is ensured by agreements between NTIS and Federal research sponsoring organizations and Special Technology Groups. NTIS is the marketing coordinator for the latter, for their publications, technical inquiries and special analyses.
Research reports available on handicapped persons and handicapping conditions vary with the number of agencies depositing reports in this area.

SERVICES: NTIS offers a number of information services to lay and professional persons to assist them in locating reports available in their areas of interest. These services include; computer-based bibliographic search services; announcement and abstracting services; sale of publications; and general public information services.
NTIS offers two computer-based bibliographic search services (NTI-Search): 1) Published Searches, bibliographies developed by information specialists at NTIS from the NTIS data base and prepared to meet anticipated user needs in specific subject areas and 2) the on-line search service providing customized searches in response to the individual user's needs. Through these searches, individuals may locate summaries of interest from among some 480,000 Federally sponsored research reports completed and published from 1964 to date; about 60,000 new summaries are added annually. An additional 180,000 descriptions of ongoing and recently terminated research projects, compiled by the Smithsonian Science Information Exchange, are also computer retrievable. Published searches are updated at regular intervals and are available in paper copy or microfiche. Copies of whole research reports, on which summaries are based, are sold by NTIS. A listing of Published Searches is available on request.

Various publications of NTIS are also primary information sources. Current summaries of new research reports and other specialized information in various categories of interest are published in some 26 weekly newsletters, WEEKLY GOVERNMENT ABSTRACTS, and indexed. The all-inclusive, biweekly journal, GOVERNMENT REPORTS ANNOUNCEMENTS & INDEX, is published for librarians, technical information specialists and those requiring summaries in a single volume.

A standing order microfiche service, SELECTED RESEARCH IN MICROFICHE (SRIM), automatically provides subscribers with the full texts of research reports specially selected to satisfy individual requirements. Automatic distribution of paper copies is also available.

NATIONAL LIBRARY OF MEDICINE National Institutes of Health,
Public Health Service, Department of Health, Education, and Welfare
8600 Rockville Pike
Bethesda, MD 20014
PHONE: 301-496-6095

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The mission of the National Library of Medicine (NLM) is to collect, organize and make available biomedical information to investigators, educators and practitioners and to carry out programs designed to develop and strengthen existing medical library services. According to NLM, it is the world's largest research library in a single scientific and professional field; it is also the central resource for the existing national biomedical information system (a system of co-operating regional and local medical libraries).
The Library collects materials exhaustively in some 40 biomedical areas and to a lesser degree, in such related subjects as general chemistry, physics, zoology, botany, psychology and instrumentation. The holdings include about one and a half million books, journals, technical reports, documents, theses, pamphlets, microfilms and pictorial and audiovisual materials; more than 70 languages are represented. Housed in the Library is one of the nation's largest medical history collections, with contents dating from the 11th to the mid-19th century.
Information relative to handicapping conditions or handicapped people is available in the following areas: 1) health, including prevention of disease, diagnostic evaluation, treatment, rehabilitation and maintenance, 2) psycho-social services, 3) equipment/special devices/aids, including prosthetics and 4) research.

SERVICES: The primary information service of NLM is its computer-based Medical Literature Analysis and Retrieval System (MEDLARS) which was established to achieve rapid bibliographic access to NLM's vast store of biomedical information. It became operational in January 1964 with the publication of the first computer-produced issue of INDEX MEDICUS, a comprehensive, monthly subject-author index from approximately 2,200 of the world's biomedical journals. The principal objective of MEDLARS is to provide references to biomedical literature for research scientists, clinicians and other health professionals. MEDLARS contains over 2.3 million references dating from 1964.
MEDLINE (MEDLARS On-Line) became operational in 1971 and provides the capability in medical libraries around the country to query the NLM computer's store of journal article references for instant retrieval. MEDLINE contains over 500,000 citations from 3,000 biomedical journals from the current year plus two previous years. Further coverage is provided by ancillary files which cover literature from 1966-1973. A data base containing only current month's citations, called SDILINE, is a subset of MEDLINE designed to provide a current awareness or selective dissemination of information service. MEDLINE is updated and SDILINE replaced each month. Information may be retrieved on a given subject by entering terms from article titles and/or abstracts or by entering any

of 14,000 medical subject headings listed in the MEDLINE controlled vocabulary, MESH. MEDLINE is available at more than 350 institutions, government agencies and companies in the U.S., Canada, Europe and Asia.

In addition to on-line services, MEDLARS provides access to medical literature by: 1) preparing citations for publication in INDEX MEDICUS and the NLM Current Catalog, 2) compiling other recurring bibliographies on specialized subjects of wide interest and 3) publishing and distributing selected "Literature Searches" on a wide basis.

Publication lists are available on request and are included in monthly issues of INDEX MEDICUS.

To provide more rapid dissemination of biomedical information, the Library has developed a network arrangement through which interlibrary loan activities, MEDLARS and MEDLINE can be shared more efficiently by libraries around the nation. Eleven major institutions have been designated Regional Medical Libraries to provide service to other libraries in their regions. Although NLM remains the heart of the network, more and more services are being provided directly by regional libraries.

The Lister Hill National Center for Biomedical Communications was established within NLM to improve health care delivery, medical education and biomedical research through new applications of computer and communication technology. It also serves as the focal point within DHEW for coordination of biomedical communications systems and network projects. Current efforts include: coordination and planning on behalf of the health community for experimental health applications of Communications Technology Satellite, including public and professional education, remote professional consultation, communication of research results and teleconferencing in any of the health desciplines, research and development in the area of computer based education/computer-assisted instruction, for which a Learning Resources Laboratory has been established; and planning programs in continuing professional medical education.

NLM offers assistance to the nation's medical libraries for library resources, research in biomedical communication, biomedical publication and Regional Medical Libraries.

REHABILITATION SERVICES ADMINISTRATION Office of Human Development, Department of Health, Education, and Welfare
Room 4324 Switzer Building
Washington, DC 20201
PHONE: 202-245-0322

HANDICAPPING CONDITIONS SERVED: All handicapping conditions; with the passage of the Rehabilitation Act of 1973, the severely handicapped have become a primary concern.

SCOPE OF ACTIVITIES: The Rehabilitation Services Administration (RSA) implements the Rehabilitation Act of 1973. RSA is part of the State-Federal vocational rehabilitation program created in 1920 by the Industrial Rehabilitation Act. The basic purpose of the program is to help disabled persons become employed. Services are provided through State Vocational Rehabilitation agencies funded through a formula grant on a four-to-one Federal-State matching ratio. State Vocational Rehabilitation agencies operate according to a plan filed with RSA which follows requirements specified by law.
Eligibility for services is determined by the State agency. Additional grant-in-aid programs make possible rehabilitation services, training of personnel, construction of rehabilitation facilities and basic and applied research into new concepts of rehabilitation.
General information about specific programs is provided to agencies, professional groups and others interested in Research and Development grant applications, counselor training and other RSA programs. Information requests from potential clients are referred to the State agency in the geographic area where the clients reside.
Information is provided about vocational rehabilitation and training and other employment considerations such as rights, hiring regulations and special needs of the handicapped employee; also on rehabilitation (health), psycho-social services and rehabilitation legislation. In the areas of activities of daily living and equipment/ special devices/aids, RSA most frequently refers an inquirer to State or RSA supported private agencies where reports of pertinent research and development studies are available; direct services in these areas are provided by the State vocational rehabilitation agencies. These agencies make decisions on how and to whom they will provide services and provide an inquirer with pertinent information on eligibility requirements, application procedures, etc. Most of the information available from RSA is program information that would normally be sought by a professional person or an agency. Client information (i.e. counseling, individual written plan and other services) is available through the States.

SERVICES: For the lay and professional inquirer, RSA provides the following information services: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) sends brochures, pamphlets or fact sheets and 4) sends the RSA magazine, AMERICAN REHABILITATION, on request. Professional inquirers are provided with previously prepared bibliographies, indexes or abstracts and films and other audiovisuals. Lay persons are referred to direct service providers when necessary.
Information on the research, demonstration and training programs supported by RSA (and previously by the Social and Rehabilitation Service (SRS)) is provided through the RSA Research Information System (formerly the SRS Research Information System).

Information is available in the form of abstracts and final reports (both printed copy and microfiche) which are deposited in all State Vocational Rehabilitation agencies, the Regional Rehabilitation Research Institutes and the Research Utilization Laboratories. Final reports are also available from the National Technical Information Service (for a fee). Access to the information is provided by contacting any of the depositories by mail, telephone or in person or by writing to the Regional DHEW Offices or to the Research and Demonstration Office of the Rehabilitation Services Administration in DHEW which will refer to the States in most cases. The file is queried by going to the two volume index (available from the Government Printing Office) which lists all studies under each (up to four) major descriptor. To find listed terms one can check the Thesaurus or use the index directly which refers to authorized terms.

For information on this System, contact George Engstrom (RSA Support Services, Rm. 3431 Switzer Bldg., 202-245-0594).

RSA sponsors 19 Rehabilitation Research and Training Centers (R & T) throughout the country. These centers are coordinated through the Special Centers Office of RSA (Joseph Fenton, Program Manager, Rm. 3212 Switzer Bldg., 202-245-0270) and are housed within university environments. Their mission is: 1) to undertake research for the production of new knowledge which will improve rehabilitation methodology and service delivery systems, alleviate or stabilize handicapping conditions and promote maximum social and economic independence and 2) to institute related teaching and training programs to disseminate and promote the immediate utilization of research findings. Each center has a general purpose or mission; 12 are oriented to medical rehabilitation (including spinal cord injury), three to vocational rehabilitation, three to mental retardation and one to deafness (Helen Keller National Center for Deaf-Blind Youths and Adults). Since these centers are regional in nature, information about them or their research can best be obtained by contacting Mr. Fenton, RSA does not have a public inquiries unit as such.

Appendix A

PROFILES OF INFORMATION AND RESEARCH SOURCES OF PROSTHETICS

American Orthotic and Prosthetic Association
National Amputation Foundation
Smithsonian Science Information Exchange, Inc.
Veterans Administration

See Also:
Accent on Information
National Library of Medicine/DHEW

AMERICAN ORTHOTIC AND PROSTHETIC ASSOCIATION
1440 N Street, N W
Washington, DC 20005
PHONE· 202-234-8400

HANDICAPPING CONDITIONS SERVED· Musculoskeletal/orthopedic conditions

SCOPE OF ACTIVITIES The American Orthotic and Prosthetic Association (AOPA) is a national professional organization interested in the rehabilitation of handicapped persons through the provision of braces, artificial limbs and other devices. Its membership consists of over 400 facilities providing orthotic and prosthetic services. AOPA fosters its members' interests by representing them before State and Federal agencies (both regulatory and legislative) which are concerned with health care services to orthopedically handicapped individuals. It also serves as a channel of communication between the basic suppliers of products and services and the facilities which supply orthoses and prostheses to patients on prescription.

SERVICES. AOPA answers professional requests for information by phone or letter and sends brochures, pamphlets or fact sheets on request Occasionally, AOPA will refer lay inquirers to other information centers.

NATIONAL AMPUTATION FOUNDATION
12-45 150th Street
Whitestone, NY 11357
PHONE: 212-767-0596

HANDICAPPING CONDITIONS SERVED: Amputation.

SCOPE OF ACTIVITIES: The National Amputation Foundation, Inc. (NAF) was created to aid and assist all amputees in solving their daily living, psychological, employment and legal problems. It provides direct services aimed at integrating the amputee into the community, and information services in the following areas: 1) employment, including placement, job counseling and rights, hiring regulations and special needs of the amputee employee, 2) housing, 3) transportation, 4) rehabilitation (health), 5) psycho-social services, including psychological counseling, 6) income maintenance/security, 7) recreation/physical education, 8) activities of daily living, 9) prosthetics and 10) civil/rights legislation. Information is particularly strong on adaptation to artificial limbs.

SERVICES: NAF provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) sends the organization's newsletter and 3) makes inquiries of other organizations on the inquirer's behalf. Lay inquirers are also sent brochures, pamphlets or fact sheets and previously prepared bibliographies, indexes or abstracts on request and are referred to other information centers or direct service providers, when necessary. In addition, NAF regularly distributes press releases on its activities.

SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC.

SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC.
Room 300
1730 M Street, N.W.
Washington, DC 20036
PHONE. 202-381-4211

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The Smithsonian Science Information Exchange (SSIE), a nonprofit corporation of the Smithsonian Institution, has as its function the collection, storage and dissemination of prepublication information about research in progress in all fields of science, including those fields which pertain to handicapped individuals and handicapping conditions. SSIE collects single-page Notices of Research Projects (NRP's) from organizations that sponsor research, including Federal, State and local government agencies; nonprofit associations and foundations; colleges and universities; and, to a limited extent, private industry and foreign research organizations. Project descriptions are collected when work is begun and are usually available for retrieval well before progress and final reports appear in published literature. The active search file covers the two most recent Federal Government fiscal years' information and contains over 200,000 descriptions of projects in the life and physical sciences (agricultural sciences, behavioral sciences, biological sciences, chemistry and chemical engineering, earth sciences, electronics and electrical engineering, engineering sciences, materials, mathematics, medical sciences, physics and social sciences and economics). At present there are approximately 8,000-12,000 projects registered in research fields pertaining to handicapped individuals, such as hospital and medical facilities, nursing, prostheses and artifical organs, rehabilitation, surgery, therapy, counseling, education and developmental psychology.

SERVICES: The primary information function of SSIE is to provide the single-page Notice of Research Project (NRP) to professionals, though interested laypersons may also request searches of the data base. The NRP contains essential information about each project supplied by the organization funding the work. It includes the name of the supporting organization and project number, project title, performing organization name and address, name(s) of the investigator(s), period of performance covered by the description, level of funding and a 200-word technical summary of work to be performed.
The Exchange employs a staff of scientists with graduate training and research experience in fields which collectively represent all major disciplines covered by the data base. The same scientists index project descriptions for retrieval and search the data base in response to user requests in their field. Because a scientist acts as an intermediary between the data base and the user, requestors may formulate search requests in their own terminology, without reference to thesauri or lists of keywords.

SSIE offers a number of search services. Custom Searches are performed on-line in response to individual requests on specific subjects. Searches for NRP's from particular performing organizations or departments, specific geographic areas or for any combination of similar requirements can also be made. The scientist who conducts the subject search reviews the results to assure relevancy.

Research Information Packages are the result of regular searches of the active file for NRP's on subjects of high current interest. These packages are announced in each issue of the SSIE SCIENCE NEWSLETTER, and package contents are updated every 90 days.

The Exchange offers two Selective Dissemination of Information (SDI) Services for users who wish to receive regular updates of Custom Searches or Research Information Packages. SSIE scientists establish user profiles for each subscriber and perform periodic on-line searches of the active file according to profile requirements to identify all new or newly updated project notices added to the data base since the previous search was made. Subscribers to Standard SDI Service receive 12 monthly search updates compiled automatically by computer. Custom SDI Service provides subscribers with quarterly updates, each of which is carefully reviewed by a staff scientist to assure relevance to search requirements.

Notes: The Smithsonian Science Information Exchange was established in 1949 as the Medical Sciences Information Exchange. The system is designed to complement other scientific and technical information services available from libraries and information centers. SSIE attempts to bridge the gap between the time a research project is initiated and the time its results are published. Individual investigators and research managers use SSIE to: 1) avoid unwarranted duplication of research effort and expenditure, 2) locate possible sources of support for research on a specific topic, 3) identify leads to the published literature or participants for symposia, 4) obtain information to support grant or contract proposals, 5) stimulate new ideas for research planning or innovations in experimental techniques, 6) acquire source data for technical forecasting and development, 7) survey broad areas of research to identify trends and patterns or reveal gaps in overall efforts and 8) learn about current work of a specific research investigator, organization or organizational unit. Among the largest sources of input are: U.S. Departments of: Health, Education, and Welfare (includes the National Institutes of Health), Agriculture, Defense, Transportation and the Interior; National Science Foundation; Environmental Protection Agency; National Aeronautics and Space Administration; American Heart Association; American Cancer Society; Robert A. Welsh Foundation, and International Atomic Energy Agency.

The Exchange maintains its own, fully automated data storage and retrieval system; all processing is done in-house. New project information is added to the file daily; records for projects continuing over a period of years are updated annually. SSIE's Medical and Biological Sciences Branches process records for more than 65,000 projects in all areas of these fields each year.

VETERANS ADMINISTRATION
810 Vermont Avenue, N.W.
Washington, D.C. 20420
PHONE: 202-389-2214

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The Veterans Administration (VA) administers laws covering a wide range of benefits for former members and dependents and beneficiaries of deceased former members of the Armed Forces and to dependent children of seriously disabled veterans.
The Department of Medicine and Surgery, through its health care system of 171 hospitals, 213 clinics and 84 nursing homes in 176 cities and towns and through contractual arrangements with institutions and services in the private sector, provides hospital, nursing home and domiciliary care and outpatient medical and dental care to eligible veterans. It also has extensive programs of medical research and education and training of health manpower.
The Department of Veterans Benefits conducts an integrated program of veterans benefits. 1) The Compensation and Pension Service has responsibility for: claims for disability compensation and pension; automobile allowances and special adapted housing; special clothing allowances; eligibility determinations based on military service for other VA benefits and services or those of other government agencies; and survivor's claims for death compensation, dependency and indemnity compensation, death pension, and burial and plot allowance claims. 2) The Education and Rehabilitation Service administers programs for vocational rehabilitation of disabled veterans, readjustment educational benefits for veterans of post-Korea conflict service and educational assistance and special restorative training for wives (husbands) widows (widowers) and children of veterans who are permanently and totally disabled or die from disability incurred or aggravated in active service in the Armed Forces or are prisoners of war or are missing in action. 3) The Veterans Assistance Service provides advice and assistance to veterans, their dependents and beneficiaries, representatives and others in applying for benefits administered by the VA. Benefit information and readjustment assistance is provided to recently separated veterans, including professional guidance in resolving socioeconomic, housing and other related problems. Other benefits include loan guaranty and insurance.

SERVICES: Information on benefits available from the VA is best obtained by contacting a regional or local VA office. The regional office is a field station which grants benefits and services provided by law for veterans, their dependents and beneficiaries within an assigned territory; furnishes information regarding VA benefits and services, adjudicates claims and makes awards for disability compensation and pension; determines eligibility for hospitalization; handles guardianship and fiduciary matters and authorized legal proceedings; aids, guides and prescribes vocational rehabilitation training and administers

educational benefits; guarantees loans for purchase or construction of homes, farms or business property and, under certain conditions, makes direct home loans; processes death claims; aids and otherwise assists the veteran in exercising his/her rights to benefits and services; and supervises VA offices under its jurisdiction. The regional office is also responsible for veterans assistance activities including coordination of efforts of participating agencies in an outreach program to assist returning servicemen, particularly those who are educationally disadvantaged.

Appendix A

PROFILES OF GENERAL RESEARCH INFORMATION SOURCES

Brain Information Service
Council for Exceptional Children CEC Information Services
Datrix II
Deafness Research Foundation
Gesell Institute of Child Development
Lions International
National Foundation/March of Dimes
Bureau of Education for the Handicapped/Office of Education, Department of Health, Education, and Welfare
National Institute of Neurological and Communicative Disorders and Stroke
National Rehabilitation Information Center
OHI Clearinghouse on the Handicapped

See also:
American Occupational Therapy Association
American Physical Therapy Association
Division for Blind and Physically Handicapped/Library of Congress
National Library Medicine/DHEW
National Technical Information Service/Department of Commerce
Rehabilitation Services Administration/DHEW
Smithsonian Science Information Exchange

BRAIN INFORMATION SERVICE
Biomedical Library
University of California
Los Angeles, CA 90024
PHONE: 213-825-6011

HANDICAPPING CONDITIONS SERVED: Neurological disorders in general, mental/emotional disorders in general, gonadal reproductive disorders, inborn errors of metabolism and blindness/visual impairments.

SCOPE OF ACTIVITIES: The Brain Information Service (BIS) was established to support basic neurological research with a specialized information center which covers the literature and channels information in these sciences. BIS identifies, stores, retrieves, repackages and disseminates information in the basic neurological sciences of neuroanatomy, neurophysiology, neurochemistry, neuroendocrinology, neuropharmacology and behavior. Bibliographic services focus on providing information about current publications, as well as on providing retrospective literature coverage. The Service attempts to reach the worldwide community of neuroscience researchers, teachers and students.

SERVICES: Services of BIS include generation of serial publications, non-serial publications (conference reports, research reports, reference bibliographies) and individualized demand bibliographies. The Service also answers inquiries by phone or letter and sends brochures, pamphlets or fact sheets.

Special Information Services: The Service provides demand bibliographies to scientists using a computer automated storage and retrieval system. The bibliographies are compiled by information specialists who edit citations from the output and augment them with a manual search when necessary. The data base currently contains approximately 500,000 citations assembled from a core of the most actively used neurological journals, from the National Library of Medicine's MEDLARS system and from biological publications not included in MEDLARS. Citations include information as to author, title, journal, source, index terms and some abstracts. The data base covers the years 1969 to present and is updated 3-4 times/year.

Notes: The Brain Information Service was established in 1964 under contract with the National Institute of Neurological Diseases and Stroke (NINDS). The activities of BIS are carried out with the cooperation of the Brain Research Institute, the Health Sciences Computing Facility and the Biomedical Library, which are under the auspices of the School of Medicine, University of California at Los Angeles.

COUNCIL FOR EXCEPTIONAL CHILDREN CEC Information Services
1920 Association Drive
Reston, VA 22091
PHONE: 703-620-3660

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: The Council for Exceptional Children (CEC) has as its principal purpose the advancement of the education of exceptional children and youth, both handicapped and gifted.

Major activities of the Council for Exceptional Children include operation of the CEC Information Center and the ERIC Clearinghouse on Handicapped and Gifted Children. The Information Center and Clearinghouse serve as a comprehensive information center identifying and collecting English language literature on the education of handicapped and gifted children, much of which is unavailable from commercial sources. The collection currently includes over 20,000 books, journal articles, curriculum guides, conference reports, research reports, guidelines and other similar materials. Citations and abstracts for these documents are prepared by CEC/ERIC staff and are computer stored for rapid retrieval.
CEC also operates the State - Federal Information Clearinghouse for Exceptional Children which maintains a data bank on State and Federal laws, regulations, and litigation involving handicapped and gifted children and provides information, products and technical assistance.

Notes: The Council for Exceptional Children was founded in 1922 and has 54 State federations and over 950 local chapters which conduct their own professional programs and produce publications. The Council has 12 divisions: 1) Association for the Gifted, 2) Council for Administrators of Special Education, 3) Council for Children with Behavioral Disorders, 4) Council for Educational Diagnostic Services, 5) Division for Children with Learning Disabilities, 6) Division of Mental Retardation, 7) Division of Early Childhood Education, 8) Division of Children with Communication Disorders, 9) Division on the Physically Handicapped, Homebound, Hospitalized, 10) Division for the Visually Handicapped, Partially Seeing and Blind, 11) Teacher Education Division and 12) Division on Career Development. In addition to other activities, a major function of CEC is the sponsoring of an annual international convention and of regional and topical conventions and conferences for educators and other professionals in the field. Services of CEC are coordinated by the CEC Center on Technical Assistance, Training, and Information on the Exceptional Person.

DATRIX II
Xerox University Microfilms
300 N. Zeeb Road
Ann Arbor, MI 48106
PHONE: 313-761-4700

HANDICAPPING CONDITIONS SERVED: Handicapping conditions in general.

SCOPE OF ACTIVITIES: Datrix II is one of the services of University Microfilms International (UMI) whose main product lines are microfilm, microfiche and xerographic reproductions of dissertations, theses, serials, periodicals, out-of-print books and scholarly monographs. UMI is publisher of DISSERTATION ABSTRACTS INTERNATIONAL, COMPREHENSIVE DISSERTATION INDEX and AMERICAN DOCTORAL DISSERTATIONS.

Datrix II is an outgrowth of the computer automation, for indexing and record keeping purposes, of the bibliographic data covering the doctoral dissertation collection. The computer data base includes virtually all dissertations ever published in the United States, most of the recent Canadian dissertations and a growing number from other countries. Every academic subject area is represented, including areas related to handicapping conditions, handicapped individuals and research in virtually every area of activity concerning handicapped individuals.

SERVICES: The Datrix II service is a mail-order computer automated information retrieval system which conducts a computer search to identify the doctoral dissertations written on a particular topic. Dissertations in the Datrix II file have been fed into the computer on the basis of keywords in dissertation titles and must be retrieved on the same basis. On the order form a user must list the words that best describe his/her topic. The set of words used represents all the words which must appear in a dissertation title for that title to be retrieved. The user is asked to express his/her research topic as a combination of individual words, not concepts or subjects, and to use as many alternate and synonymous words as possible. When the search strategy is developed, the data base is searched by computer and a printout of retrievals supplied to the inquirer.

Notes: The Datrix II data base contains over 500,000 doctoral dissertations accepted by accredited, degree-granting U.S. universities since 1861, plus many from Canadian universities and some of foreign origin. It is maintained by the editors of COMPREHENSIVE DISSERTATION INDEX who update the file monthly. To request a search form or other information, contact Datrix II at the above address.

DEAFNESS RESEARCH FOUNDATION
366 Madison Avenue
New York, NY 10017
PHONE: 212-682-3737

HANDICAPPING CONDITIONS SERVED: Deafness/hearing impairments.

SCOPE OF ACTIVITIES: The goal of the Deafness Research Foundation (DRF) is to explore causes, means of prevention, and treatments of deafness and other ear disorders. To this end, DRF strives to: 1) alert U.S. industry, the public and private philanthropy to the needs of ear research, 2) encourage more research scientists to focus attention on this field, 3) provide a central source of information necessary for coordination of all research in this field and 4) raise funds to support research and conduct public and professional education programs. In addition, the Foundation conducts a nationwide program to encourage individuals with ear disorders to bequeath their inner ear structure for use in medical research. Leading universities and medical centers maintain temporal bone laboratories where these pathological specimens are studied.
Coordination of the network of temporal bone laboratories and maintenance of completed pledge forms, together with the medical histories of donors are carried out by the National Temporal Bone Banks Center of the Deafness Research Foundation located at Johns Hopkins Hospital in Baltimore, Maryland.

SERVICES: DRF provides the following information services to lay and professional inquirers: 1) answers inquiries by letter, 2) sends brochures, pamphlets or fact sheets and 3) sends the organization's newsletter. Lay inquirers are also referred to other information centers when necessary and provided with films and other audiovisuals on request.

The Foundation also maintains reports of research being undertaken at various institutions, including the National Institutes of Health, the Ear Research Institute in Los Angeles, Baylor University School of Medicine Department of Otolaryngology, Mid-America Hearing Institute, Mt. Sinai School of Medicine, Tulane University and others.

GESELL INSTITUTE OF CHILD DEVELOPMENT
310 Prospect Street
New Haven, CT 06511
PHONE: 203-777-3481

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments, deaf-blind and learning disabilities.

SCOPE OF ACTIVITIES: The purpose of the Gesell Institute of Child Development is to conduct research and to provide diagnostic services, visual evaluations and visual therapy in the area of child development. The Institute offers general information on disabling conditions, especially as they relate to child development, as well as information in the following areas: 1) education, including formal education of handicapped individuals and the education of persons dealing with them, 2) psycho-social services and 3) research in visual development, child development and learning problems. Information is particularly strong in vision development and child development, the areas in which the Institute conducts research.

SERVICES: The Institute provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) sends brochures, pamphlets or fact sheets, 4) makes inquiries of other organizations on the inquirer's behalf and 5) permits on-site use of its literature and film holdings.
The Gesell Institute also offers a number of direct services. Diagnostic developmental services are given to children aged 5-12, and vision services are offered to youngsters from infancy to college age, when abnormalities such as slow development or poor academic achievement are related to poor vision. Counseling services are also available for parents of children with behavioral, academic or developmental difficulties.

LIONS INTERNATIONAL
York and Cermak Roads
Oak Brook, IL 60521
PHONE: 312-986-1700

HANDICAPPING CONDITIONS SERVED: Sensory impairments in general, communicative impairments in general, alcoholism and drug addiction.

SCOPE OF ACTIVITIES: Lions International (LI) is an association of business and professional men organized in local clubs in 148 countries. This fraternal humanitarian service organization is dedicated to improving the quality of life for all people. Goals are to provide community service and to promote better international relations. Local clubs provide direct services. The international headquarters, although primarily administrative, provides information in the following areas: 1) general information on disabling conditions, 2) vocational rehabilitation and training of handicapped persons, 3) health, including disease prevention, diagnostic evaluation, treatment, rehabilitation and maintenance, 4) recreation/ physical education, 5) equipment/special devices/aids and 6) research. Information is particularly strong in the area of visual impairments and treatment.

SERVICES: Lions International's information services are aimed at disseminating information to the lay public primarily in the areas of sight and hearing. For the lay inquirer, LI provides the following information services: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) sends brochures, pamphlets and fact sheets and 4) makes inquiries of other organizations on the inquirer's behalf. Persons seeking direct services are referred to local Lions Clubs. The Research and Health Activities Department maintains an information service called the Activities Information Bank, an indexed system of information storage and retrieval used to respond to most inquiries. Files are divided between Lion's projects and activities worldwide and general public information and referral sources.

NOTES: Work with visually handicapped individuals is a major service interest; activities include provision of canes, guide dogs and eye health services, braille classes, production of large print materials and repair of aids and devices.

Lions Clubs sponsor workshops and social and recreational programs. Seminars are conducted annually in conjunction with the International Convention.

For information, contact the Research and Health Activities Department at the above address.

NATIONAL FOUNDATION/MARCH OF DIMES
1275 Mamaroneck Avenue
White Plains, NY 10605
PHONE: 914-428-7100

HANDICAPPING CONDITIONS SERVED: Congenital defects and genetic disorders.

SCOPE OF ACTIVITIES: The goal of the National Foundation/March of Dimes (NF) is to prevent birth defects resulting from genetic disorders, chromosomal heredity and environment. To achieve this goal, the Foundation sponsors and funds numerous programs in basic and clinical research, medical services, professional and public education and community services aimed at the elimination of birth defects. Specific areas of coverage include: 1) general information about birth defects, 2) the education of personnel dealing with birth defects, 3) health, including prevention of birth defects, diagnostic evaluation, treatment and rehabilitation, 4) psycho-social services, 5) income maintenance/security, 6) civil rights/legislation and 7) research concerning birth defects.

SERVICES: One of the primary objectives of the National Foundation is to provide extensive information on birth defects to the general public and professionals by answering individual inquiries and by sponsoring public and professional education programs. The Foundation routinely provides the following information services to any lay or professional inquirer: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets, 5) sends previously prepared bibliographies, indexes or abstracts, 6) prepares bibliographies, indexes or abstracts in response to certain individual requests, 7) provides films or other audiovisuals, 8) sends the organization's newsletter and 9) permits on-site use of the Foundation's library. In addition to these services, the Foundation sponsors many special education and information programs. Through its Professional Education Publications program, the Foundation transmits the latest scientific findings on birth defects to schools of medicine and nursing, university hospitals, medical centers, physicians, nurses and other health professionals. Included in these publications are original articles from symposia sponsored or cosponsored by the Foundation, publications which consolidate data for health professionals in schools, hospitals, research laboratories and private practice and a Reprint Series which provides the professional with reprints of over 200 articles about birth defects which have appeared in journals here and abroad. Also included in the publications program are: 1) the INTERNATIONAL DIRECTORY OF GENETIC SERVICES, a comprehensive listing of medical centers in the United States and other countries that provide genetic counseling and sophisticated analyses of special genetic conditions, 2) the BIRTH DEFECTS ATLAS AND COMPENDIUM, the first book to standardize names and descriptions of nearly 850 congenital anomalies and 3) SYNDROME IDENTIFICATION, an international journal on congenital disorders.

The Foundation also sponsors medical conferences and symposia regionally, nationally and internationally and has initiated professional training programs and school health education programs.
The Foundation has developed 16mm color films for use by medical and health personnel, instructors and students. For public broadcast, NF has prepared special materials for radio broadcasting, network television and cable TV. Educational displays and exhibits for use at professional meetings, health fairs, libraries, store windows, health departments and schools are also available. The Foundation funds a considerable amount of research, and produces several publications which provide brief descriptions of research in progress. RESEARCH GRANTS lists grants in three categories of research: 1) basic research, 2) clinical research and 3) Basil O'Connor Starter research, awarded to young M.D.s or Ph.D.s embarking on independent careers in birth defects research. MEDICAL SERVICE PROGRAM GRANTS lists 250 medical service programs funded by the NF to improve delivery of maternal/infant health care, early diagnosis of high-risk pregnancies, intensive care of abnormal or sick newborns, genetic services and treatment of birth defects. PROFESSIONAL EDUCATION GRANTS/HEALTH PERSONNEL DEVELOPMENT GRANTS lists grants awarded to support professional education programs for the medical and allied professions and grants awarded to support advanced training of nurses as qualified midwives and nurse clinicians in skilled perinatal care.

Special Information Services: The National Foundation is currently in the process of developing a nationwide computer automated information system which will benefit physicians, geneticists, researchers and students. The computer will contain complete and current descriptions and related facts about every known birth defect syndrome to assist in the diagnosis of rare disorders. Upon completion, an inquirer will be able to phone from anywhere in the United States or Canada and receive what will amount to a "consultation" with a suggested diagnosis. The system is being developed by a team of physicians and computer scientists from Tufts New England Medical Center and the Massachusetts Institute of Technology, supported by grants from the National Foundation.
Since the spring of 1975, the Foundation has participated in the U.S. Birth Defects Monitoring Program. This Program is a cooperative enterprise of NF, two Federal agencies and the largest hospital case abstracting service in the country. The objective is rapid identification and prompt investigation of unusual changes in the incidence of certain specific birth defects. NF will also serve as a clearinghouse for the exchange of data generated in birth defect monitoring programs in a number of European nations, Canada and the U.S.

BUREAU OF EDUCATION FOR THE HANDICAPPED Office of Education,
Department of Health, Education, and Welfare
400 Maryland Avenue, S.W.
Washington, DC 20202
PHONE: 202-245-2709

HANDICAPPING CONDITIONS SERVED: Sensory impairments in general, communicative impairments in general, orthopedic impairments, neurological disorders in general, learning disabilities, mental retardation and other health impairments by reason of which special education is needed.

SCOPE OF ACTIVITIES: The Bureau of Education for the Handicapped (BEH) is the principal agency within the Office of Education (OE) for developing Federal policy and administering and carrying out programs and projects relating to the education and training of handicapped individuals. BEH has four divisions: 1) Division of Innovation and Development which provides support for development and dissemination of results of applied research in education and for the implementation of model demonstration programs, 2) Division of Personnel Preparation which administers grants and provides guidance, technical assistance and support to colleges, universities, State educational agencies and nonprofit institutions to train teachers, clinicians and allied personnel in special education, 3) Division of Assistance to States which administers programs of financial assistance to State and local education agencies for developing and implementing plans and programs for the education of handicapped children, and for demonstration programs for special target groups of handicapped children, specifically deaf-blind and severely and multiply handicapped children and 4) Division of Media Services which administers a loan service of captioned films for deaf persons, and disseminates other media products (films, tapes, videotapes, etc.) to handicapped persons. the parents of handicapped children and persons working with handicapped individuals; and the Learning Resource Centers Program, which includes the Area Learning Resource Centers/Specialized Offices/National Center on-Educational Media and Materials for the Handicapped (ALRC/SO/NCEMMH) system and the Regional Resource Centers Program. (ALRC/SO/NCEMMH works with State and local media-materials programs in providing teachers and students with information on media and materials in special education, their availability and instruction in their use. NCEMMH assists in identifying the need for specialized instructional materials, in arranging for commercial and noncommercial distribution of newly developed instructional and teacher training materials, coordinates the ALRC/SO/NCEMMH network, and operates the National Instructional Materials Information System (NIMIS), a computer retrieval system used by the ALRCs to locate information about special education instructional materials for teachers, parents and other educators. SOs develop, adapt and distribute instructional materials for visually handicapped, hearing impaired, and other handicapped individuals. The ALRC/SO/NCEMMH system complements the Regional Resource Centers which identify, diagnose and prescribe programs for handicapped students.)

SERVICES: BEH provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets, 5) sends previously prepared bibliographies, indexes or abstracts; 6) provides films or other audiovisuals and 7) permits on-site use of its holdings which include reports of research, final reports of projects and various other publications.

NATIONAL REHABILITATION INFORMATION CENTER
308 Mullen Library
Catholic University of America
Washington, D.C. 20064
PHONE: 202-635-5826

THE NATIONAL REHABILITATION INFORMATION CENTER includes materials in all media and which will provide specific information services to the rehabilitation community - including rehabilitation professionals, researchers, trainers, handicapped individuals, and concerned members of the public.

SPECIFIC OBJECTIVES of the Center are to: serve as a resource for RSA documents; provide access to rehabilitation - related information; make information usable by specific groups of users by repackaging; improve cost effectiveness of existing RSA-funded information facilities; and assist RSA in its planning and evaluation activities relative to R&D.

SERVICES: To meet these objectives, the Center provides the following services:

a. Assemble, maintain, and provide access to definitive collection of RSA-generated materials for anyone requesting them. These materials will eventually include those sponsored by research, demonstration, training, and any other components of RSA. The collection would be accessible for use on the premises and through the provision of a copy service.

b. Assemble and provide access to a "core collection' of rehabilitation books, journals, and materials in non-print media.

c. Fully catalog Center information items for easy retrieval. A book catalog, in fiche or hard copy form, of the Center's collection will be produced and disseminated to users.

d. Provide access to computerized data bases containing materials relevant to rehabilitation. Such data bases would include MEDLINE, Psychological Abstracts, and ERIC (Education Resources Information Center).

e. Prepare and disseminate to the rehabilitation community concise summaries of 10 selected recent RSA R&D final reports as an experimental compendium.

f. Coordinate existing information services in order to promote their use and increase their overall effectiveness.

OHI CLEARINGHOUSE ON THE HANDICAPPED
OHI/DHEW
338 D Humphrey Building
Washington, D.C.
PHONE: 202-245-1961

THE CLEARINGHOUSE FOR THE HANDICAPPED has a legal mandate to:

> "Provide a central clearinghouse for information and resource availability for handicapped individuals through (A) the evaluation of systems within the Department of Health. Education and Welfare, other departments and agencies of the Federal Government, public and private agencies and organizations, and other sources, which provide (i) information and data regarding the location, provision and availability of services and programs for handicapped individuals, regarding research and recent medical and scientific developments bearing on handicapping conditions (and their prevention, amelioration, causes, and cures), and regarding the current members of handicapped individuals and their needs, and (ii) any other such relevant information and data which the Secretary deems necessary and (B) utilizing the results of such evaluation and existing information systems, the development within such Department of a coordinated system of information and data retrieval, which will have the capacity and responsibility to provide general and specific information regarding the information and data referred to in subclause (A) of this clause to the Congress, public and private agencies and organizations, handicapped individuals and their families, professionals in fields serving such individuals, and the general public."

NOTE: With such a broad concern, the Clearinghouse has limited its initial service to referrals. This means that in response to a request the Clearinghouse will refer the requestor to the source most likely to be able to provide the information requested. The Clearinghouse has built a file of sources of information related to the handicapped.

Appendix A

PROFILES OF INFORMATION AND RESEARCH SOURCES FOR VISION IMPAIRMENT/BLINDNESS

American Foundation for the Blind, Inc.
National Eye Institute/National Institutes of Health, Public Health Service, DHEW
National Eye Research Foundation
National Institute of Neurological and Communicative Disorders and Stroke
Research to Prevent Blindness

AMERICAN FOUNDATION FOR THE BLIND, INC.
15 W. 16th Street
New York, NY 10011
PHONE: 212-924-0420

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments.

SCOPE OF ACTIVITIES: The American Foundation for the Blind (AFB) was established to carry on research, collect and disseminate information and advise and give counsel on matters that improve and strengthen services to blind persons. AFB serves as a national clearinghouse for information about blindness, promotes the development of educational, rehabilitation and social welfare services for blind children and adults and conducts programs for partially sighted individuals through its educational services. Specific areas of concern include: 1) education, including formal education of visually impaired individuals and education of personnel dealing with them, 2) employment, including vocational rehabilitation and training, rights, hiring regulations and special needs of blind and visually impaired employees and employment of personnel working with blind persons, 3) health, including diagnostic evaluation, treatment, rehabilitation and maintenance, 4) psycho-social services, 5) income maintenance/security, 6) recreation/physical education, 7) activities of daily living, 8) equipment/special devices/aids, 9) civil rights/legislation and 10) research.

SERVICES: AFB provides the following information services to lay and professional inquirers: 1) answers inquiries by letter, 2) refers inquirers to other information centers or direct service providers, 3) sends brochures, pamphlets or fact sheets, 4) sends previously prepared bibliographies, indexes or abstracts, 5) provides films or other audio-visuals, 6) sends the organization's newsletter and 7) permits on-site use of its library which includes over 30,000 volumes and other materials on blindness. The library will prepare bibliographies, indexes or abstracts in response to certain individual professional requests. The Foundation also publishes a variety of informational materials, more than 150 in total, from one-page flyers with basic facts about blindness to highly technical research monographs. Among the publications are: the NEW OUTLOOK FOR THE BLIND, a professional journal, published since 1907; and the WASHINGTON REPORT, a legislative newsletter. Other publications include monographs, handbooks, manuals, curriculum guides, newsletters, pamphlets and the biennial DIRECTORY OF AGENCIES SERVING THE BLIND AND VISUALLY HANDICAPPED IN THE UNITED STATES. A publications catalog is available on request.
The publication AIDS AND APPLIANCES has information on nearly 400 aids that help blind persons lead an independent life which are sold at cost by AFB. Some of these aids have been developed by AFB's own designers and technicians, some are commercial products adapted by AFB for use by blind persons, and some are unadapted commercial products particularly useful to blind persons.

Under contract to the Library of Congress, Division for the Blind and Physically Handicapped, AFB records and manufactures nearly 400 talking books each year. Books are available free on loan from regional libraries to anyone who cannot read ordinary print.

The Foundation also administers a travel concession plan that allows a blind person traveling with a guide to obtain reduced fares on most railroad and bus lines in the United States. Identification cards are distributed for this purpose.

NATIONAL EYE INSTITUTE Natational Institutes of Health,
Public Health Service, Department of Health, Education, and Welfare
Bldg. 31
Room 6A-25
Bethesda, MD 20014
PHONE: 301-496-5248

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments, with particular emphasis on retinal and choroidal diseases, glaucoma, corneal diseases, cataract and sensory and motor disorders of vision; also diabetes mellitus, cancers and genetic disorders as they relate to loss of vision.

SCOPE OF ACTIVITIES: The National Eye Institute (NEI) has primary responsibility within NIH and the Federal Government for supporting and conducting research aimed at improving prevention, diagnosis and treatment of visual disorders. To this end, NEI: 1) supports, through grants, fellowships and contracts to medical schools and research institutions, research and research training aimed at improving the prevention, diagnosis and treatment of visual disorders, 2) conducts laboratory and clinical research at its own facilities and fosters statistical and epidemiological studies of visual disorders in human populations, 3) fosters research on the rehabilitation of visually impaired persons, 4) encourages the application of research findings to clinical practice, 5) heightens public awareness of vision problems and 6) cooperates with voluntary organizations which engage in related activities. In addition, NEI provides general information on eye disorders and on equipment/special devices/aids available to visually impaired persons. Information is particularly strong on prevention, diagnosis and treatment of visual disorders, research in this area, statistics on prevalence, incidence and costs of eye disorders and on U.S. support of vision research.

SERVICES: NEI provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers and 3) sends brochures, pamphlets or fact sheets. NEI also provides annual listings of projects supported by other organizations and funding information when available.

NATIONAL EYE RESEARCH FOUNDATION
18 S. Michigan Avenue
Chicago, IL 60603
PHONE: 312-726-7866

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments.

SCOPE OF ACTIVITIES: The major objective of the National Eye Research Foundation (NERF) is to improve eye care for the general public. To accomplish this objective, NERF: 1) sponsors research and eye care projects, 2) disseminates knowledge gained from important studies, experiments and original theses through its magazine CONTACTO, 3) encourages the exchange of ideas through a variety of meetings and congresses held each year for its professional membership, 4) provides public information programs to radio and TV stations to educate the public in proper eye care and 5) encourages cooperation among the professions to advance technical knowledge to all practitioners.

SERVICES: The Foundation provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) sends brochures, pamphlets or fact sheets and 3) provides films or other audiovisuals. Lay inquirers are also referred to other information centers or direct service providers when necessary. NERF's bimonthly magazine, CONTACTO, is a professional information source.

NATIONAL INSTITUTE OF NEUROLOGICAL
AND COMMUNICATIVE DISORDERS AND STROKE
National Institutes of Health,
Public Health Service, Department of Health, Education, and Welfare
Bldg. 31
Bethesda, MD 20014
PHONE: 301-496-5751

HANDICAPPING CONDITIONS SERVED: Neurological disorders in general, communicative disorders in general, metabolic disorders in general, autism, learning disabilities, deafness/hearing impairments and deaf-blind.

SCOPE OF ACTIVITIES: The purpose of the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) is to conduct, foster and coordinate research into the causes, prevention, diagnosis and treatment of neurological and communicative disorders and stroke and in related areas. To this end, the Institute carries out a diversified program of intramural and collaborative research in its own laboratories, branches and clinics, provides grants-in-aid to public and private institutions and individuals in fields related to its areas of interest, including research project, program project and center grants and provides training grants and awards to increase professional research manpower in neurological and communicative fields. The Institute also collects and disseminates research information related to neurological and communicative disorders, as well as information on the formal education of neurologically or communicatively handicapped individuals and prosthetics available for them.

SERVICES: NINCDS provides the following information services to lay and professional persons: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets, 5) sends previously prepared bibliographies, indexes or abstracts, 6) prepares bibliographies, indexes or abstracts in response to certain individual requests, 7) provides films or other audiovisuals and 8) permits on-site use of its holdings.
NINCS has numerous publications available. A monograph series containing research and conference reports, reviews and other neurological science contributions is produced for physicians, scientists and other professional health workers. A Hope Through Research Series of leaflets for patients, their families and paramedical workers, containing general information on various neurological disorders, is also published.

Other publications of interest include: special reports summarizing the state of research and knowledge on stroke, Parkinson's disease, cerebral palsy, epilepsy, multiple sclerosis, neuromuscular diseases and spinal cord injury (prepared in 1975); a CEREBROVASCULAR BIBLIOGRAPHY, a tool for research in this area; and a 1700 page bibliography on epilepsy. Reports on the manpower situation in several scientific specialties are in production. In 1975, special attention was given by the information program to multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS), spinal cord injury and regeneration, hearing and speech disorders, epilepsy, autism and Huntington's disease.
A publications list is available on request.

RESEARCH TO PREVENT BLINDNESS
598 Madison Avenue
New York, NY 10022
PHONE: 212-752-4333

HANDICAPPING CONDITIONS SERVED: Blindness/visual impairments.

SCOPE OF ACTIVITIES: Research to Prevent Blindness (RPB) provides general information on blindness/visual impairments and information on research into the causes of blindness. RPB's primary objective is to help finance scientific research on the causes, prevention, diagnosis and treatment of blinding diseases.

SERVICES: RPB provides the following information services to lay and professional inquirers: 1) answers certain inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) makes inquiries of other organizations on the inquirer's behalf, 4) sends brochures, pamphlets or fact sheets and 5) distributes RPB's newsletter.

NOTES: Research to Prevent Blindness directly finances research and sponsors a number of related programs. Annually, RPB awards unrestricted grants to almost 50 departments of ophthalmology, providing them with fluid funds to support a wide range of research programs. RPB has provided funds for the development of innovative techniques, such as laser treatment, cryosurgery, microsurgery, electronic tonography, vitreous surgery and therapeutic use of contact lenses. It assists qualified institutions in building needed eye research facilities by underwriting management for construction campaigns.

Appendix A

PROFILES OF INFORMATION AND RESEARCH SOURCES FOR SPEECH AND HEARING LOSS

American Speech and Hearing Association
National Association of the Deaf
National Association for Hearing and Speech Action

AMERICAN SPEECH AND HEARING ASSOCIATION
10801 Rockville Pike
Rockville, MD 20852
PHONE: 301-897-5700

HANDICAPPING CONDITIONS SERVED: Deafness/hearing impairments, deaf-blind and communicative impairments in general.

SCOPE OF ACTIVITIES: The American Speech and Hearing Association (ASHA) was established to: 1) maintain high standards of clinical competence for professionals providing services to the public, 2) encourage the development of comprehensive clinical service programs, 3) promote investigation of clinical procedures used in treating disorders of communication, 4) stimulate exchange of information through conventions, publications and other continuing professional education activities and 5) encourage basic research and scientific study of human communication and its disorders.
The Association is a source of descriptive information about handicapping conditions and has information in the following areas: 1) education, including formal education of handicapped individuals and education of personnel working with them, 2) employment of personnel in the field and certification of individuals, clinics and training programs, 3) health, including prevention, diagnostic evaluation, treatment, rehabilitation and maintenance, 4) psycho-social services and 5) research. Information is particularly strong on certification.

SERVICES: ASHA provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) distributes the organization's newsletter and 3) prepares bibliographies, abstracts or indexes in response to certain individual requests. Lay inquirers are also: 1) referred to other information centers or direct service providers, 2) sent brochures, pamphlets or fact sheets, 3) sent previously prepared bibliographies, indexes or abstracts and 4) provided with films or other audiovisuals.
ASHA's publications program is extensive and contains much public education and career information. A brochure, ASHA PUBLICATIONS, is available on request.

ASHA also publishes periodicals in the field; these include: JOURNAL OF SPEECH AND HEARING DISORDERS; JOURNAL OF SPEECH AND HEARING RESEARCH; LANGUAGE, SPEECH AND HEARING SERVICES IN SCHOOLS; dsh ABSTRACTS; and ASHA.

NATIONAL ASSOCIATION OF THE DEAF
814 Thayer Avenue
Silver Spring, MD 20910
PHONE: 301-587-1788

HANDICAPPING CONDITIONS SERVED: Deafness/hearing impairments and deaf-blind.

SCOPE OF ACTIVITIES: The National Association of the Deaf (NAD) was established to bring deaf persons in different sections of the United States into close contact with one another and to deliberate on the needs of deaf individuals as a class. NAD's goals include serving deaf persons and promoting their unique needs in legislation, education, communication, health, research, taxes, rehabilitation, information on personal and family counseling and fighting descrimination in insurance and employment. NAD emphasizes "total communication," that is the right of all deaf people to learn to use all forms of communication available to develop language competence. This includes the full spectrum of gestures, speech, formal sign language, fingerspelling, speechreading, reading, writing and making use of residual hearing through amplification. In addition, NAD is a publisher and a clearinghouse of books and information relating to deafness.

SERVICES: NAD provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers or direct service providers, 3) sends brochures, pamphlets or fact sheets, 4) sends the organization's newsletter and 5) permits on-site use of its holdings which include over 15,000 books and other materials on deafness from 1965 backwards to 1880; the collection is currently being updated.

NATIONAL ASSOCIATION FOR HEARING AND SPEECH ACTION
814 Thayer Avenue
Silver Spring, MD 20910
PHONE: 301-588-5242

HANDICAPPING CONDITIONS SERVED: Deafness/hearing impairments and communicative impairments in general.

SCOPE OF ACTIVITIES: The National Association for Hearing and Speech Action (NAHSA) is an organization dedicated to promoting the interests of persons with hearing and speech handicaps. Its four major goals are to: 1) enhance public understanding, 2) provide direct assistance to hearing and speech agencies, 3) foster needed social action and 4) launch a program of prevention.

SERVICES: NAHSA provides the following information services to lay and professional inquirers: 1) answers inquiries by phone or letter, 2) refers inquirers to other information centers, 3) provides films or other audiovisuals, 4) sends the Association's newsletter and 5) makes inquiries of other organizations on the inquirer's behalf. Lay inquirers are also referred to direct service providers and provided with brochures, pamphlets and fact sheets. Professionals are sent previously prepared bibliographies, indexes or abstracts.

NOTE: The Association collects and disseminates information on speech and hearing impairments and on the following topics: 1) education of personnel dealing with handicapped individuals, 2) health, including prevention, diagnostic evaluation, treatment and rehabilitation, 3) psychosocial services, 4) activities of daily living and 5) equipment/special devices/aids.

NATIONAL LEVEL RESOURCES RELATED TO THE HANDICAPPED*

Ability Tours
Academy of Rehabilitative Audiology
Accent on Information
Adventures in Movement for the Handicapped
Aid to Adoption of Special Kids
Alexander Graham Bell Association for the Deaf
Allergy Foundation of America
American Academy for Cerebral Palsy
American Academy on Mental Retardation
American Academy of Pediatrics, Committee on Children With Handicaps
American Alliance for Health, Physical Education & Recreation, Information & Research Utilization Center
American Association for the Advancement of Science, Project on the Handicapped in Science
American Association for the Education of the Severely/Profoundly Handicapped
American Association on Mental Deficiency
American Association of Psychiatric Services for Children
American Association for Rehabilitation Therapy
American Association for Respiratory Therapy
American Association of University Affiliated Programs for the Developmentally Disabled
American Association of Workers for the Blind
American Athletic Association of the Deaf
American Bible Society
American Blind Bowling Association
American Camping Association
American Cancer Society
American Coalition of Citizens with Disabilities
American Corrective Therapy Association
American Council of the Blind
American Dance Therapy Association
American Diabetes Association
American Foundation for the Blind
American Heart Association
American Institute of Architects
American Library Association, Library Services to the Blind and Physically Handicapped
American Lung Association
American Medical Association, Department of Environmental, Public and Occupational Health
American National Red Cross, Program of Swimming for the Handicapped
American Occupational Therapy Association
American Orthotic & Prosthetic Association
American Parkinson Disease Association

*Source, Office for Handicapped Individuals. For more information consult Directory of National Information Sources on Handicapping Conditions and Related Services.

Table A-3 (Continued)

American Physical Therapy Association
American Printing House for the Blind
American Speech & Hearing Association
American Wheelchair Bowling Association
Amputee Shoe & Glove Exchange
AMVETS
Arthritis Foundation
Association for Children with Learning Disabilities
Association for Education of the Visually Handicapped
Association of Handicapped Artists
Association of Mental Health Administrators
Association of Rehabilitation Facilities
Better Hearing Institute
Blinded Veterans Association
B'nai B'rith Career & Counseling Service
Boy Scouts of America, Scouting for the Handicapped Division
Braille Circulating Library
Brain Information Service
Camp Fire Girls
Carroll Center for the Blind
Center on Human Policy
Center for Innovation in Teaching the Handicapped
Center for Sickle Cell Disease
Child Welfare League of America
Christian Record Braille Foundation
Closer Look
Clothing Research & Development Foundation
Clovernook Printing House for the Blind
Commission on Accreditation of Rehabilitation Facilities
Committee to Combat Huntington's Disease
Communications Foundation
Computer Assisted Placement Service
Conference of Executives of American Schools for the Deaf
Convention of American Instructors of the Deaf
Cooley's Anemia Blood & Research Foundation for Children
Council for Exceptional Children
Curriculum Research & Development Center in Mental Retardation
Cystic Fibrosis Foundation
DATRIX II
Deafness Research Foundation
Dental Guidance Council for Cerebral Palsy
Disabled American Veterans
Down's Syndrome Congress
Eastern Conference of Rehabilitation Teachers of the Visually Handicapped

Table A-3 (Continued)

Ephphatha Services for the Deaf and Blind
Epilepsy Foundation of America
Episcopal Conference of the Deaf
Episcopal Guild for the Blind
Evergreen Travel Service
Eye-Bank Association of America
Flying Wheels Tours
4-H Youth Extension Service
Gallaudet College Library
Gesell Institute of Child Development
Girl Scouts of America Handicapped Girls Program
Goodwill Industries of America
Gospel Association for the Blind
Guide Dog Foundation for the Blind
Guide Dogs for the Blind
Guiding Eyes for the Blind
Hadley School for the Blind
Handy-Cap Horizons
Helen Keller National Center for Deaf-Blind Youths & Adults
Human Growth Foundation
Human Resources Center
International Association of Parents of the Deaf
International Committee of the Silent Sports
International Guiding Eyes
International Handicapped Net
Jewish Braille Institute of America
Jewish Guild for the Blind
John Milton Society for the Blind
John Tracy Clinic
Joseph Bulova School of Watchmaking
Joseph P. Kennedy, Jr. Foundation
Junior National Association of the Blind
Just One Break
Juvenile Diabetes Foundation
Leader Dogs for the Blind
Leukemia Society of America
Linguistics Research Laboratory of Gallaudet College
Lions International
Little People of America
Louis Braille Foundation for Blind Musicians
Lutheran Braille Evangelism Association
Lutheran Braille Workers
Lutheran Library for the Blind
Materials Development Center
Mental Disability Legal Resource Center

Table A-3 (Continued)

Mental Health Law Project
Mental Health Materials Center
Ministries to the Deaf and Blind
Ministry to the Deaf
Muscular Dystrophy Association
Myasthenia Gravis Foundation
National Accreditation Council for Agencies Serving the Blind & Visually Handicapped
National ALS Foundation
National Amputation Foundation
National Association of Concerned Veterans
National Association of Coordinators of State Programs for the Mentally Retarded
National Association of the Deaf
National Association for Hearing & Speech Action
National Association for Mental Health
National Association for Music Therapy
National Association of the Physically Handicapped
National Association of Private Residential Facilities for the Mentally Retarded
National Association for Retarded Citizens
National Association for Visually Handicapped
National Braille Association
National Catholic Education Association, Special Education Department
National Catholic Office of the Deaf
National Center for a Barrier Free Environment
National Center for Law & the Deaf
National Center for Law & the Handicapped
National Clearinghouse of Rehabilitation Materials
National Congress of Jewish Deaf
National Congress of Organizations of the Physically Handicapped
National Council on Alcoholism
National Council for Homemaker-Home Health Aide Services
National Easter Seal Society for Crippled Children and Adults
National Epilepsy League
National Eye Research Foundation
National Foundation of Dentistry for the Handicapped
National Foundation/March of Dimes
National Fraternal Society of the Deaf
National Genetics Foundation
National Hearing Aid Society
National Hemophilia Foundation
National Inconvenienced Sportsmen's Association

Table A-3 (Continued)

National Industries for the Blind
National Industries for the Severely Handicapped
National Institute for Rehabilitation Engineering
National Kidney Foundation
National Multiple Sclerosis Society
National Paraplegia Foundation
National Parkinson Foundation
National Pituitary Agency
National Rehabilitation Counseling Association
National Retinitis Pigmentosa Foundation
National Society for Autistic Children, Information and Referral Service
National Society for the Prevention of Blindness
National Tay-Sachs & Allied Diseases Association
National Theatre of the Deaf
National Therapeutic Recreation Society
National Tuberous Sclerosis Association
National Wheelchair Athletic Association
National Wheelchair Basketball Association
New Eyes for the Needy
North American Riding for the Handicapped Association
Office of Demographic Studies, Gallaudet College
Orton Society
Paralyzed Veterans of America
Parkinson's Disease Foundation
People-to-People, Committee for the Handicapped
Perkins School for the Blind
Pilot Dogs
Professional Rehabilitation Workers with the Adult Deaf
Psychological Abstracts Information Services, American Psychological Association
Quota International
Rambling Tours
Recording for the Blind
Registry of Interpreters for the Deaf
Rehabilitation International
Research to Prevent Blindness
Rubella Project
Ruth Rubin Feldman National Odd Shoe Exchange
Science for the Blind Products
Scoliosis Research Society
Seeing Eye
Sertoma Foundation, Sertoma Centers for Communicative Disorders
Sex Information & Education Council of the U.S.
Sickle Cell Disease Foundation of Greater New York

Table A-3 (Concluded)

Sister Kenny Institute
Society for the Rehabilitation of the Facially Disfigured
Spina Bifida Association of America
Tapes for the Blind
Teletypewriters for the Deaf
Therapeutic Recreation Information Center
Trace Research & Development Center for the
  Severely Communicatively Handicapped
Travel Information Center
United Cerebral Palsy Associations
United Ostomy Association
United Parkinson Foundation
United States Deaf Skiers Association
Volunteer Services for the Blind
Xavier Society for the Blind

Table A-4

FEDERAL GOVERNMENT AGENCIES CONCERNED WITH REHABILITATION ENGINEERING

Veterans Administration
Vermont Ave and H Streets, N W
Washington, D.C. 20420

Rehabilitation Services Administration
Office of Human Development Services
Department of Health, Education, and Welfare
Mary E Switzer Building
Washington, D C

Biomedical Engineering Program
National Institute of Neurological and Communicative Disorders and Stroke
Room 1016A, Federal Building
7550 Wisconsin Avenue
Bethesda, Maryland 20015

National Science Foundation
1800 G Street, N W
Washington, D C 20550

Office of Environmental Affairs
Office of Assistant Secretary for Environmental Safety
Department of Transportation
Room 9420, 400 Seventh Street, S W
Washington, D.C. 20024

Committee of Technology Utilization
U.S House of Representatives
Washington, D C 20515

National Aeronautics and Space Administration
600 Independence Avenue, S W
Washington, D C. 20546

Division of Medical Device Standards and Research
Bureau of Medical Devices and Diagnostic Products
Food and Drug Administration
Washington, D C. 20204

Office for Handicapped Individuals
Office of Human Development Services
Room 3511, Mary E. Switzer Building
Washington, D.C. 20201

Bureau of Education of the Handicapped
Office of Education
Room 2010, Regional Office Building
7th and D Streets, S W
Washington, D C 20201

Architectural and Transportation Barriers Compliance Board
Office of Human Development Services
Room 1010, Mary E Switzer Building
Washington, D.C. 20201

Director, Office of Developmental Disabilities
Office of Human Development Services
Room 3070, Mary E, Switzer Building
Washington,D.C 20201

Programs for the Elderly and Handicapped
Department of Housing and Urban Development
7th and D Streets, S W.
Washington, D C 20410

Appendix B

IDENTIFICATION AND SCOPE OF INDUSTRIES PROVIDING GOODS AND SERVICES TO THE HANDICAPPED/DISABLED

Table B-1

MAJOR MANUFACTURERS/DISTRIBUTORS
OF PRODUCTS FOR THE DISABLED

Abbey Rents & Sales 600 S. Normandy Los Angeles, CA 90005	Auto travel aids, bathroom aids, reading and writing aids, wheelchairs and parts/ accessories, transport vehicles, boards, cushions, typing systems, splint/brace systems
Ability Building Center, Inc. 1500 First Avenue Northeast Rochester, MN 55901	Auto travel signs, stocking pull, nail clipper reachers
AC Cars Ltd. High Street Thames Ditton Surrey England KT70SG	Motorized vehicles
Acme Lite Products Co. Fortune Road West Middletown, NY 10920	Desk lites
Action Products, Inc. 22 Mulberry Street Hagerstown, MD 21740	Bed & positioning pads
Activeaid, Inc. 501 E. Tin Street Redwood Falls, MN 56283	Commodes
AliMed P.O. Box 10 Boston, MA 02113	Sandals, lap boards, wheelchair accessories, pads, packs (hot & cold), splint/brace systems
American Stair-Glide Corp. 10220 Locust Kansas City, MO 64131	Elevating chairs, lifts (porch & stairway)
Amigo Sales, Inc. 6693 Dixie Highway Bridgeport, MI 48722	Motorized vehicles
AMW Enterprises P.O. Box 252 Dayton, OH 45405	Bidets

Table B-1 (Continued)

Aparco Inc. 55 Lee Rd. Newton, MA 02167	Trays, book holders, half-glove (rubber) blanket supports, bag toters
Apor Industries, Inc. Village Bank Bldg. 251 Garfield Rd. Aurora, OH 44202	Water Temp control (bathing)
A. R. Mann 1560 W. William St. Decatur, IL 62522	Voice amplifier
Atlantic Research Corp. 5390 Cherokee Ave. Alexandria, VA 22314	Vans/lifts
Bard/Carba Div. 731 Central Avenue Murray Hill, NJ 07974	Remote control environmental control systems
Bathing Aids to the Handicapped Box 1956 Greeley, CO 80631	Portable tubs
Battle Creek Equipment Co. 307 West Jackson Avenue Battle Creek, MI 49016	Steam baths, automatic trimcycle
Beneke Corp. Box 1367 Columbus, MS 39701	Specialized toilet seats
Bernina Sewing Machines of Switzerland 534 W. Chestnut Hinsdale, IL 60521	Sewing machines for disabled
Better Sleep, Inc. New Providence, NJ 07974	Gripper pads (bath), grab bars/rails, cushions, slants (back & legs), blanket supports, reachers
Bio Clinic Co. 59 E. Orange Grove Ave. Burbank, CA 91502	Bed and wheelchair pads
The Black-Cottle Co. P.O. Box 121 Clinton, NY 13323	Rocker knives

C-3

Table B-1 (Continued)

Bodark Mfg. Co., Inc. P.O. Box 28 Edmond, OK 73034	Crutches
Bradley Corp. Washroom Accessories Division Church & Fellowship Roads Moorestown, NJ 08057	Grab bars/rails, lavatory units
The Braun Corp. 1014 S. Monticello Winamac, IN 46996	Raised roofs (vans), vans/lifts, wheelchair floorwells, shower stalls, motorized vehicles, motor homes
Braune of Stroud Griffin Mill Thrupp Stroud Gloucestershire GL5 2AZ England	Motorized vehicles
Brookstone Company 11 Brookstone Bldg. Peterborough, NY 03458	Reachers
Bunting SteriSystems, Inc. 46 Beatrice St. Bridgeport, CT 06607	Personal television systems
Burke Enterprises P.O. Box 1064 Mission, KS 66222	Elevating beds, chairs, swivel rocker, commodes
California State Department of Rehabilitation Attention, Information Officer 830 K Street, Mall Sacramento, CA 95814	Wheelchair loader
Camp International P.O. Box 89 Jackson, MI 49204	Support-dropped foot
Care-Chair Systems, Inc. 5602 Elmwood Avenue Suite 219 Indianapolis, IN 46203	Travel chair (adaptive child's)

Table B-1 (Continued)

Carl Heald, Inc. P.O. Box 1148 Benton Harbor, MI 49022	Recreation motor vehicles
C. Beil Designs 5435 N. Artesian Avenue Chicago, IL 60625	Bookholders, page turners
Cecil Corporation P.O. Box 654 Evanston, IL 60204	Elastic shoe laces
Chair-E-Yacht P.O. Box 231 Shoshoni, WY 82649	Motorized vehicles
Channellock, Inc. Meadville, PA 16335	
Chec Medical Products P.O. Box 1112 166 Ridgedale Ave. Morristown, NJ 07960	Bath lifts
The Cheney Company 163rd St. New Berlin, WI 53151	Vans/lifts, stairway lifts
Chesebrough-Ponds, Inc. 33 Benedict Place Greenwich, CT 06830	Urinary devices
Clarke Carrier Corporation 1216 S.E. 12th Way Ft. Lauderdale, FL 33316	
Clos o mat, USA Inc. 75 Valentine Rd. Bloomfield, NJ 07003	Bidets
Collins Industries, Inc. Box 58, Huchinson, KS 67501	Auto travel ramps, vans/lifts, wheelchair tiedowns
The Colson Company Equipment Division 2600 Nonconnah Blvd. S. Suite 156 Memphis, TN 38132	Wheelchairs and parts/accessories, cushions, reachers

Table B-1 (Continued)

Contourpedic Corporation 280 Midland Avenue Saddle Brook, NJ 07662	Child's seating system
Convo-Pad P.O. Box 1454 Gardena, CA 90249	Bed pad
Creative Foam Corporation 511 Beach Street Fenton, MI 48420	Elbow & chair cushions, elbow & knee protectors
Crescent - The Cooper Group Box 728 Apex, NC 27502	
"D.A.S.H." The Kinsmen Rehabilitation Foundation 2256 W. 12th Street Vancouver, B.C. Canada V6K 2N5	Auto travel signs (need help/parking)
Dow-Knob, Inc. Box 721 Bloomington, IL 61701	Door knob attachments
Down East Electronics Mfg. Co. 44 Bucknam Road Falmouth, ME 04105	Environmental control systems, holder for cigarette in ashtray
Drive-Master Corporation 16 Andrews Drive West Paterson, NJ 07425	Automobile controls, vans/lifts, wheelchair floorwells
Dynamic Systems, Inc. Leicester, NC 28748	Wheelchair cushions
Earl's Stairway Lift Corp. 2513 Center Street Cedar Falls, IA 50613	Elevators, stairway lifts
Earth Products P.O. Box 4360 Pasadena, CA 91106	Portable hydroponic garden

Table B-1 (Continued)

Easy Riser 87 Millstone Road Wilton, CT 06897	Furniture leg extenders
Eaton E-Z Bath Co. P.O. Box 712 Garden City, KS 67846	Bath lift
Eberhard Faber, Inc. Crestwood Wilkes-Barre, PA 18703	Felt tip pens
Edco Surgical Supply Company, Inc. 125 S. Street Passaic, NJ 07055	Bathing aids, furniture, crutches, walkers, incontinent pants, grab bars/ rails, commodes, elevated seats
Ednalite Corporation Visions Systems Division Ande Bldg. Peekskill, NY 10566	Image enlarger
E.F. Brewer Company P.O. Box 159 Minomonee Falls, WI 53051	Bathing chairs, canes, motorized vehicle, walkers (adj./seats/ wheels), commodes, elevated seats.
Electric Autochair Mfg. Co. 765-B Saint Clare St. Costa Mesa, CA 92626	Motorized vehicles
Escalera, Inc. P.O. Box 1359 Yuba City, CA 95991	Stair chairs
Eton Phone Company 555 Greenbrier Dr., #29 Oceanside, CA 92054	Cordless phone
Evans Specialty Co., Inc. 14 E. Fifteenth St. P.O. Box 4220 Richmond, VA 23224	Desk rack
Everest & Jennings, Inc. 1803 Pontius Avenue Los Angeles, CA 90025	Wheelchairs & parts/accessories, grab bars/rails, bathing & toilet aids, furniture, canes, crutches, walkers, loading chairs, stretcher chairs, whirl-pool hydromassage

Table B-1 (Continued)

Fairfield Medical 10 Winters Lane Baltimore, MD 21228	Canes, flotation systems
Falkenberg, Inc. 3612 Troy Street Portland, OR 9219	Mobile chair
FashionAble Rocky Hill, NJ 08553	Clothing, bath aids, appliances, utensils, holders, cushions, remote control switches reachers, tilting top tables
Ferno-Washington, Inc. P.O. Box 826 70 Weil Way Wilmington, OH 45177	Stair chairs, chair cot
Fidelity Electronics, Ltd. 5245 W. Diversey Avenue Chicago, IL 60639	Remote control environmental control systems
Flinchbaugh-Murray Corp. 390 Eberts Lane York, PA 17403	Stairway lifts
Foley Mfg. Co. 3300 5th St., N.E. Minneapolis, MN 55418	One-handed flour sifter
Frank Industries, Inc. Xplorer Motor Home Div. 3950 Burnsline Road Brown City, MI 48416	Motor home (recreational)
Fred Sammons, Inc. Box 32 Brookfield, IL 60513	Utensils/holders; cushions/protectors; wheelchair parts/accessories; grooming, reading & writing, eating & drinking, dressing aids
Fred Scott & Sons 101 Kelly Street Elk Grove, IL 60007	Ramps, vans/lifts, stairway & bus lifts
Freedom Gardens Strawberry Road Mohegan Lake, NY 10547	

Table B-1 (Continued)

The Freedom Home Box 246 Lakeview Drive Powhatan, VA 23139	Accessible mobile homes
French Italian Marketing Corp. P.O. Box 1152 Great Neck, NY 11023	
Fun Country 29833 Ruby Ranch Road Evergreen, CO 80439	Recreational motor vehicle
Gandy Company 528 Ganrud Road Owatonna, MN 55060	Pedal kit bicycles
Genac, Inc. 2220 Norwood Avenue Boulder, CO 80302	Stroller (wt. limit)
Gendron, Inc. Lugbill Road Atchbold, OH 43502	Bathing & toilet aids, canes, crutches, walkers, motorized wheelchairs & parts, safety devices, grab bars/rails, mobilechairs, stretchers
General Bedding Corporation 8337 Nieman Road Lenexa, KS 66214	Inflatable beds
George H. Snyder 5809 N.E. 21 Avenue Ft. Lauderdale, FL 33308	Exercising standing aid, bowling ball holder
Godfrey Engineering Limited Howden & Godfrey House Godfrey Way Hounslow, Middlesex, England	
Grayline Housewares 1616 Berkley Street Elgin, IL 60120	Storage/organizers
Gresham Driving Aids P.O. Box 405A Wixom, MI 48096	Automobile controls, signs (need help/parking), vans/lifts, wheelchair floorwells, wheelchair tiedowns

Table B-1 (Continued)

Helmac Products Corp. P.O. Box 73 Flint, MI 48501	Clothing - lint pickup
The Helper Corp. P.O. Box 473 Stuarts Draft, VA 24477	Vans/lifts
Herbst Shoe Manufacturing Co. P.O. Box 1952 Little Rock, AR 72203	Shoes
Hesco P.O. Box 3547 Santa Fe Springs, CA 90670	
Holeck Engineering Co. 9255 Clancey Avenue Downey, CA 90240	Auto travel individual lifts
Holo Industries 12888 Haster Garden Grove, CA 92640	Bed transfers
Horton Automatics Division of Overhead Door Corp. 4242 Baldwin Blvd. Corpus Christi, TX 78504	Automatic door operators
HP Bus Corp. of America P.O. Box 38 N. Billerica, MA 01862	Buses
Hughes Hand Driving Controls, Inc. Box 275 Lexington, MO 64067	Automobile controls
Hustler Corp. Box 1283 Jonesboro, AR 72401	Recreational motor vehicles
Inclinator Company of America 2211 Paxton Street Harrisburg, PA 17105	Elevators

Table B-1 (Continued)

G. T. Luscombe Company 622 Prestwick Drive Frankfort, IL 60423	Lap boards
Guardian Products Co., Inc. 8277 Lankershim Blvd. N. Hollywood, CA 91605	Canes, crutches, cane & crutch tips, walkers
Gyro Tech, Inc., 6750 Industrial Loop Greendale, WI 53129	Automatic door operators
Habny Products 261 Huntington Avenue Buffalo, NY 14214	Tables w/casters
Handee For You 7675 Park Avenue Lowville, NY 13367	Clothing
Handicaps, Inc. 4335 S. Sante Fe Drive Englewood, CO 80110	Automobile controls, signs (need help/ parking) vans/lifts
Handi-Ramp, Inc. P.O. Box 745 1414 Armour Blvd. Mundelein, IL 60060	Ramps, wheelchair floorwells, wheel-chair tiedowns, ramp railings
Harriet Carter Dept. 62 Plymouth Meeting, PA 19462	Portable ironing board
Housmann Industries, Inc. 130 Union Street Northvale, NJ 07647	Bathing aids, wheelchair trays, sliding boards
Haws Drinking Faucet Co. Fourth and Page Streets Berkeley, CA 94710	Public building (drinking faucets)
HB & D Products P.O. Box 743 S. Laguna, CA 92677	Page turners

Table B-1 (Continued)

Innovations, Inc. Box 1418-L Pittsburg, KS 66762	Wheelchair loader/carriers
Intermed Associates, Inc. 563 Ringwood Avenue Wanaque, NJ 07465	Urinary devices
Insta Gaiter 7239 Industrial Blvd. Mentor, OH 44060	Wheelchair power units
International Bicycle Shop, Inc. 604 Veterans Memorial Blvd. P.O. Box 9015 Metairie, LA 70055	Bicycles
Invacare Corporation 1200 Taylor Street Elyria, OH 44035	Bathing & toilet aids, canes, walkers, wheelchairs & parts/accessories, transfer boards
Jafny Manufactured Homes 2414 East F. Tacoma, WA 98421	
The Jal Company 3046 Bamlet Road Royal Oak, MI 48073	Telephone arm
J. A. Preston Corporation 71 Fifth Avenue New York, NY 10003	Bathing aids, utensils, canes, crutches, walkers, play equipment, bicycles
J. E. Nolan and Son, Inc. P.O. Box 43201 Louisville, KY 40243	Bath lifts
Jobst Institute, Inc. Box 653 Toledo, OH 43694	Waterbeds, wheelchair cushions, bed pads
John Kallander 776-18th Avenue Menlo Park, CA 94025	Book holders

Table B-1 (Continued)

Keane Monroe Corporation Broome & Mason Sts. P.O. Box 1071 Monroe, NC 28110	Automatic door operators
Ken McRight Supplies, Inc. 7456 S. Oswego Tulsa, OK 74135	Air mattresses, wheelchair cushions
Kroepke Kontrols, Inc. 104 Hawkins St. Bronx, NY 10464	Automobile controls
Lakeland Tool Works and Products P.O. Box 1224 21 Birnamwood Drive Burnsville, MN 55337	Page turners
Lakewide Manufacturing Inc. 1983 S. Allis Street Milwaukee, WI 53207	Motorized wheelchairs
Lamson and Goodnow Manufacturing Company Shelburne Falls, MA 01370	Rocker knives
Lance Enterprises, Inc. 1391 Blue Hills Avenue Bloomfield, CT 06002	Automobile controls (hand driving controls & steering devices), vans/ lifts, wheelchair tiedowns
Lane Bryant Indianapolis, IN 46201	Clothing
LA-Z-Boy Contract 1284 N. Telegraph Road Monroe, MI 48161	Recliners
Lee's Roll-A-Ball Rt. 2 Mason City, IA 50401	Sports-tracks
Leinenweber, Inc. Brunswick Bldg. 69 W. Washington St. Chicago, IL 60602	Clothing

Table B-1 (Continued)

Lifecare Services, Inc. 5505 Central Avenue Boulder, CO 80301	Respirators
Lodes Lift 1931 Consuello Drive Holiday, FL 33589	Wheelchair loader
Lossing Orthopedic Brace Co. 2217 Nicollet Avenue Minneapolis, MN 55404	Row car (wt. limit)
Loyal LaPlante Supply Co. 1519 S. Lewis Tulsa, OK 74104	Wheelchair loader
Lumex, Inc. 100 Spence Street Bay Shore, NY 11706	Grab bars/rails, canes, crutches, walkers, fastening belt, safety devices
Mac's Power Lift Gate, Inc. 2727 South St. North Long Beach, CA 90805	Vans/lifts
Maddak, Inc. Pequannock, NJ 07440	Hand gym, wheelchair accommodating desks
Maintainer Corporation Stand Aid Division Box 386 Sheldon, IA 51201	Stand aid (wheels)
Maxon Industries 1960 Slauson Avenue Huntington Park, CA 90255	Vans/lifts
Mead Johnson Laboratories Evansville, IN 47721	Instant formula child care
Medical Equipment Distributors, Inc. 1215 S. Harlem Forest Park, IL 60130	Wheelchairs, parts/accessories, support systems, transfer boards, utensils & aids, cushions, bathing & toilet aids/devices, auto controls, splint/brace systems

Table B-1 (Continued)

MediGlas, Inc. Box 17566 Charlotte, NC 28211	Portable tubs
Mentor, Inc. 811 N. Longfellow Ave. Tucson, AZ 85711	Bidets
Micon Industries 252 Oak Street Oakland, CA 94607	Typing system telephoning (for deaf)
Microlert Systems International 3030 Empore Avenue Burbank, CA 91504	Remote control emergency summoning system
Minnesota Mining & Manufacturing 3M Company Medical Products Division St. Paul, MN 55101	Bed pads
Mobility Dynamics, Inc. 21029 Itasca Chatsworth, CA 91311	Vans/lifts, wheelchair power units
Mobility Products & Design, Inc. 709 Kentucky Street Vallejo, CA 94590	Automobile controls
Monadnock Lifetime Products, Inc. Fitzwilliam, NH 03447	Cane and crutch ice grippers
Multi Marketing Inc. P.O. Box 1125 Littleton, CO 80160	Bottle/jar openers
Multi Media Resource Center 1525 Franklin Street San Francisco, CA 94107	
National Identification Company Division of NIDCO of Colorado, Inc. 3955 Oneida Street Denver, CO 80207	Emergency medical aid

Table B-1 (Continued)

National Institute for Rehabilitation Engineering 97 Decker Road Butler, NJ 07405	Typewriter (cerebral palsy) large print typewriter, one-handed typewriter, TV phone, page turners
National Odd Shoe Exchange 3100 Neilson Way - 220 Santa Monica, CA 90405	Shoes
Nelson Medical Products 5690 Sarah Avenue Sarasota, FL 33581	Automobile controls, automobile travel assist bars/handles, bathing aids, eating utensils, ramps, getting in wheelchair pouches, cushion covers, cushions, transfer boards, weighing scales (for wheel bound)
North American Recreation Convertibles, Inc. P.O. Box 668 Westport, CT 66880	Sports equipment
NuVogue Creations 812 Huron Rd. Cleveland, OH 44115	Incontinent pants
Ortho-Kinetics, Inc. P.O. Box 436-182 Waukesha, WI 53186	Recliners, elevating chairs, adaptive child's travel chair, rising seat wheelchairs, commodes
Oscar B. Stiskin Ulverscroft P.O. Box 3055 Stamford, CT 06905	Large print books
Owen Miniwinch 412 Woodward Blvd. Pasadena, CA 91107	Wheelchair loader
Pacific Leather Co. P.O. Box 641 McMinnville, OR 97128	Bed pads
Palmer Industries P.O. Box 707 Union Station Endicott, NY 13760	Motorized vehicles, bicycle power units

Table B-1 (Continued)

Palmer Sales & Service, Inc. 3043 West Colter Phoenix, AZ 85017	Motorized vehicles
Para Industries, Ltd. #6 4826 11th St., N.E. Calgary, Alberta, T2E 2W7 Canada	Vans/lifts, bus lifts
Phillips-Brooks, Inc. P.O. Box 43 Cumming, GA 30130	Telephone booths (accessible)
Phonics Corp. 814 Thayer Ave. Silver Springs, MD 20910	TV phone
Physical Aids, Inc. 144 S. Orange Ave. El Cajon, CA 92020	Wheelchair loaders, portable desks, reachers
Piper Braces Sales Corp. 811 Wyandotte St. Kansas City, MO 64105	Crutches, canes
Power Access Box 11 Shrewsbury, NY 07701	Automatic door operators
Prentke Romich Co. R.D. 2 Box 191 Shreve, OH 44676	Telephone-automatic dialing, automatic door operators, remote control switches
PTL Designs P.O. Box 364 Stillwater, OK 74074	Clothing
Rabjohn Medical Aids 18754 Parthenia St., #3 Northridge, CA 91324	Wheelchair power units
Ralco Mfg. Co. Box 15187 1534 E. Edinger Santa Ana, CA 92705	Incontinent pants
Rambling Tours, Inc. P.O. Box 1304 Hallandale, FL	Tours for disabled

Table B-1 (Continued)

R-Anell Homes Route 2 Box 71 Maxton, NC 28364	Accessible mobile homes
Reel Power, Inc. 811-42nd St., South St. Petersburg, FL 33713	Fishing - electronic reel
Rehabilitation Equip., Inc. 1556 Third Ave. New York, NY 10028	Elevating & adjusting beds, adaptive child's travel chair, wheelchair caddies
Rehabilitation Equip. & Supply 1823 West Moss Ave. Peoria, IL 61606	Bathing aids
Research Library Human Resources Center Albertson, L.I., NY 11507	Sports-frame directions
R. H. Boehm Co., Inc. 2625 Lathrop Ave. Racine, WI 53405	Automatic door operators
Rico Recreational Industries, Inc. P.O. Box 3143 5232 Tod Ave., S.W. Warren, OH 44485	
Riswell, Inc. P.O. Box 73 Greenwich, CT 06830	Bottle/jar openers
R. J. Chairlift Co., Inc. 715 S. 5th Avenue Maywood, IL 60153	Automobile controls (hand driving controls), vans/lifts, porch lifts, wheelchair parts, ramps
Roethisberger, Mrs. H. J. Emerald Lake Rd. Evart, MI 49631	Auto travel signs (need help/parking)
Roho Research & Development, Inc. 208 Yorktown, Collinsville, IL 62234	
Romich, Berry, & Bayer, Inc. R.D. 2 Box 191 Shreve, OH 44676	Remote control environmental control systems

Table B-1 (Continued)

Rosenthal Mfg. Co. 5033 N. Kedzie Chicago, IL 60625	Wheelchair power units
Royce International Ltd. 4345 S. Santa Fe Dr. P.O. Box 1337 Englewood, CO 80110	Auto controls (ignition key extension), raised roofs, signs (need help/parking), vans/lifts
Roy Dodgen Roy Dodgen Shop Blue Eye, MO 65611	Bath aids (brushes & sponges) fishing belt
Rubbermaid Inc. Wooster, OH 44691	Storage/organizers
Safety Walk, Inc. 1247 Garden Ave. Roseville, MN 55113	Canes
Saltus Corp. Pleasant St. South Natick, MA 01760	Page turners, call switch (remote control)
Science for the Blind Products 221 Rock Hill Rd. Bala - Cynwyd, PA 19004	Calculator (w/Braille printout)
Scimedics, Inc. 700 N. Valley St., Ste. B Anaheim, CA 92801	Wheelchair trays, back cushions, wheelchair cushions, flotation systems
SCM Corp. Consumer Products Division Smith-Corona Group 65 Locust Ave. New Canaan, CT 06840	Large print typewriters, one-handed typewriter, typewriter mask
Scrambler, Inc. 26 S. Main St. Genoa, OH 43430	Recreational motor vehicle
Sears, Roebuck and Co. c/o LeRoy Meyer 1633 Broadway New York, NY 10019	Bathing and toilet aids, adjusting beds, wheelchairs & parts/accessories, cushions, walkers, grab bars/rails, incontinent pants
Seton Name Plate Corp. 951 Boulevard New Haven, CT 06505	Auto travel signs (need help/parking) access symbols

Table B-1 (Continued)

Sharpe Aids West, Inc. Suite B 7484 University Avenue LaMesa, CA 92041	Wheelchairs
Sheller-Globe Corp. Superior Div. One Superior Dr. Kosciusko, MS 39090	Buses
Sheltered Workshop for the Disabled, Inc. 200-204 Court St. P.O. Box 310 Binghamton, NY 13902	Stocking pull
Sherry Products, Inc. 1501 Pacific Coast Hwy. Hermosa Beach, CA 90254	Vans/lifts, motorized wheelchairs
Skill Development Equip. Co. 1340 N. Jefferson Anaheim, CA 92807	Play equipment
Smith Hand Control 1420 Brookhaven at Hwy. 51 South Southhaven, MS 38671	Automobile controls (hand driving
Snitz Manufacturing Co. 2096 S. Church St. East Troy, WI 53120	Basketball (controlled unit), balls w/handles
Solo Products 2435 Front St. West Sacramento, CA 95691	Wheelchair power units
Sonneville & Associates 8604 Oakwood Dr. Crystal Lake, IL 60014	Bathing aids, wall mounted desks, lap-boards, cushions
Southeastern Mobility 8236 Middlebrook Pike Knowville, TN 37929	Automobile controls (hand driving controls), vans/lifts
Sparr Telephone Arm Co. P.O. Box 143 Allamuchy, NJ 07820	Telephone arm
Speedy Wagon of Florida 9211 4th St. No. St. Petersburg, FL 33702	Raised roofs (vans), vans/lifts, showerstalls, porch lifts, motor home

Spenco Medical Corp. P.O. Box 8113 Waco, TX 76710	Bed pads, foot protectors
Stainless Medical Products 3107 S. Kilson Dr. Santa Ana, CA 92707	Bathing aids, wheelchairs
Standard Products Corp. P.O. Box 270 Whitman, MA 02382	Hair curlers, hand care (callous eraser)
Stanley Door Operating Equip. Division of the Stanley Works Farmington, CT 06032	Automatic door operators
Staplex Co. 777 Fifth Ave. Brooklyn, NY 11232	Automatic staplers
Steven Motor Chair Co. 120 N. Gunter Siloam Springs, AR 72761	Motorized wheelchairs
Stimulation Learning Aids, Ltd. 65 Earle Avenue Lynbrook, NY 11563	Image enlarger
Success Association International P.O. Box 47621 Dallas, TX 74247	Training & personal development system
Sween Corp. Rapidan, MN 56079	Skin care cream, catheter skin protectors
Ted Hoyer and Co. 2222 Minnesota St. Oshkosh, WI 54901	Auto travel individual lifts, bath lifts, swimming pool transfers
Telesensory Systems, Inc. 3408 Hillview Ave. Palo Alto, CA 94304	Talking calculator, sensor (for blind), obstacle detector, image converter (tactile)
Teletronics United, Inc. 2910 Rubidoux Blvd. Riverside, CA 92509	Cordless phone
Telmec Systems, Inc. P.O. Box 161 Old Hickory, TN 37138	Word activated telephoning

Table B-1 (Continued)

Theradyne Corp. P.O. Box 458 Jordan, MN 55352	Motorized wheelchairs, commodes
Thera-Med Products, Inc. Doncaster Medical 140 Doncaster Ave. Thornhill, Ontario, Canada	Grab bars/rails, elevating & adjusting beds, walkers, wheelchairs, oxygen
Theraplay Products 29-24 40th Ave. Long Island City, NY 11101	Play equipment
Thermo-Cryonics, Inc. 275 Hwy. 18 East Brunswick, NY 08816	Flotation systems
Thomas Built Buses, Inc. P.O. Box 2450 High Point, NC 27261	
Thompson Respiration Products Boulder Industrial Park 1925 55th St. Boulder, CO 80302	Respirator
Top Shelf Reacher 19438 Business Center Dr. Northridge, CA 91324	Reachers
Total Mobility Systems & Designs, Inc. 4060 Stewart Rd. Eugene, OR 97402	Automobile controls (hand driving controls, auto directional signals), raised roofs (vans), vans/lifts, wheelchair floorwells.
Touch Turner Co. 443 View Ridge Dr. Everett, WA 98203	Page turners
Triaxon, Inc. 3339 W. Lake Ave. Glenview, IL 60025	Bath lift
Tri-World Industries 16015 West 5th Ave. Golden, CO 80401	Tricycle-hand controlled
Trujillo Industries 5726 W. Washington Blvd. Los Angeles, CA 90016	Ramps

Tubular Specialties 8110 S. Beach St. P.O. Box 71527 Los Angeles, CA 90001	Grab bars/rails, bathing aids
United Surgical Co. Division of Howmedica, Inc. Box 1970 Largo, FL 33541	Urinary devices
Urocare Products, Inc. 10031 E. Rush St. South El Monte, CA 91733	Urinary devices
Vargas Fishing-Aid Rodholder Co. 5453 Norwalk Blvd. Whittier, CA 90601	Fishing rod holders
Ventura Enterprises 35 Lawton Ave. Danville, IN 46122	Wheelchair pouches
Vibralite Products, Inc. 83 S. Highland Ave. Ossining, NY 10562	Alarm Clock for deaf
Vocal Interface Division Federal Screw Works 500 Stephenson Highway Troy, MI 48084	Communication display board
Voyager, Ltd. P.O. Box 1577 South Bend, IN 46634	Motorized vehicle
Wainerdi, Dr. & Mrs. R. E. 1115 Langford Dr. College Station, TX 77840	
Walter F. Nicke Box 667-8 Hudson, NY 12534	Lawn shears/weed puller
Waugh & Co. P.O. Box 12264 4130 N. Canal St. Jacksonville, FL 32209	Shower stalls
Weil Service Products Corp. 2434 West Fletcher St. Chicago, IL 60618	Wheelchair tire pressure gauge, repair kits

Table B-1 (Concluded)

Wells-Engberg Co., Inc. Box 6388 Rockford, IL 61125	Automobile controls
The Wheelchair Carrier Corp. 5829 N. Seventh St. P.O. Box 9328 Phoenix, AZ 85068	Wheelchair loader/carriers
Wheel-O-Vator Division of Toce Bros. Mfg. Ltd. P.O. Box 489 Broussard, LA 70518	Porch lifts
Wilkinson Sword, Inc. British-American Marketing Services, Ltd. 251 Welsh Pool Rd. Linnville, PA 19353	Long handled & custom made tools
Winfield Co., Inc. 3062 46th Ave., North St. Petersburg, FL 33714	Commodes, bathing aids, grab bars/ rails, convalescent chairs, recliners, foot stools, canes, walkers, adjusting/
Wiss-The Cooper Group P.O. Box 728 Apex, NC 27502	Left-handed scissors
Wright-Way, Inc. P.O. Box 907 Garland, TX 75040	Automobile controls, auto travel assist bars/handles, getting in
Zaner-Bloser Co. 612 N. Park St. Columbus, OH 43215	Writing frames

Appendix C

SAMPLE PRODUCT EVALUATION REPORT

FROM THE RESEARCH INSTITUTE FOR CONSUMER AFFAIRS
LONDON, ENGLAND

The Disabled User

Pick-up Sticks

RICA
Comparative Test Report
No 8

Published by The National Fund for Research into Crippling Diseases
Vincent House Vincent Square London SW1 01-834 7001
Obtainable from the publishers, price 30p

THE DISABLED USER

A programme of comparative testing of equipment for the disabled is being carried out by the Research Institute for Consumer Affairs (RICA), sponsored jointly by the National Fund for Research into Crippling Diseases and the Sembal Trust

Research Institute for Consumer Affairs

RICA is an independent non-profit-making charitable trust, whose terms of reference include the investigation of provisions made for the under-privileged consumer. RICA is closely associated with the Consumers' Association (CA), publishers of 'Which?', and draws on CA's resources and accumulated experience in the comparative testing of equipment.

Current Situation

The recent Government social survey (1) estimates that there are 1,130,000 very severely, severely or appreciably handicapped people aged 16 or over living at home in Great Britain and who need care and help. In addition the Government (2) estimate that there are another 300,000 handicapped adults in hospital or living in institutions and about 80,000 handicapped children – a total of 1½ million The survey also estimates that there are close on another 2 million adults with more minor difficulties which limit their getting about, working or taking care of themselves

To cope with living at home a disabled person may need special equipment, adaptations to standard products or advice on the selection of consumer durables suitable for his use Most therapists and others working with the disabled are acutely aware of their needs and problems They are, however, limited by the lack of information about work done in this field, and they have neither the experience nor the facilities for specialist testing techniques

Programme

All products to be tested are bought anonymously and are thus identical to those bought by an individual user. Full laboratory tests for safety, durability and performance are carried out on aids and equipment specially designed for the disabled, and are followed by user trials. In the case of standard domestic equipment, disabled user trials are carried out following the laboratory tests of the Consumers' Association

Aims

In the case of a disabled user there are so many individual variations to be taken into account that a specific choice of goods providing best value for money may not always be possible.

These projects will, however, indicate the design features which will assist a disabled person and those concerned with him to select the most suitable item for his individual needs from a similar range of goods

It is hoped that the findings will emphasise the need for good design in ordinary consumer goods for the benefit of the able-bodied as well as the disabled, thus obviating the need for specially designed equipment for the disabled

Publication

Reports so far published are:

July 1969	No 1	Refrigerators
July 1969	No. 2	Reading Aids. Page-turners
January 1970	No. 3	Reading Aids. Microfilm Projectors
January 1970	No. 4	Reading Aids Prismatic Spectacles
January 1970	No 5	Cookers
July 1970	No. 6	Easy Chairs
July 1970	No 7	Gas Fires
July 1971	No 8	Pick-Up Sticks
July 1971	No. 9	Can Openers
September 1971	No. 10	Vacuum Cleaners
May 1972	No. 11	Bed/Chair Tables
September 1972	No. 12	Food Mixers
December 1972	No 13	Bath Aids

FOOTNOTES

(1) 'Handicapped and Impaired in Great Britain', Amelia I Harris. Office of Population Censuses and Surveys, HMSO, 1971.

(2) Secretary of State for Social Services, Hansard, 21 May 1971, Col 1752.

R I C A Comparative Test Report No 8

Pick-up Sticks

PICK-UP STICKS

There is scarcely any cause of disablement which does not, sometimes, make it difficult or even impossible, for people to bend down or to reach as far as is normal A pick-up stick (sometimes called a 'reacher') or a pair of tongs enables such people to pick up a wide variety of objects from the floor or beyond their reach on tables and shelves. A pick-up stick can also be useful for household activities such as switching on the light, drawing curtains, operating window catches or for personal activities such as pulling on stockings

Pick-up sticks and tongs are often supplied to individuals at little or no cost by Hospitals, Local Authority Social Service Departments and voluntary organisations such as the Red Cross

In addition to studying pick-up sticks available in the UK, this report also covers those available in Sweden This was arranged in co-operation with the Swedish Institute for the Handicapped (Handikappinstitutet) who provided proportionate finance for the project

UK MODELS

We tested 12 basic models -

Cee Vee	New Lightweight	£2 40
Cee Vee	Standard, 'A' jaws	£3 50
Cee Vee	Standard, 'C' jaws	£3 50
DoE	Lightweight	47½p
DoE	One-handed	69p
Helping Hand	Featherweight	£2.00
Home Office	Lazy Tongs	25p
Mabar	Yardarm	£2.10
Masters	No 10	£2.63
Medico-Therapeutics	Tongs	£2.43
Wexen (Red Cross)	Tongs	40p
Zimmer	Lazy Tongs	£2.25

Where possible, we tested models with a nominal length of 30in. (76cm)., which was the most usual.

We also looked at, but did not fully test -

Red Cross, Lazy Tongs, 33p, very similar to the Home Office Lazy Tongs,

Bell and Croyden, Lazy Tongs, £3 15, very similar to the Zimmer lazy tongs,

DoE, Stone, 38p, very similar to the DoE Lightweight;

and four variants of the Helping Hand Featherweight -

Longreach, £2 25	- 6in longer than the Featherweight
Folding, £3.00	- 2½in shorter than the Featherweight, folding to 12¾in.
Limpet, £2 25	- as the Featherweight, with the addition of clips for attaching it to a walking stick or wheelchair.
Retainer, £3.25	- as the Featherweight, with the addition of a second lever to operate the jaws and which locks the jaws onto the object while lifting it

For manufacturers' names and addresses, see Summaries

MODELS FROM SWEDEN

These were -

Aidbrax Type V (made in Italy under the name Sekurbrax)	44 50	S Kr
HEA-1	32	S.Kr
HEA-2 (for weak hands)	32	S Kr
LIC-1 (jaws at 45° to shaft)	26	S Kr
LIC-3 (jaws at 90° to shaft)	26	S Kr
LIC-2 (for weak hands)	26	S Kr
SVCR-2 (jaws at 45° to shaft)	22	S Kr
SVCR-3 (jaws at 90° to shaft)	22	S.Kr

SVCR-1 (for weak hands) 24 S.Kr

(12.48 S.Kr = £1. Thus the equivalent price of the SVCR-1 is about £2 and that of the Aidbrax about £3.50.)

Where possible we tested models with a nominal length of 70cm (27½in.).

None of these are available in the UK.

DESIGN DETAILS

The **pick-up sticks** consisted essentially of a shaft with a pair of spring jaws at one end controlled by a lever, or similar device, at the other. On most of the models this was a lever hinged beside the handle (see photograph Summary I), but the **Helping Hand** had a trigger-like grip (see photograph Summary VI), while the **DoE Lightweight** and **Stone** had a loop of wire which had to be pulled along the shaft (see photograph Summary IV).

On most of them the spring held the jaws open so that they could be placed around the object to be picked up. The lever is then squeezed to close the jaws on to the object and held squeezed while lifting the object. On some, however - mostly intended for users with weak hands - the spring held the jaws closed. With this type, the user had to squeeze the lever only to open the jaws when placing them round the object, but not while lifting. This meant however that the weight of objects which can be picked up depended on the strength of the spring, instead of on the grip of the user.

The **Lazy Tongs** had a lattice structure; the gap between the jaws closed as the lattice is extended by closing the scissor-like handles held between finger and thumb. (See photograph Summary XII.)

For details of the UK models see Summaries I to XII. For those of the Swedish models see Table 1.

USER REQUIREMENTS

We first carried out a pilot user trial with the help of four disabled housewives - handicapped respectively by rheumatoid arthritis, paraplegia, Still's disease and cerebral palsy - to find out the characteristics and requirements for assessing the pick-up sticks and tongs.

As a result of this trial we found the criteria were -

1. ability to pick up a range of differently shaped objects
2. convenience for lifting and moving objects from one side of the table to the other.
3. convenient length
4. light in weight
5. ease of reaching lever
6. ease of squeezing lever
7. presence of a magnet
8. adequate width of jaws
9. relative convenience of spring-open and spring-closed jaws.
10. good grip of jaws
11. comfortable handle

To these we added three general requirements -

12. not too flexible
13. generally robust
14. not affected by corrosion

We also consider that it should be possible to use pick-up sticks and tongs with only one hand.

Some of these requirements are, of course, contradictory; for instance, a model with very wide jaws will pick up large objects but may be heavy. In assessing the various models some compromise is therefore necessary.

LABORATORY TESTS

Laboratory tests were carried out to compare each model for the three general requirements mentioned above, and the length, weight, effort to squeeze the lever, width and grip of jaws and ability to pick up a range of objects.

Length and Weight

The nominal length quoted by the manufacturer is sometimes a little misleading, as the effective length depends on the shape of the jaws and handle. The effective length we measured was from the web of the user's thumb to the tip of the jaws of the stick.

Weights varied widely from 19oz (539gr) to 4oz (118gr).

Width of Jaws

The maximum gap across the open jaws varied

from just over 1in. (28mm) to nearly 5in (122mm). The models with the widest jaws tended to be the heaviest.

Grip of Jaws

The force needed to pull a 1in. (25mm) thick wooden block out of the jaws of each model was measured. This force varied from 10½lb (4.7kg) on the model with the best grip to ¼lb (0.1kg) on that with the worst.

Stiffness of Hand Grip

The force needed to squeeze the lever varied from 13lb (5.9kg) to 2lb (0.9kg) - the smaller the force the better.

Strength of the Shaft

To measure this, we clamped the handle of the stick, loaded it at a point 15¾in. (40cm) from the clamp and measured the maximum load each model would take without bending permanently.

Distortion When Loaded

All the UK models and three of the Swedish ones lifted 2.2lb (1kg) without any permanent bending.

For detailed results of these tests on the UK models, see Summaries I to XII. For those on the Swedish models, see Table 1.

Picking Up

Four able bodied people assessed each model for its basic ability to pick up a range of objects irrespective of any disability of the user.

These objects were -

1lb can, eg vegetables, (73mm diameter), lying on its side

6oz can, eg fruit juice, (53mm diameter), lying on its side

1lb packet of detergent, (48mm thick), standing upright

10p (2s) coin (28mm diameter)

paperback book (15mm thick) lying flat

round pencil (8mm diameter)

crumpled duster.

For results, see Table 2.

Corrosion

None of the models were appreciably rusted or marked by our corrosion test.

USER TRIALS

Elimination Test

During the pilot trial five models were found to be markedly less satisfactory than the others. To make the tests more manageable these five models were eliminated from the main user trial.

These five, with typical comments, were -

UK Models

DoE one-handed	- 'too big and clumsy', 'poor claws will not pick up much', 'elbow piece no use at all'
Mabar	- 'poor (hand) grip - too stiff', 'things slip out too easily'
Masters	- 'claws not wide enough', 'too heavy', 'handles too wide'. (See photograph 1.)
Medico-Therapeutics tongs	- 'impossible', 'no use at all'

1 The Masters - showing the impossibly wide grip needed

Models Available in Sweden

Aidbrax	- 'far too heavy', 'can't use it'

These criticisms were borne out by the laboratory tests. For instance, the Aidbrax and Mabar required twice as much force to squeeze the lever as the stiffest of the acceptable models. The Aidbrax was much the heaviest, while the Medico-Therapeutics tongs gripped objects least well of all the models tested. For details see Summaries and Table 1.

Main Test

A total of 24 disabled people took part in the main trial, 20 women and 4 men. These included people with rheumatoid arthritis, multiple sclerosis, cerebral palsy, polio and spina bifida. Ten of the 24 had limited use of their hands and arms - stiff or swollen joints or in-co-ordination. In the main trial all the users used the pick-up sticks sitting down, 13 of them in a wheelchair.

After the elimination of the five models described above, the remaining sixteen basic models were tried out in the main trial plus the 6in. longer version of the Helping Hand (the Longreach) and a 10cm shorter version of the SVCR-1 to help study the effect of length.

Operations and questions

To compare the models, using the criteria determined by the pilot test, each user carried out and assessed the following seven operations -

- picking up a match box and placing on table
- moving a match box from one side of the table to the other
- picking up a 6oz can of fruit juice
- picking up a ½lb packet of detergent
- picking up a round pencil
- reaching the hand lever
- squeezing the hand lever

Supplementary questions covered how convenient they found the stick's length and weight, the width of its jaws, whether they preferred the spring-open or spring-closed type, how much of an advantage they considered a magnet, and the order in which they preferred different materials of the jaws and different types of handle.

For assessments of the UK models, see the Summaries on pages 9 to 14, and of the Swedish models see Table 1.

FINDINGS - POINTS TO LOOK FOR

Length

The users were asked to assess the models for length when used from a sitting position. In general, the preferred models had an 'effective' length - from the web of the user's thumb to the tip of the jaws of the stick - of between 23 and 24½in. (59 to 62cm). Seven of the models fell within these limits. When used from a standing position, an effective length of 30in. (76cm) was preferred.

2 Using a pick-up stick standing up

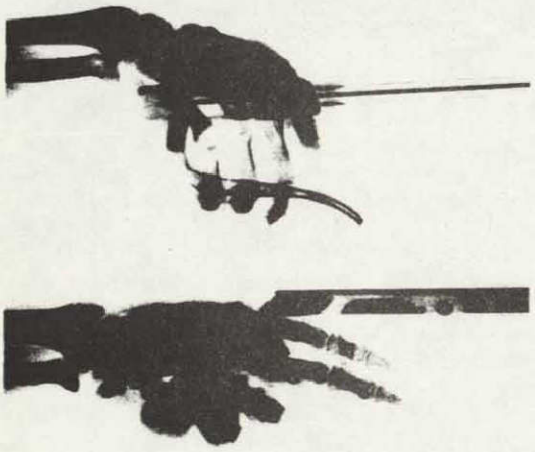
So when selecting a pick-up stick, the user has to decide from which position it will be used most frequently. (See photographs 2 and 3.)

However, the shorter the stick the less the effort needed to pick things up. Short tongs served a useful function where only a short extension of the user's reach was needed.

Handle

A pick-up stick with the handle at an angle of about 45° to the shaft is likely to be more comfortable than one with a straight handle, because in the latter case the wrist deviates from its natural position. (See photograph 4.)

3 Using a pair of tongs sitting down
Reproduced from Principles of Rehabilitation, W.Russell Grant, by permission of E.& S. Livingstone Ltd.



4 X-rays showing
(a) deviation of the wrist holding a straight handle
(b) how the wrist can be kept straight holding a handle at an angle to the shaft.

Jaws

Rubber covered jaws provided a better grip than bare metal; cork covered were the next best.

There was a division of opinion among both users with strong hands and those with weak hands as to whether they preferred those models on which they had to squeeze the lever while lifting (spring-open type) or only to open the jaws (spring-shut type).

For handling a 1lb cylindrical can the jaws need to have a gap of 3in. (76mm).

Magnet

In general, a magnet was a useful addition to a pick-up stick but users preferred it at the jaw end. When at the handle end, the user had to turn the stick end to end in order to use the magnet.

Lazy Tongs

Lazy tongs were not found particularly convenient or easy to use as the gap of the jaws depended on how far the lattice was extended. However, the smaller tongs have the advantage that they can be carried in a handbag or pocket.

WHICH MODEL?

Individual requirements and limitations obviously vary widely among disabled users. In choosing a pick-up stick or tongs these factors have to be taken into account.

However, this investigation has shown clearly which, among those tested, are generally the best and which generally the worst and which are good buys for particular uses.

UK Models

Five - the **DoE One-handed**, **DoE Lightweight**, **Mabar**, **Masters** and **Medico-Therapeutics Tongs** - were considered unsatisfactory as a suitable aid for the disabled user.

In the user trials, the **Helping Hand Featherweight**, followed closely by the **Cee Vee New Lightweight**, stood out as the most convenient (and better than any of the models from Sweden).

The Helping Hand had the advantage over the Cee Vee of a handle at an angle to the shaft and a more securely attached magnet.

On the other hand, the Cee Vee jaws had the better grip; the grip on the Helping Hand would be improved if the jaws were covered with rubber. The Cee Vee had a hinged hand lever, while the Helping Hand had a trigger-like grip to work it. Any hand impairment of the user needs to be considered before deciding which is the easier to hold and use.

From past experience, the plastic jaw of the Helping Hand was liable to break. It is now, however, being made of a much tougher plastic.

For those who only need a short extension of their reach, the **Wexen Tongs** were cheap, had a very good grip and were found satisfactory in use.

The **Home Office Lazy Tongs** were also cheap and some users liked them as they folded up small enough to go into a handbag or pocket. Their grip can easily be improved by covering the jaws with rubber tubing.

For those with a really strong hand and arm, the **Cee Vee Standard 'A' jaws**, £3.50, though heavy was satisfactory to use and it would pick up larger objects than the Helping Hand or Cee Vee Lightweight.

Not even the best are ideal for all the needs of any one user and for maximum convenience and independence two or more differing models, or different lengths of the same model, may be desirable.

Remembering again that individual's requirements need to be taken into account, we consider the following are GOOD BUYS -

- For those who have considerable difficulty in stretching and bending and who need a long extension of their reach:

  Helping Hand Featherweight, £2, for use when sitting

  Helping Hand Longreach, £2.25, for use when standing

  Cee Vee New Lightweight, £2.40, 75cm model for use when sitting

  90cm model for use when standing

- For those able to bend more easily and who need only a short extension of their reach:

  Wexen Tongs, available from the British Red Cross, 40p, post free

- For those who want one they can carry around in their handbag or pocket:

  Home Office Lazy Tongs, 25p
  (The Red Cross Lazy Tongs, 33p, were very similar)

- For those with a really strong arm and hand and want to pick up wide objects:

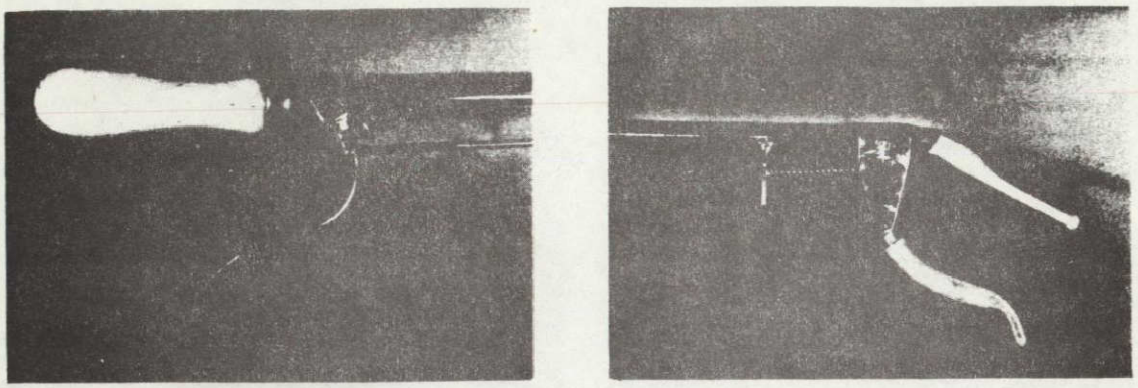
  Cee Vee Standard 'A' jaws, £3.50.

Swedish models

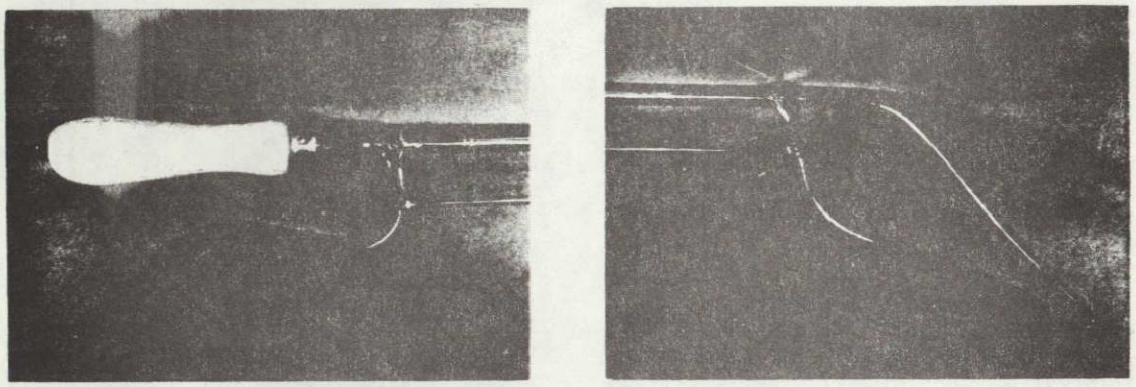
Of the models available in **Sweden**, the Italian made **Aidbrax** was much too heavy and the lever too difficult to squeeze. It was considered unsatisfactory as a suitable aid for the disabled.

The **LIC-3** and **SVCR-3**, both with jaws at 90° to the shaft were difficult to use, particularly for picking up small objects like a pencil.

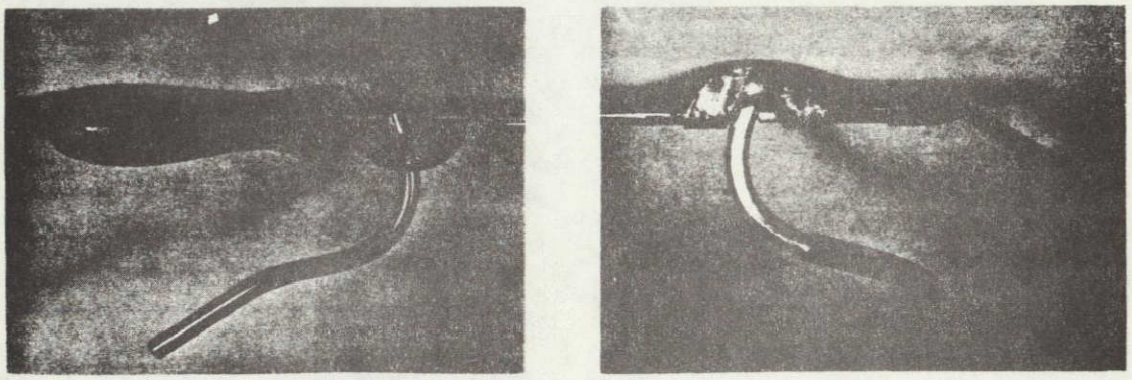
The best were the **SVCR-2**, 22 S.Kr, with spring-open jaws and the **HEA-2**, 32 S.Kr, with spring-shut jaws. These were followed by the **LIC-1**, 26 S.Kr. (See photographs 5, 6 and 7.) The jaws of the **HEA-2**, however, had rather a narrow gap. It could be improved by altering the shape of the jaws and covering them with rubber, like the other **HEA** models.



5 The Swedish SVCR-2 model



6 The Swedish HEA-2 model



7 The Swedish LIC-1 model

PICK-UP STICKS Table 1 - Models available in SWEDEN (the more '●'s the better)

	List price	Spring open(O) or closed(C)	Nominal length	Other lengths available	Special features	Effective length	Weight	Maximum gap of jaws	Grip of jaws	Ease of squeezing handle	Strength of shaft	Lack of distortion when loaded	Ease of use
	S.Kr		(cm)	(cm)		(cm)	(gr)	(mm)					
Aidbrax V[1]	44.50	C	70	120	-	56.5	539	112	●●	●	●●●●	●●●●	very difficult
HEA - 1	32	O	60	70	magnet	54.5	284	99	●●●●	●●●●	●●●●	●●	fairly difficult
HEA - 2	32	C	60	70	magnet; intended for weak hands	53	250	37[2]	●	●●●	●●●●	●●●	satisfactory
LIC - 1,45°	26	O	70	60,80	magnet	59.5	234	62	●●●●	●●●	●●	●●●	satisfactory
LIC - 3,90°	26	O	70	80	90° jaws	56.5	246	82	●●●●	●●●	●●[3]	not tested	difficult
LIC - 2	26	C	70	80	magnet; intended for weak hands	59	152	48	●●●	●●●	●	●●	fairly difficult
SVCR - 2,45°	22	O	70	60,80	magnet	62	239	50	●●●●	●●●	●●●●	●●	satisfactory
SVCR - 3,90°	22	O	70	80	magnet; 90° jaws	67.5	252	58	●●●●	●●●	●●●●[3]	●●●●	difficult
SVCR - 1	24	C	70	40,50,	magnet; intended for weak hands	61.5	125	34	●	●●●	●●	●●●●	fairly difficult

(1) Has an extended fore-arm support

(2) But will encircle an object of 70 mm diameter

(3) Not tested, but same shaft as 45° jaw model

TABLE 2 ABILITY TO PICK UP A RANGE OF OBJECTS

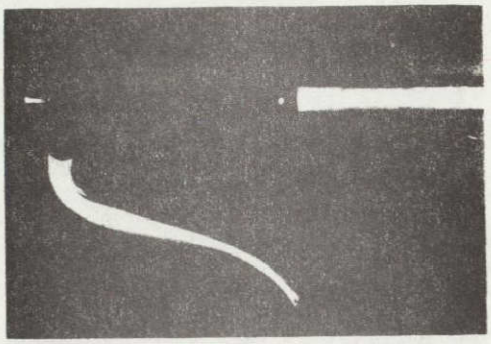
(the more '●'s the better; one '●' ≡ impossible or nearly so)

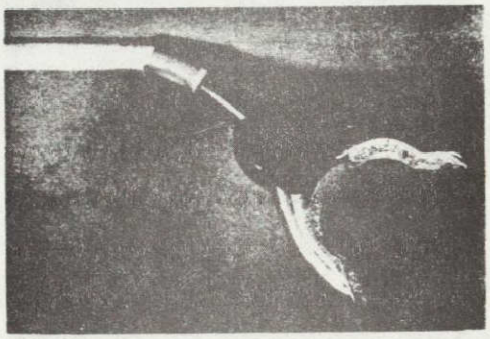
	1lb can of vegetables	6oz can of fruit juice	1lb pkt of detergent	10p (2s) coin	Paperback book	Round pencil
UK PICK-UP STICKS						
Cee Vee New Lightweight	●	●●●●	●●●	●●●	●●	●●●●
Cee Vee Standard, 'A' jaws	●	●●●●	●●●	●●●	●●	●●●●
Cee Vee Standard, 'C' jaws	●●●	●●●	●●●	●●●●	●●●	●●●●
DoE, Lightweight	●	●	●	●●●	●●	●●●●
DoE, One handed	●	●●●	●●	●●●●	●●	●●●
Helping Hand Featherweight	●	●●●●	●●●	●●●	●●	●●●●
Mabar Yardarm	●	●●●●	●●●	●●●	●●●●	●●●
Masters No.10	●	●	●	●●●	●●	●●●●
TONGS						
Medico-Therapeutics	●	●	●●	●●●●	●●●	●●●●
Wexen (Red Cross)	●	●●●●	●●●●	●●●	●●●●	●●●●
LAZY TONGS						
Red Cross, 227/35	not tested; similar to Home Office model					
Home Office	●	●●●●	●●●	●●●●	●●●	●●●●
Zimmer	●	●●●	●●	●●●	●●●	●●●●
SWEDISH PICK-UP STICKS						
Aidbrax V	●●	●●●	●●●	●●●	●●●	●●●●
HEA - 1	●●●●	●●●●	●●●●	●●●	●●●	●●●●
HEA - 2	●	●	●	●●●●	●●●	●●●●
LIC - 1, 45° jaws	●	●●●●	●●●	●●●	●●●	●●●●
LIC - 3, 90° jaws	●	●●●●	●●●●	●	●●●	●●
LIC - 2	●	●	●	●●	●●	●●●●
SVCR - 2, 45° jaws	●	●	●	●●	●●●	●●●●
SVCR - 3, 90° jaws	●	●●●●	●●	●●	●●●	●●●
SVCR - 1	●	●	●	●●●●	●●●	●●●●

(All picked up a crumpled duster very easily)

SUMMARY I

CEE VEE NEW LIGHTWEIGHT





£2.40

(Cee Vee Engineering Co., Cooden Sea Road, Bexhill-on-Sea, Sussex)

Effective length and weight - 26in.; 6oz.

Type and material of jaws - spring-open; cork lined.

Maximum gap and grip of jaws - 2.7in.; satisfactory.

Squeezing lever spring - very easy.

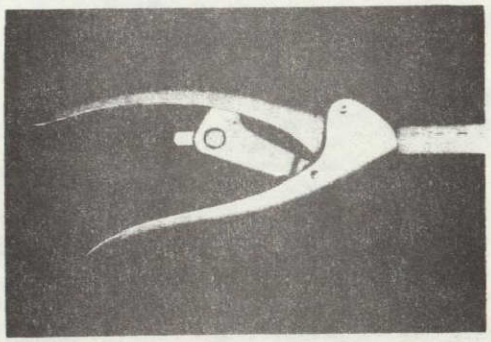
Strength of shaft - satisfactory.

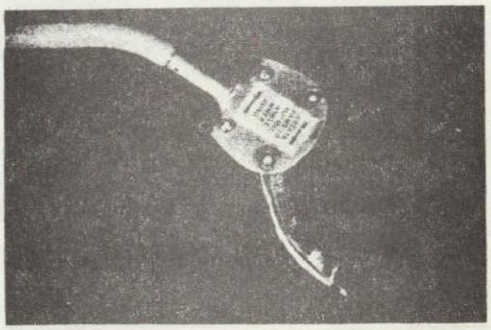
Ease of use - easy.

Other details - rotatable jaws; magnet at jaws end, but insecurely attached. Other lengths to special order.

SUMMARY II

CEE VEE STANDARD, 'A' JAWS





£3.50

(Cee Vee Engineering Co., Cooden Sea Road, Bexhill-on-Sea, Sussex)

Effective length and weight - 27in.; 15oz.

Type and material of jaws - spring-open; cork lined.

Maximum gap and grip of jaws - 3.2in.; satisfactory.

Squeezing lever spring - easy.

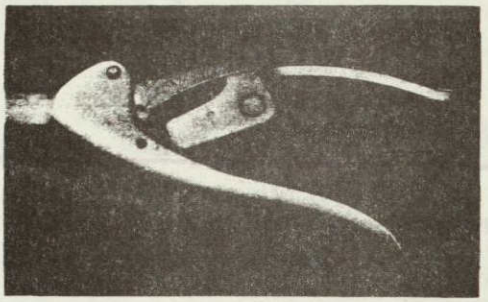
Strength of shaft - good.

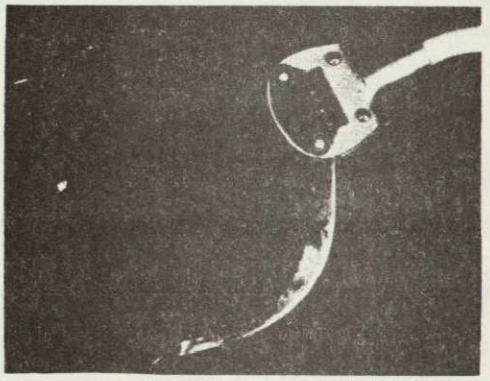
Ease of use - fairly difficult.

Other details - rotatable jaws. Longer versions available.

SUMMARY III

CEE VEE STANDARD, 'C' JAWS





£3.50

(Cee Vee Engineering Co., Cooden Sea Road, Bexhill-on-Sea, Sussex)

Effective length and weight - 28in.; 16oz.

Type and material of jaws - spring-open; cork-lined.

Maximum gap and grip of jaws - 4.8in.; poor.

Squeezing lever spring - easy.

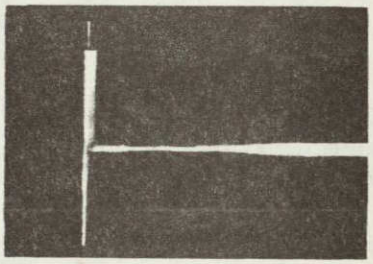
Strength of shaft - (not tested, same as for 'A' jaws model)

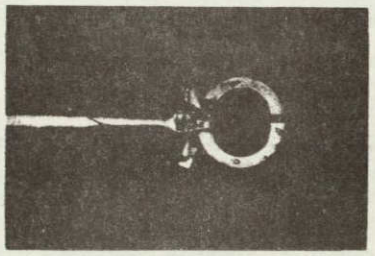
Ease of use - difficult.

Other details - rotatable jaws. Longer versions available.

SUMMARY IV

DOE LIGHTWEIGHT





48p

(Industrial Rehabilitation Units of the Department of Employment)

Effective length and weight - 30in.; 7oz.

Type and material of jaws - spring-close; steel.

Maximum gap and grip of jaws - 1.7in.; very poor.

Squeezing lever spring - satisfactory.

Strength of shaft - good.

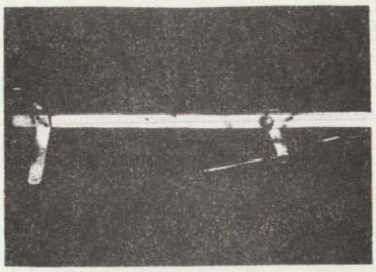
Ease of use - very difficult.

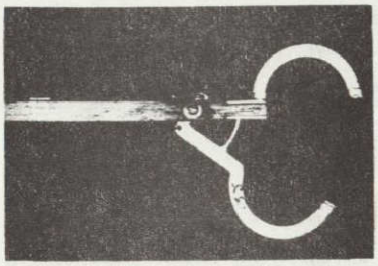
Other details - 'T' shaped handle; magnet at handle end; no lever - worked by pulling a loop of wire. Version with straight handle and no magnet, the Stone, 38p, also available.

Formerly, but no longer, available from the Red Cross. Made by the disabled in the Department of Employment Industrial Rehabilitation Units. They are produced as part of the process of rehabilitation and assessment of disabled persons.

SUMMARY V

DOE ONE-HANDED





69p

(Industrial Rehabilitation Units of the Department of Employment)

Effective length and weight - 27in.; 13oz.

Type and material of jaws - spring-open; light alloy.

Maximum gap and grip of jaws - 4.1in.; poor.

Squeezing lever spring - easy.

Strength of shaft - good.

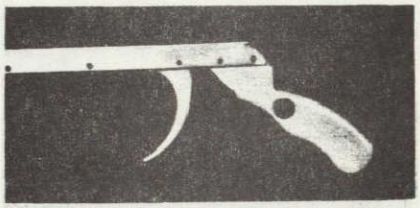
Ease of use - very difficult.

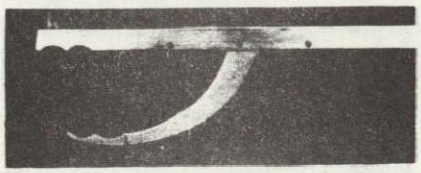
Other details - Extended fore-arm support.

Formerly, but no longer, available from the Red Cross. Made by the disabled in the Department of Employment Industrial Rehabilitation Units. They are produced as part of the process of rehabilitation and assessment of disabled persons.

SUMMARY VI

HELPING HAND FEATHERWEIGHT





£2

(The Helping Hand Company, Bransgore, Christchurch, Hants)

Effective length and weight - 24in.; 7oz.

Type and material of jaws - one serrated light alloy, the other serrated ABS plastic.

Maximum gap and grip of jaws - 2.8in.; very poor.

Squeezing lever spring - very easy.

Strength of shaft - good.

Ease of use - easy.

Other details - handle at angle to shaft; trigger grip; magnet (at jaws end); gap of jaws is adjustable.

Four other versions available -

Longreach 1320B, £2.25, 6in. longer than Featherweight.

Limpet 1320C, £2.25, as Featherweight with two stick clips.

Retainer 1320D, £3.25, as Longreach with additional lever operation to clamp jaws on object lifted.

Folding 1320E, £3, 2½in. shorter than Featherweight folding to 12¾in.

SUMMARY VII

HOME OFFICE LAZY TONGS

25p

(Home Office, Tolworth Tower,
Surbiton, Surrey)

Effective length and weight - 18in. (at 90% extension); 4oz.

Type and material of jaws - no spring; light alloy.

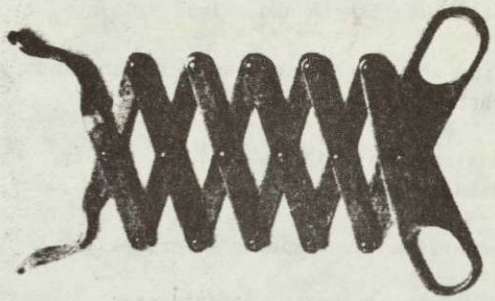
Maximum gap and grip of jaws - 1.1in. (at 90% extension); good.

Squeezing lever spring - no spring.

Strength of shaft - not applicable.

Ease of use - fairly difficult.

Other details - closes up to go in handbag or large pocket. Lazy tongs of a similar design are available from the Red Cross Cat.No.227/35 at 33p.



Made in Wormwood Scrubs Prison. Supplied only to organisations or to people nominated by them.

SUMMARY VIII

MABAR YARDARM

£2.10
post free

(Mabar Manufacturing Co.Ltd.,
Halfway, Sheffield, Yorks)*
(mail order only)

Effective length and weight - 25in.; 6oz.

Type and material of jaws - spring-open; rubber covered.

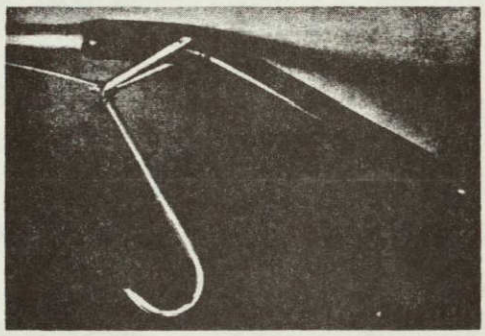
Maximum gap and grip of jaws - 2.1in.; poor.

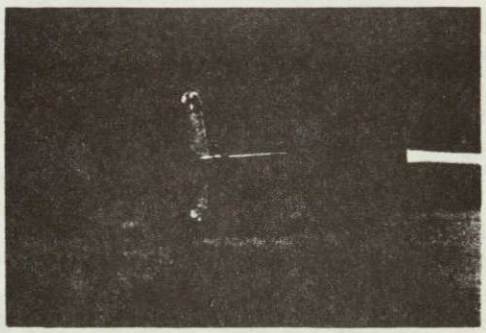
Squeezing lever spring - very difficult.

Strength of shaft - poor.

Ease of use - very difficult.

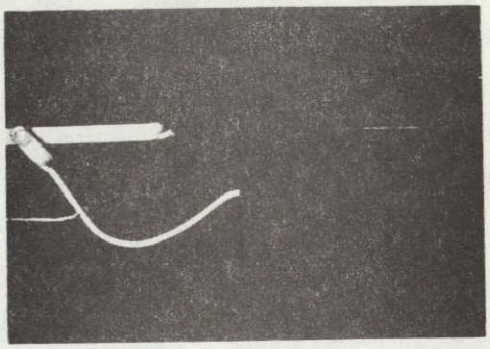
Other details - handle at angle to shaft; magnet (at handle end).

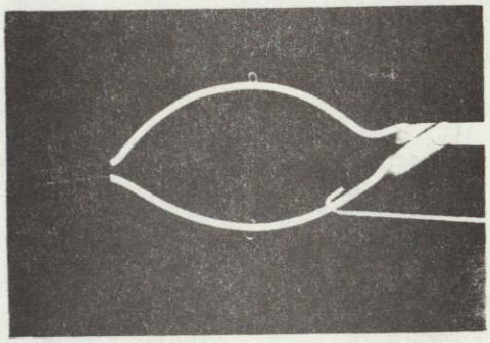




SUMMARY IX

MASTERS NO.10





£2.63

(M.Masters & Sons Ltd., 177/184 Grange Road, London S.E.1)

Effective length and weight - 25in.; 11oz.

Type and material of jaws - spring-shut; rubber covered.

Maximum gap and grip of jaws - 1.6in.; satisfactory.

Squeezing lever spring - very easy.

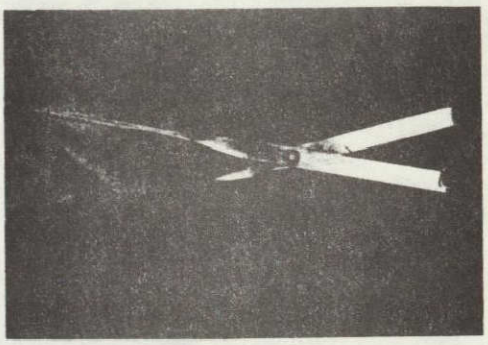
Strength of shaft - satisfactory.

Ease of use - very difficult.

Other details - inadequate joint between lever and actuating rod allowing lever to move far away from handle. Handles rubber covered.

SUMMARY X

MEDICO-THERAPEUTICS TONGS



£2.43

(Medico-Therapeutics,
44 Connaught Gardens, London N.13)

Effective length and weight - 14in.; 4oz.

Type and material of jaws - no spring; light alloy.

Maximum gap and grip of jaws - not applicable; very poor.

Squeezing lever spring - no spring.

Strength of shaft - good.

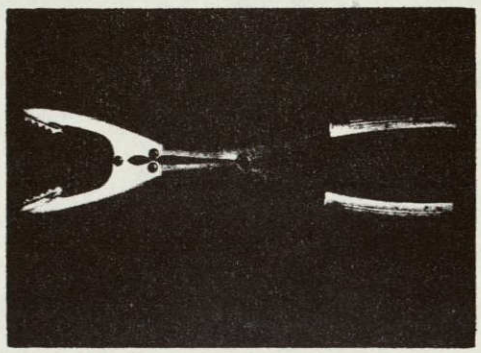
Ease of use - very difficult.

SUMMARY XI

WEXEN TONGS

40p

(Euill Trading Co.Ltd.,
Preston, Yeovil, Somerset)
(wholesale only, available from British Red Cross)



Effective length and weight - 11in.; 9oz.

Type and material of jaws - spring-open; serrated rubber.

Maximum gap and grip of jaws - 2.8in.; very good.

Squeezing lever spring - very easy.

Strength of shaft - not applicable.

Ease of use - satisfactory.

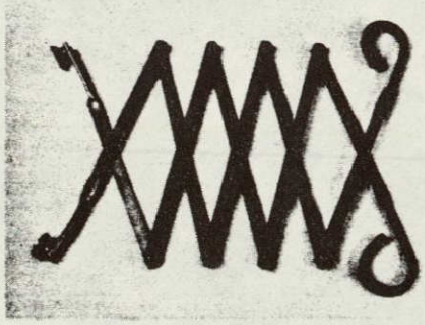
Other details - handles are rubber covered.

SUMMARY XII

ZIMMER LAZY TONGS

£2.25

(Zimmer Orthopaedic Ltd.,
134 Brompton Road, London S.W.3)



Effective length and weight - 26in. (at 90% extension); 5oz.

Type and material of jaws - serrated steel.

Maximum gap and grip of jaws - 1.6in. (at 90% extension); very good.

Squeezing lever spring - no spring.

Strength of shaft - not applicable.

Ease of use - difficult.

Other details - handles are rubber covered.

Veterans Administration Survey/Questionnaire

Project work sponsored under Veterans Administration contract # V5244P-1628

PURPOSE: The main purpose of this questionnaire/survey is to obtain first hand data about the comparative brand;product quality,buying information and advice, problems and needs of physically disabled or limited consumers and those who may assist them.

GOAL: The overall goal of this questionnaire/survey is to help analyze the feasibility and requirements for a product testing and reporting program for various kinds of handicapped consumers in the U.S.A. An information clearinghouse,useful to all, may result.

DESIGN/TIME: This questionnaire/survey is made-up of four main sets of questions including those concerning;(1)the respondents background or identity, (2)buying information and advice needs, (3)the kinds of products involved and (4)existing product design deficiencies.

This questionnaire typically takes about thirty minutes to complete.

INSTRUCTIONS: It is recommended that you review each set of questions before you go about answering them.

Please use a soft leaded pencil to fill-in your answers. This will expedite making changes or corrections if necessary. In addition please respond to questions within the spaces(blanks) provided via using clear marks or writing. This will expedite the analysis of your questionnaire.

It is recognized that your response to some of the questions could potentially vary depending on the kind or type of product that is considered. Thus when answering such questions try to think of the normal or general product buying situation.

Any further comments, ideas, and or suggestions about the comparative brand product buying information and advice needs, requirements,and or desires of the handicapped consumers(adults and children)and or those who may assist them will be welcomed. Please use the back of this cover sheet for this purpose.

ANONYMITY: All questionnaire respondents names, inconjunction with their opinions or responses will be heldin the strictest of confidence.

RETURNS: Please fold the questionnaire in thirds(see back of last page) to expose the return address, and then staple together. Besure to fill-in your return address and to place 15¢ postage in the corner indicated. Return to pickup place when obtained at conventions.

THANK YOU: Only through the giving of many individuals time, effort, and ideas can this project be a success. Your help is greatly appreciated.

1.1 BASIC BACKGROUND:
Name:(last)_____(first)_____(mid.)_____
Age:_____ Sex: (M)____(F)____ Weight:(lb.)_____ Height(ft.-in.)_____
Questionnaire completion date: (mon.)_____(day)_____(yr.)_____
Questionnaire filled in by:(individual assisting)____(respondent)____

1.2 YOUR IDENTITY CODE:
a___partially self-care independent/physically disabled or limited
b___fully self-care independent/physically disabled or limited
c___rehabilitation or health care professional
d___family or friend of disabled person(s)
e___other(describe)_____

1.3 YOUR CITY CODE:
a___population less than 2,500
b___population 2,500 to 50,000
c___population 50,000 to 100,000
d___population 100,000 or more

1.4 YOUR EDUCATION CODE:
a___no schooling
b___Grade School
c___some High School
d___completed High School
e___some College or Technical School
f___completed College or Technical School
g___post-graduate school

1.5 YOUR OCCUPATION CODE:
a___not working at present
b___maintain a part-time job within the home environment
c___maintain a part-time job outside of the home environment
d___maintain a full-time job within the home environment
e___maintain a full-time job outside of the home environment

1.6 YOUR DISABILITY CAUSE CODE:
a___congenital(present at birth)
b___traumatic accident
c___war injury
d___infectious disease
e___not applicable
f___other(describe)_____

1.7 YOUR DISABILITY OR LIMITS CODE:

Mental Impairment	a___have difficulty interpreting information
Visual Impairment	b___no useful vision in either eye c___some useful vision in one or both eye
Hearing Impairment	d___no useful hearing in either ear e___some useful hearing in one or both ears
Speech Impairment	f___no useful speech or talking ability g___some useful speech or talking ability

Absence of all or part of major extremities	h___upper only; at least one of arms, hands, fingers, or thumbs i___lower only;at least one of legs, feet,or toes
Absence of all fingers or toes only	j___all fingers missing k___all toes missing
Partial or complete paralysis	l___only one leg affected m___both legs affected n___trunk affected o___one arm-hand affected p___both arms-hands affected q___shoulders-neck affected r___neck-head affected
Orthopedic impairments including; limited stamina, body-joint motion, coordination, balance, difficulty	s___back or spine t___upper extremity and or shoulder u___lower extremity and or hip v___multiple impairments of limbs, trunk, and body
Chronic Impairment	w___arthritis x___asthma y___chronic bronchitis z___diabetes za___heart conditions zb___hypertensive disease(without hear involvement)

1.8 YOUR MOBILITY CODE:

a___can not sit to work
b___wheelchair bound(can not self-propel)or must sit to work
c___wheelchair bound(can self propel)
d___can stand only with or without use of an aid
e___semi-ambulatory with the use of an aid
f___can walk without an aid but am limited interms of speed and or distance
g___fully mobile

2.1 Do you feel that there is an existing need for more buying information and advice about the comparative dependability, ease of use, and or effectiveness of special aids and equipment made for varying kinds of physically disabled or limited consumers?
a___yes, b___no (if no, why not)_____

2.2 If you agree with question 2.1 how extreme do you feel this information problem or deficiency is?
a___severe, b___moderate, c___minimal

2.3 Do you feel that there is an existing need for more buying information and advice about the comparative dependability, ease of use, and or effectiveness of regular consumer goods and appliances interms of varying kinds of potential handicap users?
a___yes, b___no (if no, why not)_____

2.4 If you agree with question 2.3 how extreme do you feel this information problem or deficiency is?
a___severe, b___moderate, c___minimal

2.5 What types of information and advice do you feel are currently most lacking i.e. in terms of similar products and their comparative:(rate each as either 1-often lacking, 2-sometimes lacking, or 3-seldom lacking)

a___cosmetic or visual acceptance
b___cost of servicing
c___competence of service agents
d___dependability or durability
e___ease of use(operating & cleaning)
f___ease of service/repair
g___ease of installation
h___initial cost
i___length/kind of warranty
j___parts availability
k___safety/health
l___utility provided(effectiveness)
m___use comfort
n___other(describe)_____

2.6 Similarly, what types of information and advice do you feel are most required needed, and or desired by handicapped consumers and or those who may assist them?(rate each as either 1-very important, 2-important, or 3-less important)

a___cosmetic or visual acceptance
b___cost of servicing
c___competence of service agents
d___dependability or durability
e___ease of use(operating & cleaning)
f___ease of service/repair
g___ease of installation
h___initial cost
i___length/kind of warranty
j___parts availability
k___safety/health
l___utility provided(effectiveness)
m___use comfort
n___other(describe)_____

2.7 What other kinds of comparative buying information do you feel are or maybe helpful to you?(rate each as either 1-very important,2-important, or 3-less important)

a___distributor's address
b___manufacturer's address
c___parts interchangeability
d___product service centers address
e___product patent number
f___references as to where product is being used
g___other(describe)_____

2.8 In addition to comparative brand product quality information do you feel that there is a need for a central source of information on the latest technological advancements in aids for the handicapped?
a___yes, b___no, c___not sure

2.9 Who or what organizations do you feel should be trusted to provide the handicapped consumers of the U.S.A. with comparative brand product buying information and advice?(rate each as either 1-most trusted, 2-trusted, or 3-less trusted)

a___Federal agencies or government
b___Individual manufacturers themselves
c___Individual distributors themselves
d___Independent not-for-profit labs
e___Insurance companies
f___Knowledgeable professionals
g___Manufacturers associations
h___State agencies or government
i___Other(describe)_____

2.10 Where do you usually find yourself when asking for or seeking comparative brand product information and or advice?(rate each as either 1-often, 2-sometimes, 3-seldom, or 4-not applicable)

a___at point of purchase decision-making in a store
b___at point of purchase decision-making (e.g. from catalog)at home
c___at your office or place of employment
d___in a hospital or clinic environment
e___in a rehabilitation agency
f___in a vocational training center
g___in a library environment
h___other(describe)_____

2.11 What is your usual source of information when making a product buying decision or selection?(rate each as either 1-often, 2-sometimes, 3-seldom, or 4-not applicable)

a___a work associate
b___a friend or family member
c___a therapist or nurse
d___a physician
e___an outside written report
f___distributors literature
g___distributors salesperson
h___manufacturers literature
i___manufacturers salesperson
j___yourself completely
k___other(describe)_____

2.12 Where would you typically go to obtain literature or reports for buying information?(rate each as either 1-often, 2-sometimes, 3-seldom, or 4-not applicable)

a___home file/references
b___local social security office
c___nearest equipment dealers office
d___office file/references
e___the bookstore
f___the library
g___the news-stand
h___the telephone to make a request
i___other(describe)_____

2.13 Overall, to what extent do you feel that existing sources, kinds, and amounts of comparative brand product buying information and advice are adequate to suite your particular needs?(rate by marking one)
a___never, b___seldom, c___sometimes, d___usually, e___always

2.14 If there were test related,comparative brand,buying information about regular and special goods and products for handicapped consumers;what particular kinds of impairment(for reference see p. 2)should be given the first, second and third priority?(rate each as either 1-first priority, 2-second priority, or 3-third priority)

a___absence of all or part of major extremities
b___absence of all fingers or toes only
c___chronic impairments
d___hearing impairments
e___mental impairments
f___orthopedic impairments
g___partial or complete paralysis
h___speech impairments
i___visual impairments
j___other(describe)_____

2.15 If there were test related, comparative brand, buying information about regular and special goods and products for handicapped consumers; who do you feel should pay for this type of information and advice service? (rate by marking one)

a___an appropriate government agency
b___insurance companies
c___manufacturers/distributors of products only
d___rehabilitation agencies and or hospitals
e___users of the service only
f___other(describe)_____

2.16 If there were test related, comparative brand, buying information about regular and special goods and products for handicapped consumers; what do you feel would be the best way of disseminating this type of information? (rate each as either 1-good, 2-fair, or 3-poor).

a___by computer printout response
b___by radio/tv
c___by select mailings
d___by special annual buyers guide
e___by subscription to publication
f___by telephone
g___by written response
h___by combination of a-g
i___other(describe)_____

2.17 Who should decide what to test and how to handle distribution of information for handicapped consumers?(rate each as either 1-good, 2-fair, or 3-poor)

a___physicians
b___representative from the Human Factors Engineering Society
c___representative from the Industrial Design Society
d___rehab/orthopedic engineers
e___registered therapists
f___various kinds of handicapped
g___various government representatives
h___various manufacturer/distributor representatives
i___other(describe)_____

2.18 What form of information feedback about remaining and or new product use and dependability problems would you recommend?(rate each as either 1-good, 2-fair, or 3-poor).

a___periodic surveys
b___reports from field testers
c___special complaint dept.
d___combination of a-c
e___other(describe)_____

3.1 On average how many major($20. or more)regular consumer goods,appliances and special rehabilitation aids and or fixtures do you purchase per year?
a___regular goods/fixtures b___special rehabilitation aids/fixtures

3.2 To what extent does the number of regular goods/fixtures purchases vary from year to year?
a___greatly, b___moderately, c___very little

3.3 To what extent does the number of special rehabilitation aids/fixtures purchases vary from year to year?
a___greatly, b___moderately, c___very little

3.4 What types of regular, home-making related,consumer goods, building fixtures and equipment do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers? (rate each as either 1-most important, 2-important, or 3-less important)

a___bath tubs
b___can/bottle openers
c___clothing
d___cooking appliances
e___dishwashers
f___food/drug packaging
g___hair dryers
h___home alarm systems
i___ironing boards
j___irons
k___light switches
l___radios
m___shower stalls
n___sinks/faucets
o___stoves/ovens
p___televisions
q___washer/dryers
r___other(describe)_____

3.5 What types of special,rehabilitation related,self-care goods, equipment and or building fixtures do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers?(rate each as either 1-most important, 2-important, or 3-less important)

a___dressing aids
b___feeding/eating aids
c___grooming aids
d___hearing aids
e___seeing aids
f___toileting aids
g___seating/chair aids
h___support/balancing aids
i___upper-limb replacements(prostheses)
j___upper-limb supports(ortheses)
k___other(describe)_____

3.6 What types of special,rehabilitation related,mobility/access goods, equipment and or building fixtures do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers?(rate each as either 1-most important, 2-important, or 3-less important)

a___braces for legs(ortheses)
b___building ramps
c___canes
d___crutches
e___door opening/closing aids
f___driving aids
g___food service/cafeteria equipment
h___lower limb replacements(prostheses)
i___orthopedic shoes
j___public curb-cut ramps
k___public elevators
l___public transport devices
m___van ramps/lifts
n___walkers
o___wheelchairs
p___wheelchair accessories
q___other(describe)_____

3.7 What types of special,rehabilitation related,job or occupation goods,equipment and or bulding fixtures do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers?(rate each as either 1-most important, 2-important, or 3-less important)

a___adjustable table/worksurface aids
b___information analysis aids
c___information storage aids
d___information transfer aids
e___job training aids
f___reading aids
g___storage aids
h___typing aids
i___writing/drawing aids
j___other(describe)_____

3.8 What types of special, rehabilitation related,medical or therapeutic goods, equipment,and or building fixtures do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers? (rate each as either 1-most important, 2-important, or 3-less important)

a___body coordination/control aids
b___body movement/extension aids
c___body positioning aids
d___general exercising aids
e___swimming aids
f___other(describe)_____

3.9 What types of special, rehabilitation related, recreational goods, equipment, and building fixtures do you feel should be tested and evaluated interms of the needs and requirements of handicapped consumers? (rate each as either 1-most important, 2-important, or 3-less important)

a___all terrain mobility devices
b___eye-hand coordination games
c___eye-hand striking recreational devices
d___other(describe)_____

3.10 Overall what categories of special aids do you feel need to be comparatively tested, and reported on first?(rank in order of priority)

a___job or occupation related
b___medical or therapeutic related
c___mobility/access related
d___recreational related
e___regular/home making related
f___self-care related
g___other(describe)_____

3.11 Do you feel that the same priority of testing,etc , concern should be applied to categories of aids deemed for use by handicapped children?
a___yes, b___no, c___not sure

3.12 With regards to question 3.11, if no, what do you feel should be the priority for testing of aids for handicapped children?(rank in order of priority)
a___job or occupation related
b___medical or therapeutic related
c___mobility/access related
d___recreational related
e___regular/home making related
f___self-care related
g___other(describe)_____

4.1 Within the last 12-months have you physically injured yourself,directly or indirectly, while using or helping someone use a regular consumer good, product,or building fixture? a___yes, b___no, c___can't recall
If yes can you please identify, if possible, the kind of product or building fixture you were using, it's brand name and model type(number),the probable cause of the accident,and type of injury sustained?

4.2 Within the last 12-months have you physically injured yourself,directly or indirectly,while using or helping someone use a piece of special rehabilitation equipment or building fixture? a___yes, b___no, c___can't recall
If yes can you please identify,if possible,the kind of product or building fixture you were using,it's brand name and model type(number),the probable cause of the accident,and type of injury sustained?

4.3 Have you ever purchased one or more pieces of special rehabilitation equipment or aid after which you found it to be in-adequate interms of effectiveness?
a___yes, b___no, c___can't recall
If yes what kind and brand of aid or equipment was it?_____

4.4 Have you ever purchased one or more pieces of special rehabilitation equipment or aid, which although effective, it was difficult or hard to operate,clean and or use? a___yes, b___no, c___can't recall
If yes what kind and brand of aid or equipment was it?_____

4.5 Have you ever purchased one or more pieces of special rehabilitation equipment or aid,which although it was realtively safe, effective, easy to use, it was mechanically unreliable,i.e. in otherwords it's durability was poor?
a___yes, b___no, c___can't recall
If yes what kind and brand of aid or equipment was it?

4.6 Have you ever purchased one or more pieces of special rehabilitation equipment or aid, which although relatively safe,effective, easy to use,and dependable you tended not to use the device because for visual or cosmetic reasons it was offensive to you and or others? a___yes, b___no, c___can't recall
If yes what kind and brand of aid or equipment was it?_____

4.7 Have you ever experienced a much greater than expected cost in finding or obtaining service for one or more of the special rehabilitation aids or equipment that you use? a___yes, b___no, c___can't recall
If yes what kind and brand of aid or equipment was it?_____

4.8 How often have you felt that you unecessarily spent or wasted money on special aids, equipment, building fixtues, and or adaptations?
a___frequently, b___sometimes, c___seldom, or d___never

Appendix E

ORGANIZATIONS CONTACTED BY THE SRI TEAM

Organizations Contacted by SRI Team

Abstracting and Indexing Project Medical College of Pennsylvania Library	Philadelphia
Accent on Living, Inc. Accent on Information	Bloomington, Ill.
Adult Independence Development Center of Santa Clara County	San Jose
American Heart Association, California Affiliate	Burlingame
Bell Laboratories	Murray Hill, N.J.
California State Department of Benefit. Payments	Sacramento
California State Department of Rehabilitation	Sacramento
Catholic Social Service of Santa Clara County	San Jose
Center for Independent Living	Berkeley
Cerebral Palsy Center for the Bay Area	Oakland
Chandler-Tripp School for the Physically Handicapped	San Jose
Civil Service Commission	San Francisco
Clearinghouse On The Handicapped OHI/DHEW	Washington
Committee On Science and Technology, U.S. House of Representatives	Washington
Community Association for the Retarded	Palo Alto

Consumer Union of U. S., Inc.	New York
Creative Growth	Oakland
Council of World Organizations Interested in the Handicapped (CWOIH)	New York
Deafness and Mental Health Rehabilitation Research and Training Center, University of California	San Francisco
De Anza College, Physically Limited Program	Cupertino
Department of Rehabilitative Medicine Northwestern University	Chicago
Disability Rights Center	Washington
Disabled American Veterans	Washington
Disabled Living Foundation (Information Serv. for the Disabled)	London
Ear Research Institute	Los Angeles
Easter Seal Society	Burlingame
Food & Drug Administration	San Francisco
Food & Drug Administration Medical Devices Div. of Compliance	Washington
Fremont Older School	Cupertino
Garden-Sullivan Hospital and Rehabilitation Center	San Francisco
Graduate Department of Library and Information Science, Catholic University of America	Washington

HEW/OHI (Hubert Humphrey Bldg.)	Washington
Hope Rehabilitation Services	San Jose
ICTA Information Center	Sweden
Innovative Systems Research	Pennsauken, New Jersey
(The) Institute of Rehabilitation Medicine	New York
(The) International Association of Lions Clubs	Oakbrook, Ill.
James Whitcomb Riley Hospital for Children Indiana University School of Medicine	Indianapolis
J. A. Preston Corporation (Equipment for Physical Medicine and Rehabilitation)	New York, N.Y.
Loma Vista Elementary School, Special Education	Palo Alto
Mainstream, Inc.	Washington
Media, Materials, Development and Dissemination University of Arkansas Rehabilitation Research and Training Center	Hot Springs, Arkansas
NASA Industrial Application Center (WESRAC) University of Southern California	Los Angeles
National Affiliation of Durable Medical Equipment Companies (NAOMEC)	Sherman Oaks
Nathional Rehabilitation Information Center Catholic University of America	Washington
National Science Foundation	Washington

National Technical Institute for the Deaf	Rochester
Occupational Therapy Department and Biomedical Engineering Department, Chedoke Rehabilitation Centre	Ontario, Canada
Peninsula Center for the Blind and Visually Impaired	Palo Alto
Project Hear (Stanford University Medical Center)	Palo Alto
Project Share: National Clearinghouse for Improving the Management of Human Services DHEW	Washington
Rancho Los Amigos Hospital	Downy
Rehabilitation Services Administration Technology Utilization	Washington
Research Institute for Consumer Affairs	London
Sam Della Maggiore School for the Retarded	San Jose
San Francisco Independent Living Project	San Francisco
San Francisco Lighthouse for the Blind	San Francisco
Santa Clara Valley Medical Center	San Jose
Sensory Aids Foundation	Palo Alto
Smith-Kettlewell Institute	San Francisco
Social Security Administration	Washington
Southwest Research Institute Project IMPART	San Antonio, Texas

Stanford Childrens Hospital	Palo Alto
Telephone Pioneers of America	San Jose New York Florida
Texas Tech University Research and Training Center in Mental Retardation	Lubbock, Texas
Toyota Motor Company Products and Parts Information Center	Los Angeles
Urban Mass Transportation Administration	San Francisco
U. S. Department of Health, Education and Welfare	Washington
Veterans Administration Hospital	Palo Alto
Western Center for the Blind, Veterans Administration	Palo Alto

Conferences Attended:

Rehabilitation Information Network Conference Sponsored by Office of Handicapped Individuals and National Rehabilitation Information Center	Arlington, Virginia
5th Annual Conference on Systems and Devices for the Disabled, Baylor College of Medicine, Texas Institute for Rehabilitation and Research	Houston, Texas

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"A person who is severely impaired never knows his hidden sources of strength until he is treated like a normal human being and encouraged to shape his own life."

-- Helen Keller