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## ABSTRACT

This sourcebook provides information for the practical implementation of independent living technology in the everyday rehabilitation process. "Information Services and Resources" lists databases, clearinghouses, networks, research and development programs, toll-free telephone numbers, consumer protection caveats, selected publications, and technology resources related to specific disabilities or age groups. "The Equipment Selection Process" addresses the importance of systematic selection procedures and provides guidelines for the initial client interview and an independent living skills checklist. "Technology at Home" offers advice on use of hospital beds at home, home management, personal care, clothing and shoes, architectural adaptations, and environmental control devices. "Educational and Vocational Technology" describes technical aids which may benefit disabled employees and students at all levels of education. "Recreational and Leisure Technology" focuses on wheelchair sports, water sports, winter sports, leisure activities such as gardening and fitness, and toys and games. "Technology for Personal Mobility" deals with seated wheeled systems, other types of mobility equipment such as walking aids and lifts, seating and positioning technology, and personal vehicles. Other sections include "Control, Communication and Sensory Aids," "Microcomputer Applications," and "Funding, Models, Policy, Statistics." (JDD)

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# TECHNOLOGY

For *INDEPENDENT LIVING*

# SOURCEBOOK

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TECHNOLOGY FOR PERSONAL MOBILITY; CONTROL, COMMUNICATION & SENSORY AIDS;  
MICROCOMPUTER APPLICATIONS; FUNDING, MODELS, POLICY, STATISTICS

**RESNA**

*Association for the Advancement of Rehabilitation Technology*

Alexandra Faders, O.T.R., Editor

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# Technology for Independent Living Sourcebook

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*Association for the Advancement of Rehabilitation Technology, Publishers*  
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## FOREWORD

A primary mission of the Education and Publication Committees of RESNA is to promote the development of quality educational courses and materials for the membership. Our efforts in the past, as with most new ventures, have been limited mostly to individuals presenting their own research or clinical experiences. Unfortunately, this does little to draw on the experiences of others with the goal towards compiling a more objective knowledge base within a specific clinical area, that then can be used by others as a valuable information source for problem-solving.

This publication represents the second effort by the Education and Publication Committees to compile our current knowledge base and related information sources in the area of technology for independent living. The first was the **Technology for Independent Living Resource Guide** published last year. The **Sourcebook** continues and updates these materials, adding sections on control, communication and microcomputer applications. It also extends the scope of the original Guide by adding material to help consumers, practitioners and developers gain a better perspective on the many and individual fields covered, as well as some understanding of the priorities for intervention or action within them.

The original Resource Guide, and now the Sourcebook, reflect a trend in RESNA from simply reporting on technology, toward the development and presentation of materials and information on the practical implementation and application of technology in the everyday rehabilitation process. This increasing orientation in RESNA toward more service delivery and community-based information is a result of the growing number of rehabilitation practitioners within RESNA who both seek and provide us with this information.

We are indebted to Alexandra Enders for setting the pace in this direction -- as well as for the tremendous effort put forth in compiling, revising and extending this Sourcebook.

A special thanks is also given to Maurice LeBlanc who provided the support for the initial Resource Guide on which this book is based and to Christine Thompson, who, under very tight timelines, typed and proofed the Sourcebook for publication.

Gregg C. Vanderheiden  
Chairman, Publications Committee  
May, 1984

If you have or know of information which you believe should be in the next edition of the Sourcebook, please forward the information to RESNA's office, attention Sourcebook Editor. If you are willing to assist the Editor in compiling the information for a section (existing or new) of the next edition, please contact either the RESNA office or the Publication committee chairperson. The quality, accuracy and comprehensiveness of the Sourcebook is dependent upon participation by consumers and professionals from each of the fields covered.

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by the staff of  
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This sourcebook is based on an earlier Resource Guide, which was compiled in conjunction with a RESNA-sponsored instructional course Technology for Independent Living, Houston, 1982. Material for the Resource Guide was contributed by the entire faculty: Lars Augustsson, Peter Axelson, Judy Bennett, Kathy Bowman, Will Clark, Alexandra Enders, Lex Frieden, Debbie Gilden, Marian Hall, John Leslie, Bob Kafka, Sam McFarland, Barry Romich, Jim Tobias, Elaine Trefler, and Margaret Young. The document was compiled and edited at the Rehabilitation Engineering Center at Children's Hospital at Stanford.

The need to expand and update the Resource Guide became obvious, and many members of RESNA helped make this second edition happen. David Jaffee, from the Palo Alto VA Rehabilitation R&D Center, had the original data files translated so they would work on the Trace Center's computers. Chris Thompson, of the Trace Center's staff, did all the typing, retyping, and arrangement -- a mammoth job -- in record time. Without her, this book would not have been produced.

Special thanks also go to Kathy Bowman, Project Threshold, Rancho Los Amigos Hospital; Jim Tobias, Rehabilitation Engineering Volunteer (REV) Network, New York; Rick Holte, Rehabilitation Engineering Center, Children's Hospital at Stanford, and John Brabyn, Smith-Kettlewell Rehabilitation Engineering Center, San Francisco, who all contributed new or greatly revised sections. Marian Hall, ABLEDATA system manager, added new information to the Information Section as well as providing up-to-date lists of manufacturers for several sections.

The staff of the Trace Center, University of Wisconsin-Madison, made this book a reality. Besides physically making it appear on paper, the Trace staff added substantially to the new sections on Microcomputer Applications, and Communication, Control and Sensory Aids. Mary Brady, Dale Bengston, and Francisco Villarruel all provided information. Gregg Vanderheiden not only contributed several articles, but also helped with the overall organization of the book, and the typesetting.

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Each section of the Sourcebook was compiled from many sources including:

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Additionally, two sources were used throughout the text

Easter Seals, bibliographies, brochures, and the reviews in its bimonthly publication, Rehabilitation Literature

National Rehabilitation Information Center (NARIC) bibliographic sources and annotations

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## INTRODUCTION

We all use "technical aids." With the advance of technology, physical strength and ability have declined as the primary measure of worth and the only means to compete for survival. When we need to accomplish a task beyond our physical capabilities, a tool is developed to make that task possible or safer or faster or just easier and more convenient. One of the identifying features of the human species has been its skill at making and using tools. The story of humankind can readily be told as the history of the development of technological innovation.

Compared to the enormous power of machinery, all human beings are physically limited. At each point in history, society defines and redefines the criteria for physical and mental normalcy. Certain members are excluded from being able to independently maintain themselves based on these arbitrary limits. In cases where technology is able to acceptably compensate for the limitation, especially when a significant portion of the population has a similar disability, the limitation is redefined as being within normal limits, and those people are no longer stigmatized as being handicapped. Disability is a matter of degree. Technology can reduce the gap, as in the case of eyeglasses. Not even airline personnel are discriminated against any longer for wearing corrective lenses. Lower back problems seem to be headed into the "normal" range -- there is a store in Boston specializing in low back problems, and it is definitely not focusing its marketing strategy toward the "disability" market, its target is the "normal" person with a back problem. Hearing aids also appear to be heading out of the "adaptive aid" category, even the US President now openly wears one, and the advertising campaigns for hearing aids are increasingly emphasizing convenience, happiness, and quality of life.

The last ten years have been exciting times in the field of applied technology for disabled people. From a time when there were very few devices, we now have a situation where there are more devices than anyone can keep track of without the help of a computer. R&D efforts have increased, service delivery is beginning to change from an art to a science, and we can begin to exchange ideas about how and why we have succeeded and failed.

Along with the many new devices that are now on the market or under development, there has come an explosion of information about technical aids for disabled people. If you are an information specialist, you may find yourself inundated with it. If you are a practitioner or a consumer, you may know it's out there, but not know quite where to find it. This Sourcebook was written to help make some sense out of the sometimes bewildering array of information available on technical aids for disabled people.

The emphasis throughout is on practical applications of technology. Many sources have been quoted, to give you an idea of the resources that you have available to you.

Organizations and people have been listed who may be able to help find answers for your questions. Publications are listed as sources of more information. A few of the publications are out of print, but have been included because they are classics, still useful, and nothing better exists to supersede them. They can generally be found in therapy departments or rehabilitation medicine units.

There is one major resource that has not been specifically referred to in this guide. As a group, this resource is often overlooked, even though their information is usually the most effective, least expensive, and has stood the test of time -- disabled consumers. Find them, ask them questions, listen to them. Trade information! Mrs. B may want to know about shower benches, but she probably has a wealth of information about kitchens. This information has proven its reliability and validity. Take advantage of it whenever possible.

A listing of local community resources was beyond the scope of this book. If you don't know where else to start looking, try the yellow pages of the phone directory. These are some suggested headings: crutches, wheelchairs, wheelchair lifts and ramps, van conversions, hearing aids, handicapped equipment, physical therapy equipment, physician's & surgeon's equipment and supplies, surgical appliances and supplies, rehabilitation services, home health services, handicapped assistance, handicapped transportation services, human services organizations, social service organizations, rental service stores, associations. Your directory may have others.

This resource guide is not intended to convey everything you always needed to know about technology for disabled people. It is, however, a good place to start if you are looking for practical information. Good luck!

*Alexandra Ender*

EO



## **A NOTE ON MYSTIFICATION: Avoiding Hardware Inferiority Complexes (HIC)**

Often nontechnologists look at the designer-technician as a wizard. It is important to deflate this myth. Everyone has excellent ideas for devices, but these ideas might never see the light of day, due to a hardware inferiority complex (HIC). Designs at the grassroots level, by the way, have HICs with respect to the even more wizard-like R&D programs!

If the idea is to provide functional services, then we must give up this socially enforced tendency to worship equipment and refocus on people. Here are some phrases to repeat before a mirror:

If you are not a technologist: "I don't care if it is 'state-of-the-art'!" "No, I'm not dumb, you just have to learn to express yourself so we can understand you." "Microprocessor, shmicro-processor!"

If you are a technologist: "Sixty seconds of silence." (You may have to work up to this.) "That sounds like a good idea. Can I explain how we might be able to build it?" "Gee, I didn't know that."

Jim Tobias  
"Grassroots Rehabilitation Technology and the Delivery System"  
AAAS Workshop, Houston, Texas  
December 4-5, 1980

## **A NOTE ON TECHNOPHILIA**

The danger exists that technology will be viewed as an end in itself, not as a means to an end. Technology produces two groups of people -- those who love it (technophiles) and those who don't (technophobes). Some people have a low "gadget tolerance," and don't feel comfortable around sophisticated assistive devices. Questions about gadget tolerance must be asked of the provider, the consumer, and the caregiver. Devices obviously shouldn't be pushed on someone who doesn't like them, they'll end up in the closet. But there is another danger here, that of the "technophile," the person with a high gadget tolerance. Sometimes devices are requested because they are new, innovative, "glitzy," not because they are best suited to the individual. Please note that when questioning the degree of gadget tolerance, the provider who is asking the question should do some self-examination at that point, and also look at the motivation of other team members who are recommending devices.

Alexandra Enders  
"Questionable Devices"  
Special Sessions  
Second International Conference on Rehabilitation Engineering  
Ottawa, Ontario, Canada  
June, 1984

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## DATABASES, CLEARINGHOUSES, NETWORKS

### COMPUTERIZED DATA RETRIEVAL SYSTEMS FOR TECHNICAL AIDS

#### WHAT IS A COMPUTERIZED DATABASE?

A computerized database is a body of information stored in a computer. The information gets into the computer via devices such as word processors or computerized typesetting machines which translate the words and sentences into the numbers which the computer can manipulate. Modern computers are large enough and fast enough to hold billions of words and read them all in seconds. A data search is what happens when the computer scans a database for the occurrence of specified words, resulting in the recovery of the desired information.

#### THE ABLEDATA SYSTEM

The ABLEDATA System is a computerized data retrieval system for information on rehabilitation products, funded by the National Institute for Handicapped Research of the US Department of Education and operated by the National Rehabilitation Information Center (NARIC). The ABLEDATA product database lists commercially available rehabilitation products. The national database lists only manufacturers, sole distributors or national distributors with unique mail-order product catalogs. Bibliographic materials and organization information are available through BRS on REHABDATA (NRIC), also maintained by NARIC. Using ABLEDATA can help people make more informed decisions about purchasing the appropriate aids or devices they require.

ABLEDATA can provide answers to questions like

My uncle has impaired vision. What kinds of reading aids are available to help him?

My company is developing an Employee Assistance Plan. Is there a resource for equipment which could help those people injured on-the-job to return to work quickly?

Kelly had always enjoyed carpentry and I think it would be therapeutic to continue, but maneuvering standard tools is impossible. How can I find out what adaptive devices are available?

I manufacture fishing gear and have developed a fishing pole mount for wheelchairs. Is there a centralized place to list its availability?

My patient wants to stay out of a nursing home, but wonders about maintaining a daily routine alone. Are there devices which would help?

Pat will be going back to work shortly. I think a van would be a wise purchase at this point, but how can I get comparative information about van modifications to help Pat make an informed decision?

ABLEDATA lists over 10,000 products which are commercially available. Further, ABLEDATA is updated monthly, which means that the product listings are continually being expanded and re-

vised to assure you of the most current product information.

Products listed in ABLEDATA extend from the simple to the sophisticated and reflect a broad range of equipment needs. Products are identified by the following categories:

- o Personal care
- o Vocational/Educational
- o Seating
- o Communication
- o Ambulation
- o Orthotics/Prosthetics
- o Home management
- o Mobility
- o Transportation
- o Recreation
- o Therapeutic Aids
- o Sensory Aids

#### WHAT DOES AN ABLEDATA PRODUCT LISTING INCLUDE?

Each ABLEDATA product listing includes the following descriptive information:

- o Common product name
- o Brand name
- o Manufacturer
- o Cost
- o Description of the product
- o Informal user comments (if available)
- o Abstracts of formal evaluations (if available)

#### HOW CAN A PRODUCT BE LISTED ON ABLEDATA?

ABLEDATA welcomes recommendations from product users, researchers, health professionals and manufacturers regarding equipment and devices to add to the database. In addition, the staff reviews journals and manufacturer catalogs as well as contacting individuals in the field of rehabilitation for new product ideas.

As an integral component with the actual database, the ABLEDATA System includes a network of Information Brokers. The Network of Information Brokers consists of Regional Information Brokers trained by NARIC to successfully access ABLEDATA's product listings. Regional Information Brokers are employed by a variety of rehabilitation related facilities and organizations. They serve as a local access point for product information. The Information Broker provides interpretation of the clients' requests or needs for obtaining information from the database and provides additional

## INFORMATION SERVICES AND RESOURCES

information on local or regional vendor resources and other related services for the products.

Requests for information about equipment may be directed to the Brokers by anyone, including disabled individuals or family members, rehabilitation professionals, manufacturers or vendors, educators, public or private agencies, or researchers. In addition to computer printout information, the Information Broker can provide photocopies of the manufacturer's literature for further detailed information, and for local requests the Broker can provide supplier information, sources for repair and maintenance or other related resources and referrals.

### DATA ENTRY FORMAT

The content of each data entry in the files includes the following fields:

- AN Accession number (Computer record ID number, includes code for year/month data entered)
- NM Generic name of item
- BN Brand name (trade name and/or model number)
- MN Manufacturer's name
- CD Manufacturer's and distributor's code numbers to locate address
- AV Availability (major distributors or developer if not commercially available)
- CT Cost/date
- DE Description--brief statement describing item
- CM Comments--includes information evaluative data, contraindications, limitations, etc (from disabled individuals, rehabilitation professionals, etc)
- EV Evaluation--formally documented test results
- ID Identifiers--index terms from controlled vocabulary listed in thesaurus

Generic Name, Brand Name, Manufacturer, Distributors, Cost and Description are self-explanatory and must be completed for each data entry. The Accession Number is not used for searching the database. The first four digits identify the month and year the data was entered into the system, and the last six digits are a document identification number for internal editing purposes. A Code Number is assigned to each manufacturer and distributor and is used to access a separate file to obtain the address of desired companies. Presently the fields, or paragraphs, for Comments and Evaluation are not completed for all data entries, these are completed as the information is submitted or otherwise available. Comments include informal use evaluation or general comments from disabled individuals, health professionals or anyone desiring to share information regarding products. All data submitted is reviewed before input to the system, and verified if necessary. The Evaluation field is for formally documented evaluation results, primarily from research programs. Evaluation results may be reproduced in total or summarized if lengthy, with references for obtaining the complete results.

The Identifier field is the only paragraph required to use a controlled vocabulary. These terms are assigned from the list of categories and sub-categories listed in the ABLEDATA thesaurus.

The thesaurus for ABLEDATA is being developed simultaneously with the data entries. The Thesaurus includes all controlled vocabulary or

Identifiers, and all generic or common product names listed by category. In addition, a separate and more detailed index is available with all terms indexed alphabetically with alternative terms (or synonyms) and cross-references for appropriate searching terms. The ABLEDATA Thesaurus (2nd edition) is available for \$25.00, including postage and all supplements. Searching the database is accomplished by free text searching. This method of searching may use either words designated in the controlled vocabulary or may be searched using any word or phrase in conjunction with applied limitations or operators. Any of the fields or paragraphs may be searched but consistency of terminology within the data entries is particularly critical with free text searching. NARIC provides training workshops specifically for learning to search ABLEDATA.

### SAMPLE DATA ENTRY

- AN 83-07-006900
- NM INSULIN SYRINGE INFUSER
- BN ACCU RINGE MODEL SP250, INSULIN PUMP
- MN DELTA MEDICAL INDUSTRIES
- CD 1372
- AV MANUFACTURER
- CT \$1,500.00, 0583
- DE INSULIN PUMP FOR CONTROLLING BLOOD GLUCOSE LEVELS. UNIT IS SIZE OF A PACK OF CIGARETTES. CLIPPED TO BELT OR WORN IN POCKET. CONNECTING SYRINGE IS INJECTED INTO SKIN AND TAPED. HOLDS FOUR DAY SUPPLY OF INSULIN. USES U-100 UNDILUTED INSULIN (OTHER CONCENTRATIONS CAN BE USED). UNIT IS PROGRAMMED TO DELIVER INSULIN AT MULTIPLE TIMES ACCORDING TO THE USER'S SELF MONITORED BLOOD GLUCOSE LEVELS. 1 1/16 BY 2 5/8 BY 4 3/8 INCHES. 5 1/2 OUNCES. SYRINGE 3 CC P3-0-L BATTERY NICKLE CADMIUM RECHARGEABLE BATTERY OR NON RECHARGEABLE BATTERY DELIVERY TUBE 2 FEET LONG. INTERNAL VOLUME 12 UNITS. NEEDLE STANDARD LUER HUB, NUMBER 25 TO 27, 1/2 TO 3/4 INCHES LONG. ON/OFF REVERSE CONTROLS. BASE RATE FROM 0.28 UNITS OF INSULIN PER HOUR TO 28 UNITS PER HOUR (99 OPTIONS). ID PERSONAL CARE PERSONAL HEALTH.
- CM MUST HAVE A DOCTOR'S PRESCRIPTION TO RECEIVE PRODUCT.

The ABLEDATA System is designed as a central database, and is stored at Bibliographic Retrieval Services (BRS) in Latham, New York. It may be accessed anywhere in the country, or internationally, by persons with subscriptions to BRS through special telecommunications lines (i.e., Telenet, Tymnet). BRS subscriptions range from \$16.00 to \$35.00 per connect hour, and telecommunication charges range from \$6.00 to \$11.00 per connect hour. There is a \$15.00 per hour/\$15 per citation royalty for public access to ABLEDATA. Each program generates its own policy regarding charging fees for providing searches of ABLEDATA or other databases. Some provide searches free of cost; others have minimal fees. As of 2/1/84, NARIC charges \$10.00 per search providing up to 100 citations, and \$5.00 for every additional 100 citations (or portion thereof).

**HOW CAN I ACCESS ABLEDATA'S INFORMATION?**

If you would like personal assistance to effectively retrieve ABLEDATA's product information, contact a trained ABLEDATA broker

**ABLEDATA INFORMATION BROKERS**

Megan Randall or Barbara Lerner  
National Rehabilitation Information Center  
4407 8th Street, NE  
Washington, DC 20017-2299  
(202) 635-6090

Sue Gaskin  
Division of Rehabilitation Services  
Department of Human Services  
1401 Brookwood Drive  
PO Box 3781  
Little Rock, AR 72203  
(501)371-7596

Barbara J Warren, Information Specialist  
PAM Assistance Centre  
110 Marshall Street  
Lansing, MI 48912  
(517) 371-5897

Lynda Harbert  
Rancho Los Amigos Hospital, REC  
7601 E Imperial Highway, 500 Hut  
Downey, CA 90242  
(213)922-8116

Resource Library  
Moss Rehabilitation Hospital  
12th Street & Tabor Road  
Philadelphia, PA 19141  
(215) 329-5715

Bill Steenbeke  
Independent Living  
Memorial Hospital  
615 N Michigan  
So Bend, IN 46601  
(212) 284-7450

Jerry Asay  
Utah State Div of Rehabilitation Services  
Rehabilitation Service Center  
250 East 500 South  
Salt Lake City, UT 84111  
(801)533-5991

Lois Byrum  
Minnesota Division of Vocational Rehabilitation  
501 Capitol Square Building  
St Paul, MN 55101  
(612)296-6684

Alice B Kuller  
Harmarville Rehabilitation Center  
Guys Run Road  
PO Box 11460  
Pittsburgh, PA 15238  
(412)781-5700 x 508

Ricardo G Cerna  
Division of Vocational Rehabilitation  
131 W Wilson St 7th Floor  
P O Box 7852  
Madison, WI 53707  
(608)266-1998

Elizabeth Levy  
Adaptive Equipment Resource Specialist  
Vermont Center for Independent Living  
174 River Street  
Montpelier, VT 05602  
(802)229-0501  
(800)622-4555 (Vermont only)

Wendell Finger  
Rehab Eng Section  
California Department of Rehabilitation  
830 K Street Mall  
Sacramento, CA 94614  
(916)323-2959

June Holt  
Massachusetts Rehabilitation Commission  
20 Park Plaza, Room 331  
Boston, MA 02116  
(617)727-1140

Ruth Lampert  
Veterans' Administration  
252 7th Avenue  
New York, NY 10001  
(212)620-6702

Roger Levy  
Texas Rehabilitation Commission  
118 E Riverside Drive  
Austin, TX 78704  
(512)445-8000

Carolyn Ramey  
Access Alaska  
841 E Dowling Road  
Anchorage, AK 99502  
(907)563-4060

Anne Holmes  
National Deaf-Blind Information & Resource Center  
2930 Turtle Creek Plaza  
Suite 102  
Dallas, TX 75219  
(214)522-4540

Helen Stonehill  
International Center for Disabled  
340 E 24th Street  
New York, NY 10010  
(212)679-0100 x 307

Dave Shaffer  
Human Resources Center  
1 W Willets Road  
Albertson, NY 11507  
(516)747-5400

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**Bibliographic Retrieval Services**

If you would prefer to access ABLEDATA directly, it is available to anyone with a subscription to Bibliographic Retrieval Services (BRS). For information regarding the equipment and resources necessary to publicly access ABLEDATA, call or write BRS, 1200 Route 7, Latham NY 12110, 800/833-4707. New York residents call 518/783-1161

**BRS AFTER DARK**

To directly access the ABLEDATA or REHABDATA, you must have a subscription to BRS (Bibliographic Retrieval System). The BRS Search Service, which is used by major research centers, corporations and university libraries around the world, is now available to the home computer user. Called BRS/AFTER DARK, this comprehensive new service provides access to information from millions of journals, reports, books and articles via a transparent, user-friendly interface to the sophisticated BRS Search software. Available from 6 p.m. until midnight, local time, the service offers dramatically reduced searching costs during convenient, after-work hours. BRS/AFTER DARK is available for a one-time subscription fee of \$75 which covers the search service, the BRS/AFTER DARK Newsletter, electronic mail, and other services. Access to BRS/AFTER DARK costs as little as \$6.00 per connect hour, including NINET telecommunications charges. Further information is available from Cathy Anderson, BRS/AFTER DARK, 1200 Route 7, Latham, NY 12110, 518/783-1161

**HOW ABLE IS ABLEDATA?**

In the November 1983 issue of Changing Times Magazine, an article, "Things that help the handicapped help themselves," reported the following information:

"To get a first-hand idea of just how well the computerized product identification system works, Changing Times sought information on a variety of products selected at random. We requested information on:

- o a hammer that a one-armed person could use,
- o a device to help a paralyzed person get into a bathtub,
- o an immersible bench that a disabled person can use in a bathtub or shower,
- o powered modes of transportation other than expensive electric wheelchairs,
- o a means by which a disabled person could summon help in an emergency, and
- o clothing designed especially for people with disabilities.

"A few days later we received a package of printouts that informed us that:

"United Pacific Corp., 245 Roosevelt Rd., West Chicago, Ill 60185, manufactures a hammer with nail slots in a magnetized head that allows one-hand use. It retails for about \$20.

"Twenty-five companies make devices that help

people with disabilities get into the bathtub. Items range from a heavy-duty polyvinyl cushion that inflates with water and costs less than \$300 to an electric, stainless steel, floor-mounted left priced at more than \$2,300.

"Some 47 different bathtub benches and shower stools are distributed by 32 companies. A molded plastic seat with no back support costs \$11, a vinyl upholstered chair and backrest with removable arms sells for \$265.

"Nineteen manufacturers offer 23 different powered mobility products, starting with a battery-operated metal frame with small wheels and footrests that converts most standard four-legged chairs into motorized vehicles for indoor use. It costs about \$860. At the top of the line is a four-wheeled, eight-speed electric cart for either indoor or outdoor travel. It can reach speeds of up to 22 mph and retails for around \$3,000.

"Fourteen different models of emergency alert systems are available from manufacturers. A \$60 unit consisting of a wireless remote-control signaler that can be clipped to a pocket, bed or wheelchair activates an alarm receiver plugged into a standard outlet up to 100 feet away. At the other end of the spectrum is an exotic \$2,300 microprocessor-based system that periodically requests a simple response from the person it is monitoring.

"A variety of 60 lines of men's and women's clothing with special off-and-on features are available from 16 listed manufacturers. Items range from easy slip-on blouses priced at about \$5 up to an \$85 jacket with Velcro fasteners in the front.

The article goes on to say that:

With the printouts from Abledata you can get a good idea of the variety of products available, who makes them and how much you can expect to pay. Printouts may also include names of local resources and distributors."

Reprinted with permission from Changing Times, The Kiplinger Magazine, November 1983 issue. Copyright 1983 by The Kiplinger Washington Editors, Inc., 1729 H Street NW, Washington, DC. This reprint is not to be altered in any way, except with permission from Changing Times.

**THE ABLEDATA USERS' GROUP**

The ABLEDATA Users' Group is an association of individuals and organizations who access ABLEDATA regularly. The annual fee is \$35. The Users' Group was created in response to the diversity of ABLEDATA's users. The Users' Group accommodates a wide variety of participants by allowing the ABLEDATA staff to target their technical assistance toward specific needs.

For more information, contact ABLEDATA, 4407 Eighth Street NE, Washington, DC 20017, 202/635-6090, TDD 202/635-5884.



SOURCES FOR MORE INFORMATION ON DEVICES: OTHER PRODUCT-RELATED DATA SYSTEMS

Accent on Information, P O Box 700, Bloomington, IL 61701

A commercial computerized product database with data entries organized by categories of equipment and by disability function. Data entries include ideas for how to make or adapt equipment, and organizations of interest to disabled persons. Total database includes 5,400 entries, representing approximately 1,000 companies, developers and organizations. Product printouts are available by mail for a cost of \$12.00 for the first 50 entries and \$08 for every additional citation. Photocopies of the literature can be provided for some products. Each data entry lists the product name, cost, and a brief description.

Accent Buyer's Guid grew out of the information system, and lists manufacturers, distributors, and organizations, classified by product type or function. It is an abbreviated version of the database holdings. Information listed includes names and addresses only. Cost is \$10.00.

**Assistive Device Database System (ADDS)**

The Assistive Device Database System (ADDS) is a source of information on adaptive equipment, programs and other resources available to handicapped or disabled persons. ADDS contains information not only on commercially available devices, but also on those which are custom made.

ADDS was originally developed by the Assistive Device Center at California State University, Sacramento for use by college and university counselors who advise disabled students needing assistance to accomplish tasks essential to getting a complete education, especially those students in the fields of sciences and engineering.

ADDS provides information on communication, manipulation, mobility and sensory handicaps. ADDS provides four basic types of information:

- o Devices, including purpose, manufacturer, vendor, cost and skill needed for use
- o Bibliographic citations, including author, title, source, and abstract
- o Resource persons, including name, address, phone, organizational affiliation, specialty, and service offered
- o Service agencies, including name, organization, address, phone, publications, and types of disabilities served

ADDS is being made available by American International Data Search (AIDS), Inc. ADDS will be available for direct on-line searching through commercial services and computer networks. Initially searches will be performed by the AIDS staff, but can be delivered electronically to your computer or terminal.

If you do not have a computer or terminal or if you prefer AIDS to do the search you may make an information request via a toll-free number or mail in an information request form. American International Data Search can also access other data-

bases of information for the disabled. In most cases, the information will be available within 24 hours.

To initiate a search or to request a search form call 800/275-8700 (in California, 800/223-2437), or write American International Data Search, Inc., 2326 Fair Oaks Blvd., Suite C, Sacramento, CA 95825.

**ERIC Clearinghouse on Handicapped and Gifted Children**, 1920 Association Drive, Reston, VA 22091, 703/620-3660

Information on curricula, teaching methods, research, program descriptions, assessment and other topics related to the education of handicapped and gifted children can be found in the Council on Exceptional Children (CEC) quarterly abstract journal Exceptional Child Education Resources (ECER) and in the ERIC monthly abstract journals Resources in Education (RIE) and Current Index to Journals in Education (CIJE). These three publications provide you with abstracts of journal articles, books, research reports, conference proceedings, curriculum guides, project reports, and other types of education literature, both published and unpublished.

You can search the information in these publications manually or by computer. Hundreds of university, professional and public libraries subscribe to ECER, RIE, and CIJE. You can search the subject indexes by hand to find abstracts of articles and documents on your topic. Many of these libraries also offer computer searching of ECER and ERIC (RIE and CIJE). Some libraries are funded to offer free or inexpensive searches to certain groups. If your topic is fairly complex, or you need to have a comprehensive review of the literature, a computer search can save you many hours in the library.

Computer searches of ECER and ERIC are available from CEC Information Services at the following rates:

**Regular and Institution Rates**

One database (ECER or ERIC) \$35.00 (up to 50 abstracts); two databases (ECER and ERIC) \$50.00 (up to 100 abstracts)

**Special CEC member rates**

One database (ECER or ERIC) \$25.00 (up to 50 abstracts); two databases (ECER and ERIC) \$40.00 (up to 100 abstracts)

Additional abstracts at \$5 per 25, add 10% for postage and handling.

If you need help locating a library near you that offers computer searching or would like to order a search from CEC, call CEC Information Services at 703/620-3660.

The Council for Exceptional Children operates the ERIC Clearinghouse on Handicapped and Gifted Children under a contract with the National Institute of Education.



**NARIC**

The National Rehabilitation Information Center (NARIC) is a rehabilitation information service and research library funded by the Department of Education, National Institute of Handicapped Research (NIHR) ..

- o facilitate access to NIHR and Rehabilitation Services Administration (RSA) funded research reports,
- o make available information on assistive devices,
- o disseminate other rehabilitation-related information resources

To meet these goals NARIC operates REHABDATA and its companion database, ABLEDATA. REHABDATA is a computerized listing of NIHR and RSA materials, selected journal articles, audiovisual materials and commercial publications. REHABDATA lists over 10,000 items. The NARIC Library collection contains all materials listed on REHABDATA as well as a variety of fact and referral resources.

The NARIC Library collection constitutes the resource base used to respond to your fact or document requests. The Information Team can either answer your questions or provide accurate referrals. In addition, because the library houses copies of all REHABDATA materials, you can receive a reproduction of any non-copyrighted document listed on the database.

NARIC, in conjunction with the National Council on Rehabilitation Education (NCRE), annually produces the Rehabilitation Research Review. This series of publications provide a state-of-the-art analysis and discussion of key topics in the field of rehabilitation, including recommendations for future research and an annotated bibliography.

The following is a list of the 1982-83 Rehabilitation Research Review titles and authors:

- 1 Rehabilitation Education and Training  
Michael Scofield, Ph D
- 2 Client Vocational Assessment Norman Berven, Ph D
- 3 Private Sector Role of Rehabilitation Professionals George Wright, Ph D
- 4 Process, Issues and Needs in Private-for-Profit Rehabilitation Mary Ellen Mitchell, Ph D, Jack M. Sink, Ph D
- 5 Benefit Cost Analysis Monroe Berkowitz, Ph D, Edward Berkowitz, Ph D
- 6 Consumerism and Advocacy in Vocational Rehabilitation Lex Frieden
- 7 Applications of Telecommunications Technology to Services for Individuals with Disabilities Susanne Bruyere, Ph D
- 8 The Role of the Family in Rehabilitation P William English, Ph D
- 9 Incentives and Disincentives in the Vocational Rehabilitation Process Kurt L Johnson
- 10 Rehabilitation and Adults with Learning Disabilities Joseph A. Suzhay, Ph D, John M. Williams, Ed.D
- 11 Sheltered Employment Services and Programs Luca E. Conte, Ph D
- 12 Delivery of Vocational Rehabilitation to

- Rural Populations Laurel Richards
- 13 Case Management Techniques Deborah A. Pape, Ph D
- 14 Contemporary Research on the Vocational Rehabilitation of Persons with Mental Retardation Harry A. Allen, Ed D, Donna R Falvo, Ph D
- 17 Computers in Vocational Rehabilitation Current Trends and Future Applications Bruce Growick, Ph D
- 18 Performance Appraisal of Rehabilitation Professionals William Sather, Ph D
- 19 Low Cost Technical Aids and Self-Help Approaches to Technology The Benefit for Disabled People Gregory Dixon, Sandi Enders
- 20 Measuring Vocational Rehabilitation Success Kenneth Reagles, Ph D

The 1984 Rehabilitation Research Reviews include:

- 1 Supported Work/Transitional Employment Steve Ostby, Ph D and Anne Chandler, Ph D
- 2 Importance of Physical Conditioning for Disabled Persons Peg Nosek and Ray Nofi
- 3 Parent Training for Early Intervention Diane Briker, Ph D (Kristine Slentz, Barbara Walker)
- 4 The Use of Computers to Expand Employment Opportunities for Disabled Persons William Crimando, Ph D and Susan Harrington Godley, Ph D
- 5 The Rehabilitation of Persons with Head Injuries Ruth Torkelson-Lynch, Ph D
- 6 The Rehabilitation of Autistic Persons Anne Donnellan, Ph D
- 7 Wheelchairs Colin McLaurin, Ph D
- 8 Medical Rehabilitation of Persons with Muscular Dystrophy and Other Neuromuscular Diseases Dr William Fowler, Jr
- 9 Disability and Older Adults Pamela Finnerty-Fried, Ph D
- 10 The Community Integration of Disabled Persons Carol Sigelman, Ph D
- 11 The Efficacy of the Independent Living Program Model Based on Descriptive and Evaluative Studies Lex Frieden
- 12 The Use of Computer Technology in Service Delivery to Disabled Persons Brian McMahon, Ph D, James Sampson, Ph D, and Jane Burkhead, Ph D

Individual Reviews are \$7.50 each, the complete set is \$100.00. All prices include postage and shipping in the USA.

While NARIC provides free fact and referral services, other products and services are available for nominal fees. However, no one will be denied access to NARIC's resources because of an inability to pay. For more information please write, call, or visit:

National Rehabilitation Information Center  
The Catholic University of America  
4407 Eighth Street, NE  
Washington, DC 20017  
Phone 202/635-5826  
TDD 202/635-5884  
ABLEDATA 202/635-6050  
REHABDATA 202/635-5822

NARIC operates under contract with the National Institute of Handicapped Research, U.S. Department of Education (Contract #300-84-0007)

**WHERE HAVE ALL THE ASSISTIVE  
DEVICE DATABASES GONE?**

Several product-related databases that were listed in the first edition of the Resource Guide no longer appear to be in operation. These include

APIAD: Automatic Retrieval of Information on Assistive Devices

Louisiana Tech University  
Rehabilitation Engineering Research Center  
P O Box 10348  
Ruston, LA 71272

Assistive Devices for People with Disabilities

Clinical Convenience Products  
2066 Helena Street  
Madison, WI 53704

Project Find

Information Center of Greater Birmingham, Inc  
3600 8th Avenue South, Suite 504  
Birmingham, AL 35222

STORPRUD

University of Washington  
Department of Rehabilitation Medicine  
BD - 805 HSB Room 30  
Seattle, WA 98195

This database doesn't appear to readily serve the general public

VAREC Information Storage and Retrieval System

Veterans Administration REC  
Information & Education Service  
252 7th Avenue  
New York, NY 10001

**SPECIALIZED DATABASES UNDER DEVELOPMENT**

Job Accomodation Network (JAN)

P O Box 468  
Morgantown, NY 26506  
1-800-JAN-PCEH

Sponsored by the President's Committee on Employment of the Handicapped, this database will provide information about worksite accommodations for disabled individuals. Accommodations will be listed according to tasks and an individual's functional limitations. It is primarily for employers seeking ways to accommodate disabled employees.

Tech-Knowledge

Center for Rehabilitation Technology, Inc  
Georgia Institute of Technology  
Atlanta, GA 30332  
404/894-4960

Tech-Knowledge is an information service of the Center for Rehabilitation Technology, Inc in Atlanta. This computerized data and information clearinghouse covers such areas as specifications, standards, legal requirements, product research and design, engineering and architecture, and marketing opportunities and business development. This service is available to all organizations by subscription. The search rate for consumers is \$3 per hour, while the charge to researchers, organizations and business is \$35 for the first search hour and \$25 for each following hour. There is a 25% discount to all users after ten hours of search in one year.

**ONLINE DATABASES THAT INCLUDE REHABILITATION**

**INFORMATION: A Guide for the Researcher** Sharon McFarland, NARIC, The Catholic University of America, 4407 Eight Street NE, Washington, DC 20017 202/635-5822 (Information Specialist), 202/635-5884 (TDD) February, 1982

This guide, prepared by the National Rehabilitation Information Center, lists databases available from the Bibliographic Retrieval Service (BRS) and DIALOG which have rehabilitation information.

Each entry lists the name of the database, which vendor or vendors have the database available, and the file label or number. In addition, a brief description of the database coverage and general subject areas are given, drawn from the database guides written by BRS and DIALOG and search experience at NARIC.

INFORMATION CLEARINGHOUSES

**Bioengineering Program, Association for Retarded Citizens (ARC) of the United States** 2501 Ave. J, Arlington, TX 76011.

The purpose of the ARC Bioengineering Program is to improve the quality of life for mentally retarded persons, especially severely/profoundly retarded persons, through technology. Program activities consist of adapting currently available assistive devices for use by retarded persons, developing new assistive devices when needed, and consolidating information on the use of technological aids into a technology resource library.

**EduTech, JWK International**, 7617 Little River Turnpike, Annandale, VA 22003. 703/750-u500

Project EduTech, funded by the Special Education Programs office of the Department of Education, is designed to provide technical assistance to state and local education agencies, educators, and other persons interested in the appropriate use of technology in special education. The Project develops reports and other information on technological advances, and maintains an information base in related areas.

EduTech's files contain information on technology, special education issues, companies/vendors, active projects, resource organizations, and funding sources involved in technological development. This material is periodically organized into topical bibliographies, resource guides, and fact sheets, which are used to respond to inquiries.

Some of the materials produced by EduTech include Election of Micro-Computers, Assistive/Communication Devices, Television Applications in Education, Technology in Special Education Instruction, and Software. The project also maintains an on-going bulletin board on SpecialNet, a national computerized information network for special education personnel.

**Materials Development Center (MDC)**, Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout, Menomonie, WI 715/232-1342

MDC is a national central source which collects, develops, and disseminates information and materials in the areas of vocational evaluation and work adjustment.

**National Clearinghouse of Rehabilitation Training Materials**, Oklahoma State University, 115 Old USDA Building, Stillwater, OK 74078

**National Information Center for Handicapped Youth and Children**

The U.S. Department of Education has awarded a three-year contract to InterAmerica Research Associates of Rosslyn, Virginia, to establish the National Information Center for Handicapped Youth and Children. The Center focuses on collecting and sharing information and ideas which may be helpful to children and youths who experience physical handicap and to the people who work with them. The Center links people with others who share common concerns, sponsors workshops and

publishes newsletters. The Center also disseminates information to rural areas and culturally diverse populations.

The Center provides publications about specific areas of interest, addresses of parent organizations, information about other resources, ideas on how to work with schools and other agencies to create the best programs possible, and newsletters which address timely subjects of interest.

Those who may use the services of the Center include parents of children experiencing handicaps, adults who experience handicaps and wish further information about rights and services, and professionals, students and advocates concerned about the needs and rights of persons experiencing handicaps.

For further information, contact National Information Center for Handicapped Children and Youth, P.O. Box 1492, Washington, DC 20013

**National Organization on Disability (NOD)**

The National Organization on Disability has been funded to establish, by mid-1984, an information clearinghouse, directing people to resources that can answer their specific questions. No charge. Contact Jean Fitzgerald, Program Coordinator, National Organization on Disability, 2100 Pennsylvania Avenue, Suite 234, Washington, DC 20039 202/293-5960, 202/293-5968 (TTY)

The Clearinghouse on the Handicapped had developed a computerized database, NISH (National Information Sources on the Handicapped), available through Bibliographic Retrieval Services (BRS). The database contains records of organizations which disseminate information nationally on disability. It is no longer available on the BRS system, but the data is still available in book form.

The Directory of National Information Sources on Handicapping Conditions and Related Services Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Stock number 017-000-00234-7 \$7.50

The National Clearinghouse on the Handicapped, Office for Handicapped Individuals, Office of Special Education & Rehabilitative Services, Washington, DC 20202, has been reduced to 2 staff members. At the end of this fiscal year, they will no longer produce their free quarterly publication, Programs for the Handicapped, nor will they be updating the above-cited Directory.

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**SOME LOCAL RESOURCE CENTERS**

Also see the list of ABLEDATA System Information Brokers on page 7, as well as the communication service centers on page 208, and seating service centers, page 184.

California

Comprehensive Rehabilitation Center (CRC)  
323 North Prairie Avenue  
Inglewood, CA 90301  
213/673-9090

The CRC is providing a telephone information service for people with disabilities, health professionals and the general community. Access Info is a system providing taped messages on a variety of topics related to disability and rehabilitation. A brochure listing the tapes available on Access Info is available from the Center.

Massachusetts

Independence Associates  
693 Bedford Street  
Elmwood, MA 02337  
617/378-3997

Independence Associates is a good resource for helping solve equipment problems, assisting you with what type of equipment you need and perhaps most importantly advocacy services to deal with funding sources, equipment suppliers, hospital staff, etc. They also have a resource guide, A Survival Handbook for Independent Living Enthusiasts, which includes information on assistive devices.

Michigan

PAM Assistance Centre  
601 W Maple  
Lansing, MI 48906  
517/371-5897

The PAM Assistance Centre is an information clearinghouse and referral service on assistive devices: what products exist, what they do, how much they cost, and where to get them. They also publish a practical newsletter, the PAM Repeater. Individual subscriptions are \$5.00/year, organizational subscriptions are \$25.00/year.

Missouri

Assistive Device Resource Service  
609 Maryland  
University of Missouri-Columbia  
Columbia, MO 65211  
600/392-0533

A primary resource center, serving the State of Missouri, this service provides technical assistance to vocational programs serving handicapped students.

Texas

REHAB TECH (formerly IMPART)  
Texas Rehabilitation Commission  
Roger Levy, program specialist  
118 E Riverside Drive  
Austin, TX 78704  
512/445-8338

REHAB TECH is an information and referral service. It provides solutions to individual problems in home, education, or vocational settings.

Vermont

Resource Guide for Augmentative Communication and Adaptive Equipment, Ruth Dennis, OTR, and Susan Edelman, RPT. A compilation of resource and service information to facilitate the processes involved in assessment, purchase, fabrication, training, and repair of equipment, and provide documentation of those resources which are sparse or non-existent in Vermont.

Canada

Disabled Living Resource Centre  
Kinsman Rehabilitation Foundation  
2256 West 12th Avenue  
Vancouver, British Columbia  
CANADA  
604/736-8841

For information centers with toll free numbers, see the section on TOLL-FREE NUMBERS.

TECHNOLOGY INFORMATION EXCHANGE NETWORKS

**Confer**

Confer is a new computer telecommunications tool that provides a highly effective medium for people to exchange ideas, resolve problems and discuss plans with others within a social network. Confer users connect their computer terminals by telephone with a central computer at Wayne State University to exchange messages and participate in discussions.

During the last half of 1983, the Blissymbolics Communication Institute has been administering the use of Confer as a trial project to identify some of the uses of computer conferencing as they relate to the international field of augmentative communication. During this trial period, attention has been focused on administrative procedures and the new skills and routines required of users, in order that this new medium's capabilities can be appropriately utilized. The particular conference being administered by BCI is called IPC AC (International Project on Communication Augmentative Communication).

The fee structure and information regarding IPC AC can be obtained by writing to Katherine Seybold, Blissymbolics Communication Institute, 350 Rumsey Road, Toronto, Ontario M4G 1R8 406/424-3806

**HEX (Handicapped Education Exchange)**

The Handicapped Education Exchange (HEX) is a computerized bulletin board which is available through the public telephone network. HEX can be reached by dialing 301/593-7033, 24 hours a day, 7 days a week. It is intended as a free service to those involved in the education of, or communications with, the handicapped. For more information, contact Richard Barth, 11523 Charlton Dr., Silver Spring, MD 20902 301/681-7372 (voice)

HEX can be useful to you as

- o A way for the handicapped, and those assisting the handicapped, to make known what sorts of devices they need
- o A way for those qualified to provide technical assistance to disabled individuals to find out what they might be doing to help
- o A way for those actively involved in designing aids for the disabled to offer suggestions to, and get help from, others who are similarly engaged
- o A way for those having products, services, or information of potential use to the handicapped to make known their availability
- o A way of disseminating information about organizations and programs useful to the handicapped.
- o A way of demonstrating the usefulness of computerized bulletin boards to the handicapped

To "talk" to HEX, you will need either an ASCII or Baudot terminal. The ASCII terminal may be either a simple terminal or a computer which is capable of running at a speed of 300 baud, using 8 data bits, no parity and 1 stop bit. It should be equipped with a Bell 103-type modem. Baudot

callers should use a standard Telecommunication Device for the Deaf (TDD), also known as a TTY (teletypewriter). HEX is set up so that it can handle an ASCII or Baudot caller, automatically, on the same line.

HEX serves as a means of exchanging ideas and information concerning application of technology to aid disabled people. If you have an ASCII or Baudot terminal, dial HEX and take a look at the information already on it. If you have something that you would like to pass along to others in the field, you can easily enter it as a new message.

HEX is operated by AMRAD, the Amateur Radio and Development Corporation. It is funded by a grant from the Office of Special Education, US Department of Education.

**SpecialNet**

The special education communication information network SpecialNet is part of a large computer network that provides telephone access in over 250 US cities. SpecialNet features electronic mail, topical bulletin boards, and data collection/information management systems. Organizations and individuals subscribing to SpecialNet can communicate via electronic mail. Information transmitted concerns conferences, computers, litigation, RFP, consultants, employment, EDutech, Congress, opinions and other related topics. A subscription to SpecialNet costs \$200 per year plus a charge for actual time connected to the system. To subscribe to SpecialNet, contact National Association of State Directors of Special Education, 1201 Fifteenth Street NW, Suite 404E, Washington, DC 20036.

The Prentke Romich Company (PRC) is managing one bulletin board on SpecialNet, ASSISTIVEDEVICE. If you have assistive device announcements in the following areas that you would like posted on the board, please contact PRC by calling, or writing through the electronic mailbox address (user name = PRC). PRC is looking for information on:

- 1 Seminars/workshops regarding the use of assistive devices
- 2 New product announcements
- 3 Used assistive devices for sale or purchase
- 4 New resources/texts/materials regarding assistive devices

A separate item to be developed and posted on the bulletin board will be FUNDING. PRC will post source (i.e., insurance company), address, type of device funded (i.e., communication aid, environmental control system). If you have specific information you would like to share, please contact Prentke Romich Company, 8769 Township Road 513, Shreve, OH 44676, 216/567-2906.

For more information on electronic bulletin boards and information exchange networks, see the section on **MICROCOMPUTER APPLICATIONS**, page 241-242.

INTERNATIONAL INFORMATION ON TECHNICAL AND INFORMATION SYSTEMS

**European Technical Aids Information System**

The European Economic Community (EEC) is developing a new technical aids system for disabled persons. Called "Handynet", the system consists of two parts: Handy aids, which lists information on technical aids available in EEC countries and Scandinavia, and Handywho, which carries information on professionals and organizations that develop or provide technical aids in these countries

Long-range plans include Handysearch, an inventory of research in the field of technical aids, Handyce, information on EEC documents and legislation concerning disabled persons, and Handynews, a service that reports new developments, meetings and conferences on technical aids

For more information, contact Patrick Daunt, Head, Bureau for Action in Favor of Disabled People, Al 613 200, rue de la Loi, B-1049, Brussels, Belgium

**International Commission on Technical Aids, Housing, and Transportation (ICTA)**

A commission within Rehabilitation International. Located in Stockholm, Sweden, it promotes an international exchange of information through publications, conferences, and seminars. Contact ICTA Information Centre, FACK, S-161 25 Bromma 1 Sweden

Information Systems as Technical Aids for the Disabled: A Transnational View James F. Garrett, Editor. Rehabilitation International USA, 1123 Broadway, New York, NY 10010 \$20.00 1982

Four papers from the 1981 conference in Bellagio, Italy, sponsored by the Rockefeller Foundation

Information Services on Technical Aids for People with Disabilities: An International Perspective Barbara Duncan, Editor. 1132 Broadway, New York, NY 10010 \$20.00 1982

This book is the proceedings of the First International Conference on Information Systems on Technical Aids for People with Disabilities, held October 4-8 in Bellagio, Italy. An exploration of the best ways to promote international exchange of information on technical aids. There is an international overview of technical aid information systems in Sweden, England, Australia, Germany, Italy, Japan and the US. The proceedings also include a resource section listing information, publications and journals on technical aids and services available for individuals who experience handicaps



RESEARCH AND DEVELOPMENT PROGRAMS ON TECHNICAL AIDS

**THE FEDERAL GOVERNMENT'S INVOLVEMENT IN DISABILITY-RELATED TECHNOLOGY R&D**

"The official role of the Federal Government in vocational rehabilitation, prosthesis research, and other disability-related research dates back to the 1930's and 1940's. The presence of the Federal Government as a purchaser of devices to aid disabled people reaches back even further to the years following the Civil War. Much of the groundwork for the current system of rehabilitation research was laid in the 1940's by the National Academy of Sciences and the armed services in response to the postwar needs of veterans. A large share of the initial research was conducted by the Department of Defense (DOD) and the Veterans Administration (VA) on prosthetic devices. Prosthetics research, along with an expanded focus on other areas of disability-related research, still continues in the VA system. The present-day Rehabilitation Services Administration (RSA) had its beginning as the Office of Vocational Rehabilitation within the then Department of Health, Education, and Welfare (DHEW) in the early 1950's. Since these early efforts, the range and depth of the Federal initiative have expanded markedly. In addition, this area of R&D has steadily gained increased attention and recognition by the Federal Government over the years, though it remains small in comparison to the immensity of the problems involved. The private and nonprofit sectors of our society have also become increasingly involved in disability-related products and services."

from Technology and the Handicapped, Office of Technology Assessment (OTA), U.S. Congress, Washington, DC, 1982

**National Institute of Handicapped Research, Department of Education, 400 Maryland Avenue, SW, Washington, DC**

The National Institute of Handicapped Research (NIHR) provides leadership and support for a national and international program of comprehensive and coordinated research regarding the rehabilitation of handicapped persons, and sees that this knowledge is made available to those who can best use it. Developing and applying new technologies to this effort is the main focus of the Institute's Rehabilitation Engineering Centers.

Each center is encouraged to establish official working relationships with institutions of higher learning in medicine, engineering, and related sciences, and to assist in the development of manpower and training programs through which the technique, hardware, and systems development can be introduced safely into the service delivery systems. Duplication of effort is avoided through intercenter coordination. Each center has an approved core of research emphasis and each reflects the needs of major patient populations of the center. In the following list, the respective core area of research, and a brief description of specific focus, is listed beneath each REC

**Current NIHR-Supported Rehabilitation Engineering Programs**

**CASE WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE, School of Medicine, 211<sup>9</sup> Abington Road, Cleveland, OH 44105, 216/444-4900 P Hunter Peckham, Ph D**

**Functional Electrical Stimulation** Research on restoration of neuromusculoskeletal impairment by functional electrical stimulation, closed loop control of electrically stimulated muscles to improve FES orthoses for restoration of hand function, therapeutic applications of FES for management of abnormal muscle contractions in cerebral palsy, biofeedback system for replacement of tactile information in quadriplegic, development of external control logic and percutaneous stimulation systems

**CEREBRAL PALSY RESEARCH FOUNDATION OF KANSAS, INC, P D Box 8217, 2021 N Old Manor, Wichita, KS 67208, 316/688-1888 John F Jonas, Jr, John H Leslie**

**Work Site Modification** Research on worksite modification using technology systems approaches -- to determine whether generalizable principles of design are feasible for neurologically impaired persons, develop taxonomy of performance characteristics, investigate the occupationally significant physical skills of pre-vocational disabled, develop an Available Motions Inventory, develop determined time standards, investigate use of robotic arm, design interfaces with computer, communication devices, and word processors, develop head wand, make and install tooling or adaptive devices for production lines in at least three sheltered workshops

**DALLAS REHABILITATION FOUNDATION, 7850 Brookhollow Road, Dallas, TX 75235, 817/273-2249, 214/637-0740 Raymond Dabney, Alfred R Potvin**

**Quantification of Human Performance** Research on improved method of quantification of human performance, refinement expansion, clinical evaluation, and commercialization of the sensory and motor function

**ELECTRONIC INDUSTRIES FOUNDATION, 2001 Eye Street NW, Suite 405, Washington, DC 20006, 202/457-4900 John Walsh**

**Evaluation of Technology & Stimulation of Industry** foster a commercialization process to lead to increased availability of assistive devices for handicapped, stimulation of industry to participate in production, marketing and distribution of devices, developing criteria for selection of devices for testing, development of evaluation protocol

**GALLAUDET COLLEGE Division of Research, 400 Florida Avenue NE, Washington, DC 20002, 202/651-5440 Raymond J Trybus, Ph D**

**Sensory Aids** Deaf and Hearing Impaired research into the various technologies for the deaf

The program of the Center consists of research and development to apply current and emerging technologies for the alleviation and solution of problems caused by deafness, ranging from mild to profound hearing loss. The major focus is on the difficulties in speech communication between deafened and hearing persons.

**HARVARD-MIT, Children's Hospital Medical Center,** 300 Longwood Avenue, Boston, MA 02115, 617/735-6594. William Berenberg, M.D.

**Quantification of Human Performance:** Research on improved method of quantification of human performance; improved methods of quantification of performance by assessing changes in range of motion; strength and segmental mobility of the spine; quantitative measures for monitoring effects of intervention strategies for treatment of arthritic condition

**THE LEXINGTON CENTER, INC., Rehabilitation Engineering Center,** 30th Avenue and 75th Street, Jackson Heights, NY 11370 Alan Lerman, Ph D

**New Generation Hearing Aids**

**NORTHWESTERN UNIVERSITY,** 345 E Superior St., Chicago, IL 60611, 312/649-8560 Dudley Childress

**Prosthetics & Orthotics** development of durable, modular and inexpensive myoelectric prehension devices for amputees, artificial arms, limb extension mechanisms, rigid knee embulation; design and development of knee orthoses, prehensile terminal headpointers, microprocessor-based powered wheelchairs and environmental control units, joint replacement-hip prostheses, knee replacements

**RANCHO LOS AMIGOS HOSPITAL,** 7601 East Imperial Highway, Downey, CA 90242, 213/922-7167 Robert Waters, Donald McNeal

**Functional Electrical Stimulation:** Improved techniques of functional electrical stimulation, improved methods of gait training and upper extremity rehab through application of electrical stimulation and biofeedback, multichannel FES implanted into body to activate muscles in lower extremities, correction of spinal deformities by FES, acute and chronic FES for incontinence control, effects of stimulus wave form and electrodes on comfort during controlled motor contraction

**LOUISIANA TECH UNIVERSITY,** P O Box 10348, Ruston, LA 71272. 318/257-4562 Duane F Bruley, Ph D.

**Transportation of the Handicapped -- Personal Licensed Vehicles**

**UNIVERSITY OF VERMONT,** Burlington, VT 05405 802/856-4631. John W. Frymoyer, MD

**Rehabilitation in lower back pain**

**SMITH-KETTLEWELL INSTITUTE OF VISUAL SCIENCES,** 2232 Webster Street, San Francisco, CA 94115 415/563-2323. Arthur Jampolsky, MD, John Brubyn

**Sensory Aids -- Blind and Deaf** Development and evaluation of sensory aids for blind and deaf

individuals

**SOUTHWEST RESEARCH INSTITUTE,** Electronic Systems Division, P O Drawer 28510, 6220 Culebra Rd, San Antonio, TX 78284, 512/864-5111 Sam McFarland

**Evaluation of Technology & Stimulation of Industry** evaluation of product performance through development of standards, user tests of suitability, and clinical evaluation of effectiveness, dissemination of information through publication, computer data files, and educational curricula

**TRACE CENTER,** University of Wisconsin, 314 Waisman Center, 1500 Highland Avenue, Madison, WI 53706, 608/262-6966 Gregg C Vanderheiden.

**Communication Systems:** Research on access to communication, control, and information processing systems; develop quantitative measures of progress, determine state-of-the-art devices for non-vocal persons, study characteristics of target population and process of augmentative communication, quantitative measures of minimum functional levels; determine whether technology can facilitate language therapy or processing; increase rate of control with aids, develop interfaces for extremely motor-impaired individuals

**TUFTS UNIVERSITY,** Tufts New England Medical Center, Department of Rehabilitation Medicine, Box 1014, 171 Harrison Avenue, Boston, MA 02111, 617/956-5036 Richard Foulds

**Communication Systems --** develop visual line of gaze communication system, develop second generation oculometer, system with videocamera, processing electronic and microcomputers using corneal reflection-pupil center method, ocular interface for commercial microcomputers, test use of proportional control, examine single fingered typing, technique for generating unit sets for single-switch aids

**UNIVERSITY OF MINNESOTA,** Department of Physical Medicine and Rehabilitation, c/o ORA, 1919 University Avenue, St Paul, MN 55455, 612/373-8990 G Gullickson, M D, R Patterson, Ph D

**Quantification of Human Performance** improved methods of quantification of performance by assessing changes in range of motion, strength and segmental mobility of the spine, quantitative measures for monitoring effects of intervention strategies for treatment of arthritic condition

**UNIVERSITY OF VIRGINIA MEDICAL CENTER,** Department of Orthopedics & Rehabilitation, P O Box 209/UVA, Charlottesville, VA 22908, 804/977-6730 Colin A McLaurin

**Wheelchairs** Improved wheelchair systems and specialized seating, research on human factors in propulsion: seating and body support, analysis and design of structural components and systems for wheelchairs, power system



## INFORMATION SERVICES AND RESOURCES

### International

REHABILITATION INSTITUTE, Linhartova 51,  
Ljubljana, Yugoslavia Aiojz Kraij

Functional Electrical Stimulation: enhancement of applicability of FES devices and therapies of paralytic patients, FES of spinal cord injured patients, restoration of locomotion, quantification of effects of electrical stimulation in patients with urinary disorders.

NIHR also funds a number of other rehabilitation research and training centers which can provide information on disability-related technology

CARROLL CENTER FOR THE BLIND, 770 Centre St.,  
Newton, MA 02158, 617/969-6200 Rachel E Rosenbaum.

Aids and Appliances Review a journal concerned with blindness and low-vision rehabilitation

HUMAN RESOURCES CENTER, I.U. Willets Road,  
Albertson, NY 11507, 516/747-5400 Jack Victor,  
Ph.D

Research on Employability of Handicapped  
Individuals

INSTITUTE FOR INFORMATION STUDIES, 200 Little  
Falls Street, Suite 404, Falls Church, VA 22046,  
703/533-0383. Elizabeth Pan, Ph.D.

REHAB BRIEF publication issued monthly summarizes findings of NIHR research and disseminates it to 30,000 users.

MISSISSIPPI STATE UNIVERSITY, P O Drawer LQ,  
Mississippi State, MS 39762, 601/325-2001  
William H. Graves, Ph.D.

Rural Independent Living Skills and Services

NATIONAL ASSOCIATION OF THE PARTNERS OF THE ALLIANCE, INC., PATH Americas Program, 1424 K Street  
NW, Washington, DC 20005, 202/628-3300 Gregory  
Dixon

Interagency Agreement with USIA PATH Americas  
Program, focuses on needs of handicapped  
children and adults in the Americas

NATIONAL REHABILITATION INFORMATION CENTER  
(NARIC), Catholic University of America, 4407  
Eighth Street NE, Washington, DC 20017, 202/635-  
5822. Susan Flowers. See page 10.

PENNSYLVANIA COLLEGE OF OPTOMETRY, Office of Academic  
Development, 1200 W Godfrey Avenue, Philadelphia,  
PA 19141, 215/424-5900 Laura Edwards

Orientation of Mobility Research for Persons  
with Low Vision

REHABILITATION INTERNATIONAL -- USA, 1123 Broadway,  
New York, NY 10010, 212/620-4040 Philip  
Pulero, Ph.D.

RIUSHARE Program to upgrade utilization of  
innovations and information from international  
rehabilitation

STOUT VOCATIONAL REHABILITATION INSTITUTE, University  
of Wisconsin/Stout, Menomonie, WI 54751,  
715/232-1464 Daniel C. McAlees

Research on Sheltered Transitional Employment

UNIVERSITY CENTER FOR INTERNATIONAL REHABILITATION  
513 Erickson Hall, Michigan State University, East  
Lansing, MI 48824, 517/355-1824 William Frey,  
Ph.D

International Research Information and Training  
Center

UNIVERSITY OF ARKANSAS, Board of Trustees,  
Fayetteville Campus, Fayetteville, AR 72701,  
501/371-1654 Douglas Watson, Ph.D

Improving Vocational Rehabilitation in Post-  
secondary Education Programs for Deaf Individuals

WORLD REHABILITATION FUND, INC., 400 E 34th  
Street, New York, NY 10016, 212/679-2934 Diane  
Woods

International Exchange of Experts and Information  
in Rehabilitation

### **Other Rehabilitation Engineering Programs**

These programs have in the past received support  
from NIHR, most have continued R&D work in their  
specialty areas

CHILDREN'S HOSPITAL AT STANFORD, Rehabilitation  
Engineering Center, 520 Willow Road, Palo Alto, CA  
94304, 415/327-4800 Maurice A LeBlanc  
Controls and interfaces

INSTITUTE OF REHABILITATION MEDICINE, New York  
University, 400 E 34th Street, New York, NY  
10016, 212/340-6015 Joseph Goodgold  
Evaluation of Functional Performance of De-  
vices for Severely Disabled Individuals

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH  
1333 Moursund Avenue, Houston, TX 77030, 713/797-  
1440 Thomas A Krouskop  
Effects of pressure on tissue

THE UNIVERSITY OF IOWA, Carver Pavilion, Iowa  
City, IA 52242, 319/356-3470 R R Cooper,  
Richard A Brand, Y King Liu  
Low Back Pain

THE UNIVERSITY OF MICHIGAN, 208 W E Lay Auto-  
motive Lab, 2320 Herbert Street, Ann Arbor, MI  
48109, 313/763-6632 J Raymond Pearson  
Automotive Transportation for the Handicapped

UNIVERSITY OF TENNESSEE, 532 S Stadium Hall,  
Knoxville, TN 37916 Carl Asp, Ph.D  
Hearing aids

UNIVERSITY OF TENNESSEE, Rehabilitation Engi-  
neering Program 682 Court Avenue, Memphis, TN  
38163, 901/528-6445 Douglas Hobson  
Aids for Handicapped Children

### International

INSTITUTE OF ORTHOPEDIC SURGERY AND REHABILITATION,  
Academy of Medicine, Dzierzynskiego 135, 61  
545 Poznan, Poland A Senger  
Upper extremity disabilities

WATA WA AMAL, Mugamaa Building, Tahrir Square,  
Cairo, Egypt. Sahah Hommossani  
Architectural barriers

**Veterans Administration**

VA has been involved in disability-related technology research since the late 1940's. For many years, VA was the primary supporter of federally sponsored research in this area, especially in the field of prosthetics research. In the last few years, VA has expanded its disability-related research focus to include a broader range of areas. The establishment of the Rehabilitation Engineering Research and Development (RER&D) program is the VA's response to the increased research and service needs of the veteran population and of disabled people in general.

REHABILITATION RESEARCH & DEVELOPMENT, Central Office, Veterans Administration Central Office, 810 Vermont Avenue, Washington, DC 20420, 202/389-5147

REHABILITATION RESEARCH & DEVELOPMENT CENTER, Decatur Veterans Administration Hospital, 1670 Claremont Road, Decatur, GA 30033, 404/321-6111

REHABILITATION RESEARCH & DEVELOPMENT CENTER, Hines Veterans Administration Hospital, Box 20, Hines, IL 60141, 313/343-7200

REHABILITATION RESEARCH & DEVELOPMENT CENTER, Palo Alto Veterans Administration Hospital, Mail Stop 153, Palo Alto, CA, 415/493-5000, x 5464

**Office of Special Education (OSE), Department of Education, 400 Maryland Avenue, SW, Washington, DC**

OSE is the third largest Federal supporter of disability-related research, and the largest in the area of educationally related efforts.

**Other Federal Agencies**

NASA and NSF are also involved in hardware-oriented research in this area.

National Science Foundation (NSF), 1800 G Street, Washington, DC 20202

NASA Technology Utilization Office, Rehabilitation Programs, 400 Maryland Avenue SW, Washington, DC 20546, 202/755-3720

NASA has been involved in transferring technology and information gained from its bioengineering efforts, as well as its general research efforts, to the health care sector since the late 1960's. Biomedical applications teams attempt to identify and interpret national trends in medicine as well as technology-related problems in health-care delivery, and develop potential solutions to these problems through the use of aerospace technology.

Another mechanism that NIHR and other Federal agencies involved in this area use is the Inter-agency Committee on Rehabilitation Engineering.

This working group is composed of representatives from the National Science Foundation, the National Council on the Handicapped, the National Bureau of Standards, the National Aeronautics & Space Administration, the Veterans Administration, the National Institute of Handicapped Research, the Department of Health and Human Services, the Department of Transportation, the National Institute of Neurological and Communicative Disorders and Stroke, and the Senate Committee on Labor and Human Relations. This Interagency Committee was instrumental in the development of NIHR's Long-Range plan.

**The Private Sector Role in Disability-Related Research**

"It is difficult to characterize the 'private sector' involvement in disability-related research. The private sector may mean a large, multi-national, multi-product, billion-dollar-a-year company like the Johnson & Johnson Corp., or it may mean a small, single-product firm like Amigo Sales Co., or possibly a private nonprofit organization such as the Cystic Fibrosis Foundation or Muscular Dystrophy Association. These diverse organizations provide a wide variety of products and services to disabled people. However, each is quite different from the others in terms of priorities, resources, and function. Manufacturers of health-related devices that specifically serve disabled people are frequently referred to as part of the medical device industry. In addition, there are thousands of agencies that derive their funds from charity or provide philanthropic services; these may be foundations, service organizations, funds, or associations. The medical device industry and charitable foundations and related organizations are both extremely diverse groups that exist to serve an equally diverse 'market'."

Technology and the Handicapped, OTA, 1982

More information on federally funded R&D efforts can be found in the publications listed in the Public Policy section of **FUNDING, MODELS, POLICY, STATISTICS**, page 261, in this Sourcebook "Research and Development," Chapter 6 of Technology and Handicapped People, Office of Technology Assessment (OTA), US Congress, 1982, provides a good overview of the process and players.

LOCATING R&D PROJECTS

AAAS Project on the Handicapped in Science. 1776 Massachusetts Avenue NW, Washington, DC 20036; 202/467-4496 (voice or TTY) The American Association for the Advancement of Science (AAAS) Project on the Handicapped in Science is beginning a new program, funded by the National Science Foundation, to bridge the gap between the researchers and developers of technologies and the disabled people who are potential users of the technologies. As a first step, the project will review completed and ongoing research and development work to aid handicapped persons. This will include identifying research projects funded by NSF and other federal agencies, searching scientific literature to locate other disability-related R&D projects, and organizing information from disabled user groups and individuals. The Project on the Handicapped in Science hopes to call attention to the field of disability research and to expand the benefits it offers to disabled individuals by more widely involving the scientific and engineering community in disability research, including disabled individuals in the R&D process, and increasing the public's awareness of these issues. The project will be directed by Martha Ross Redden and Virginia Stern.

Technology R&D Publications

Journal of Rehabilitation R&D, formerly the Bulletin of Prosthetics Research. Sheldon Todd, Ed. Address correspondence to Office of Technology Transfer (153D), 252 Seventh Avenue, New York, NY 10001. Quarterly journal on rehabilitation engineering research & development. One issue each year will be devoted to progress reports for all VA Rehab R&D projects, as well as reports from other Federal Agencies such as the National Institute on Handicapped Research, the National Institutes of Health, and from other domestic and foreign research scientists.

Rehabilitation Engineering Society of North America, Proceedings from the Annual Conferences on Rehabilitation Engineering. Available from RESNA, Suite 402, 4405 West Highway, Bethesda, MD 20814. The annual compilation of the scientific papers presented at the yearly rehabilitation technology conference.

Reports from the federally-funded projects listed in this section can be obtained from the individual centers, or from the National Rehabilitation Information Center (NARIC). See Information Resources, page 10.

Reports on international R&D projects can be obtained through projects such as UCIR, RIUSA, World Rehabilitation Fund, all listed under NIHR-supported projects.

**TOLL-FREE NUMBERS RELATED TO PRODUCTS FOR DISABLED PEOPLE**

800 telephone numbers are nothing new, but you might be surprised by how many companies have them. Expert advice on choosing or using a device may be only a call away. And because it's free, it's worth a try.

By dialing (800)555-1212, you can find out if a manufacturer has a toll-free number. Or if you want more than 35,000 toll-free numbers listed both by company and category, write to Toll-Free Digest, Box 800, Claverack, NY 12513 or call (800)447-4700 to order the 480-page book. It costs \$10.95 plus \$2 shipping.

Except where noted, use 800 number only outside the respective state

- |   |  |   |
|---|--|---|
| <b>A-BEC</b><br>Torrance, CA<br>800/421-2269<br>800/262-1331 in California                                | <b>Aquatherm Products Corp</b><br>Rahway NJ<br>800/526-4296              | <b>Borg Textile Corp</b><br>Chicago, IL<br>800/241-8992                                       |
| <b>Abest</b><br>see Newton, USA   | <b>Ascher Surgical Supplies, Inc</b><br>Philadelphia, PA<br>800/523-1300 | <b>EF Brewer Co</b><br>Menomonee Falls, WI<br>800/558-8777                                    |
| <b>Abbey Medical, Inc</b><br>Subsidiary American Hospital<br>Supply Corp<br>Hawthorne, CA<br>800/421-5186 | <b>B-D Drake Willock</b><br>Portland, OR<br>800/547-5534                 | <b>Briox Technologies, Inc</b><br>Worcester, MA<br>800/225-7496                               |
| <b>Abbott Laboratories</b><br>North Chicago, IL<br>800/942-9255<br>800/323-9067 in Illinois               | <b>B&amp;F Medical Products, Inc</b><br>Toledo, OH<br>800/537-3419       | <b>John Bunn Co.</b><br>Tonawanda, NY<br>800/828-7331   |
| <b>Active Aid</b><br>Redwood Falls, MN<br>800/533-5330  | <b>Ballert Orthopedic Corp</b><br>Chicago, IL<br>800/345-3456            | <b>The Burdick Corporation</b><br>Milton, WI<br>800/356-0701                                  |
| <b>Aeroceuticals Health Care<br/>Products</b><br>Southport, CT<br>800/243-9876                            | <b>Banyan International Corp</b><br>Abilene, TX<br>800/351-4530          | <b>Canyon Products</b><br>Simi Valley, CA<br>800/221-5499                                     |
| <b>Ajay</b><br>Delavan, WI<br>800/558-3276  | <b>Battle Creek Equipment Co</b><br>Battle Creek, MI<br>800/253-0854     | <b>Carrom Health Care Products</b><br>Maryland Heights, MO<br>800/325-4004                    |
| <b>Alimed, Inc</b><br>Boston, MA<br>800/225-0211  | <b>Be Mar Surgical Supply Co</b><br>Centerport, NY<br>800/645-5322       | <b>Cheesebrough Pond's Inc</b><br>Hospital Products Division<br>Greenwich, CT<br>800/245-5320 |
| <b>Allied Healthcare Products, Inc</b><br>Chemetron Medical Division<br>St. Louis, MO<br>800/325-3890     | <b>Bell-Horn</b><br>Philadelphia, PA<br>800/523-4518                     | <b>Cleo Living Aids</b><br>Cleveland, OH<br>800/321-0595                                      |
| <b>Alpha Unlimited</b><br>800/237-6836  | <b>Bio Clinic Co.</b><br>San Bernardino, CA<br>800/854-2369              | <b>Clinical Data Instruments, Inc</b><br>Brookline, MA<br>800/225-9180                        |
| <b>AMEREC Corporation</b><br>Bellevue/ WA<br>800/426-0858   | <b>Biomega Corp</b><br>Gainesville, FL<br>800/874-7878                   | <b>The Clinipad Corporation</b><br>Guilford, CT<br>800/243-6548                               |
| <b>American Health Sciences</b><br>Phoenix, AZ<br>800/528-0181  | <b>Biosearch Medical Products, Inc</b><br>Somerville, NJ<br>800/526-5976 | <b>Colson Equipment, Inc</b><br>Caruthersville, MO<br>800/325-4126                            |
| <b>Amigo Sales, Inc.</b><br>Bridgeport, MI<br>800/248-9130  | <b>Bioestim, Inc</b><br>Princeton, NJ<br>800/257-5184                    | <b>Conco Medical Co</b><br>Bridgeport, CT<br>800/243-2294                                     |
|   | <b>Otto Bock</b><br>Minneapolis, MN<br>800/328-4058                      | <b>Control Products</b><br>Stockton, CA<br>800/344-3288<br>800/892-3453 CA only               |

Except where noted, use 800 number only outside the respective state

Convacare, Inc.  
Raleigh, NC  
800/662-8735 NC only

Creative Rehabilitation  
Equipment  
Portland, OR  
800/547-4611

Crow River  
Wayzata, MN  
800/328-3632

Cryo-2  
Fort Pierce, FL  
800/327-0313

Cyborg Corp.  
Newton, MA  
800/343-4494

DMC Systems, Inc  
Temple Terrace, FL  
800/237-9023

Dale Medical Products  
by Baka Mfg. Co., Inc.  
Plainville, MA  
800/343-3980

Dart Medical, Inc  
Mason, MI  
800/248-9618  
800/292-3912 MI only

Desemo  
Savannah, GA  
800/342-7661

Detecto Scale Co  
Great Neck, NY  
800/845-6524

Dillon Manufacturing Co  
Norcross, GA  
800/241-7492

Dixie USA, Inc.  
Houston, TX  
800/231-6230

Don Joy Orthopedic  
Carlsbad, CA  
800/336-6569

Donley Battery Co  
Los Angeles, CA  
800/423-3934

DRIpride  
Div. of Weyerhaeuser Co  
Fremont, MI  
800/253-3078

Duro-Med Industries, Inc  
Hackensack, NJ  
800/526-4753

Dynamed Corp/ Dynarex Corp  
Elmsford, NY  
800/431-2786

Elmer's Weights, Inc  
Lubbock, TX  
800/858-4568

EMPI, Inc.  
Fridley, MN  
800/328-2536

EquipMed Corp.  
Lake Forest, IL  
800/323-9790

Erie Medical  
div. of Erie Mfg  
Milwaukee, WI  
800/558-3915

Flaghouse, Inc  
New York, NY  
800/221-5185

John B Flanerty Co  
Bronx, NY  
800/221-8742

Fox Medical Products  
Los Angeles, CA  
800/421-4210  
800/252-0500 CA only

Freeman Manufacturing Co  
Sturgis, MI  
800/253-2091  
800/632-2015 MI only

Fronock-Stewart, Inc  
Northboro, MA  
800/243-6059

G-MBRO, Inc  
Barrington, IL  
800/323-4156

Gaymar Industries, Inc  
Orchard Park, NY  
800/828-7341

Genac Incorporated  
see Theradyne

Gendron, Inc  
Archbold, OH  
800/537-2521

George Clove Co. Inc  
Englewood, NJ  
800/631-4292

Gottfried Medical, Inc  
Toledo, OH  
800/537-1968

Graham-Field Surgical Co, Inc  
New Hyde Park, NY  
800/645-8176

Grant Airmass Corp  
Stamford, CT  
800/243-5237

John F. Greer Corp  
Oakland, CA  
800/227-0992

Gresham Driving Aids, Inc  
Wixom, MI  
800/521-8930

Hard Mfg Co  
Buffalo, NY  
800/828-7148

Dave Harrison Products, Inc  
Bowie, TX  
800/433-0918  
800/772-0845 TX only

Harvy Surgical Supply Corp  
Flushing, NY  
800/221-0142

Hausmann Industries, Inc  
Northvale, NJ  
800/526-0289

Heelbo, Inc  
Niles, IL  
800/323-5444

Her-Mar Inc  
Miami Beach, FL  
800/327-8209

Humane Restraint Co., Inc  
Madison, WI  
800/356-7472

Humanicare International, Inc  
East Brunswick, NJ  
800/631-6270

The Huntleigh Group, Inc  
New York, NY  
800/223-1218

The Independence Chair Co., Inc  
Waukesha, WI  
800/558-2151

inmed Corp  
Norcross, GA  
800/241-1926

Intec Medical, Inc  
Blue Springs, MO  
800/821-8598

Intermed Inc  
Sparta, NJ  
800/631-3689

Invacare Corporation  
Elyria, OH  
800/321-5715  
800/362-7415 Ohio only

Jefferson Industries, Inc.  
Princeton, NJ  
800/257-5145

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Johnson & Johnson Products, Inc  
Patient Care Division  
New Brunswick, NJ  
800/526-2459

Jordan Plastics Corporation  
PLASTA-MEDIC  
Carson, CA  
800/421-5536

LaJolla Technology, Inc  
San Diego, CA  
800/854-1915

Labtron Scientific Corporation  
Hauppauge, NY  
800/645-9066

Lattoflex International  
Hudson, NY  
800/341-1522

Lec Tec Corp  
Eden Prairie, MN  
800/328-6276

Leisure Lift Chairs  
Kansas City, KS  
800/255-4147

Lifeline Systems  
Massachusetts  
800/343-4632

Lossing Orthopedic  
Minneapolis, MN  
800/328-5216

Lotus Health Care Products  
Naugatuck, CT  
800/243-2362

Lumex  
Bay Shore, NY  
800/645-5272

The Lumiscope Co., Inc  
Edison, NJ  
800/221-5746  
800/221-5747

MGI Strength/Fitness Systems Inc  
Independence, MO  
800/821-3126

Maclaren  
New York  
800/233-1224

MacLevy Products Corp  
Elmhurst, NY  
800/221-0277

Mada Medical Products, Inc  
Carlstadt, NJ  
800/526-6370

Marathon Medical Equipment  
Denver, CO  
800/525-0654

Marcy Fitness Products  
Alhambra, CA  
800/423-3920

Mark One Healthcare Products, Inc  
a member of the Seton Group  
Philadelphia, PA  
800/523-3660

Medela, Inc  
Crystal Lake, IL  
800/435-8316

MEDFURN Systems  
Flushing, NY  
800/847-4018

Medi Inc  
Holbrook, 12640, 30590, MA  
800/225-8634

Medical Devices, Inc  
St Paul, MN  
800/328-0875

Medical Devices International  
Corp  
Waukegan, IL  
800/323-9035

Medical Specifics  
Dallas, TX  
800/448-4511 x 304  
800/962-1480 x 304 NY only

Medpro, Inc  
East Brunswick, NJ  
800/526-0988 x 121

Medtek Corporation  
Princeton, NJ  
800/257-5103

Medtronic Neuro Division  
Minneapolis, MN  
800/328-0810

Minnetonka, Inc  
Minnetonka, MN  
800/328-5927  
800/328-5926

Mistogen Equipment Co  
Oakland, CA  
800/227-0525

Mobility Plus  
Santa Paula, CA  
800/325-7397

Mobilizer Medical Products  
Mount Vernon, NY  
800/431-1720

Mor-Loc Corporation  
Claremont, NC  
800/438-9201

Motion Designs  
Clovis, CA  
800/888-2827  
800/888-2837

Mountain Medical Equipment, Inc  
Littleton, CO  
800/525-8950

Mulholland  
see Mobility Plus

John Nageldinger & Son, Inc.  
Westbury, NY  
800/645-3496

NARCO Scientific, Air Shields  
Division  
Hatboro, PA  
800/523-5756

National Wheel-O-Vator, Inc  
Patterson, LA  
800/551-9095

Neuromedics, Inc.  
Clute, TX  
800/231-2330  
800/392-3726 TX only

Newton, USA  
Rochester, NY  
800/828-6284

Nissen Corp  
Cedar Rapids, IA  
800/553-7901

OTC Professional Appliances  
Cincinnati, OH  
800/543-0458

Orthion Corporation  
Costa Mesa, CA  
800/854-6900

Ortho-Med, Inc  
Portland, OR  
800/547-5571

Otto Bock  
Minneapolis, MN  
800/328-4058

OWL Biomedical  
Charlotte, NC  
800/828-1186

Oxygen Enrichment Company, Ltd.  
Schenectady, NY  
800/833-4751

PCP-Champion  
Ripley, OH  
800/543-0458

Palmer Industries  
Endicott, NY  
800/847-1304

Parke Davis & Co  
Med/Surg Division  
see Professional Medical  
Products



Except where noted, use 800 number only outside the respective state.

Parker Laboratories, Inc Orange, NJ 800/631-8888	Salton Inc Bronx, NY 800/221-8794	Theradyne Corporation Lakeville, MN 800/328-4014
Polychem Corporation New Haven, CT 800/243-3093	Schuco div American Caduceus Industries Williston Park, NJ 800/645-2500	Thompson-Blair St Louis, MO 800/325-0877
J.T. Posey Co Arcadia, CA 800/423-4292	Science Products (formerly Science for the Blind Products) Southeastern, PA 800/233-3121 800/222-2148 (PA only)	Timeter Instrument Corp Lancaster, PA 800/233-0258
Posture Support Mfg. Inc Salton, OH 800/321-6870	Sci-o-Tech Lancaster, PA 800/233-0291	Toce Brothers Mfg., Ltd Eroussard, LA 800/842-8158
J.A. Preston Co Clifton, NJ 800/631-7277 800/221-2425	Shugarman Surgical Supply Toledo, OH 800/537-8918	Tubular Fabricators Industry, Inc Passaic, NJ 800/526-0178
The Procter & Gamble Co Cincinnati, OH 800/543-0400 800/582-0313 OH only	Sickroom Service, Inc Milwaukee, WI 800/558-7130	Ulster Scientific, Inc Highland, NY 800/431-8233
Professional Medical Products, Inc Greenwood, SC 800/845-4560	Skill Development Equipment Co Anaheim, CA 800/854-6085	Uni-Patch, Inc Wabasha MN 800/328-9454
Pryor Products Solana Beach, CA 800/854-2280	Smith & Davis Mfg Co St Louis, MO 800/325-9512	Union Carbide Medical Products & Distribution Center Memphis, TN 800/238-5055
PyMaH Corp Somerville, NJ 800/526-3538	Solo see Mobility Plus	Urocure Products, Inc South El Monte, CA 800/423-4441
Quadra Westwood, CT 800/824-1068	Spenco Medical Corp Waco, TX 800/433-3334	Vacumed, Inc Ventura, CA 800/235-5000
Renal Systems, Inc Minneapolis, MN 800/328-3324	St Louis Ostomy & Medical Supply St Louis, MO 800/325-0979	Veratex Corporation Troy, MI 800/521-2470
Respironics, Inc Monroeville, PA 800/245-2767	Stand Aid of Iowa, Inc Sheldon, IA 800/831-8580	Vix Breathing Equipment Jamestown, CA 209/984-5212 collect
Rockford Medical & Safety Co Rockford, IL 800/435-9451 800/892-9435 IL only	Stadynamics, Inc Longmont, CO 800/525-2114	Western Enterprises Avon Lake, OH 800/321-4148
KOHO Research & Development, Inc East St Louis, IL 800/851-3449	Stryker Corp Kalamazoo, MI 800/253-3210	Whitestone Products Piscataway, NJ 800/526-3567
Rolyan Medical Products Menomonee Falls, WI 800/558-8633	Sween Corp Lake Crystal, MN 800/533-0464	Wright & Filippis, Inc Drayton Plains, MI 800/482-0222 MI only
Murray Salk, Inc. Allston, MA 800/343-4497	Temco Healthcare Industries, Inc Passaic, NJ 800/831-0170	
Salter Labs Arvin, CA 800/235-4203	Texas Instruments	

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**The National Health Information Clearinghouse** publication "Healthfinder" lists toll-free numbers for health information. Some of the numbers which may be relevant to products for disabled people include

**Alzheimer's Disease and Related Disorders Assn**  
800/621-0379  
800/572-6037 IL only

**Cancer Information Service (CIS)**  
800/4-CANCER

**Children's Defense Fund**  
800/424-9602  
202/483-1470 Washington, DC only

**Shriners Hospital Referral Line**  
800/237-5055  
800/282-9161 FL only

**National Down Syndrome Society Hotline**  
800/221-4602  
212/764-3070 NY only

**Epilepsy Information Line**  
800/426-0660  
206/323-8174 WA only

**Library of Congress National Library Services for the Blind and Physically Handicapped**  
800/424-8567  
202/287-5100 Washington, DC only

**National Health Information Clearinghouse**  
800/336-4797  
Provides an information and referral service designed to bring together consumers and health information resources. A service of the Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services

**National Hearing Aid Hotline**  
800/521-5247  
313/478-2610 MI only  
Provides information on hearing aids and distributes a directory of hearing aid specialists certified by the National Hearing Aid Society

**Hill-Burton Hospital Free Care Program**  
800/638-0742  
800/492-0359 MD only  
Provides information on hospitals participating in the Hill-Burton Hospital Free Care Program.

**Federal Internal Revenue Service for TDD Users**  
800/428-4732  
800/382-4059 IN only  
Answers questions on Federal income tax, including questions on medical deductions for the cost of telecommunications devices for the deaf (TDDs), hearing aids, trained hearing-ear dogs, and sending deaf children to special schools. Accepts orders for the free publication "Tax Information for Handicapped and Disabled Individuals" and other free IRS publications

**Medicare/Medicaid Complaint Line**  
800/368-5779  
202/472-4222 Washington, DC area  
Handles complaints regarding the fraud, waste and abuse of Medicare and Medicaid. Assists people who have been overbilled for services or billed for services not rendered

**Practitioner Reporting System**  
800/638-6725  
Offers a service for health professionals to report problems with drugs or medical devices. A service of the Food and Drug Administration, U.S. Department of Health and Human Services.

**Consumer Product Safety Commission**  
800/638-CPSC  
Answers questions and provides free material on different aspects of consumer product safety, including product hazards, product defects, and injuries sustained as a result of using products

**Spina Bifida Information and Referral**  
800/621-3141



CONSUMER PROTECTION

BUYER BEWARE -- SHOPPING FOR ADAPTIVE DEVICES

"Technology advances in recent years have created a multitude of aids for disabled people -- aids that have opened up doors of employment and independence. But these aids are expensive, and sometimes have 'bugs' which have not been ferreted out. Individuals and agency representatives need to exercise caution when purchasing expensive, new equipment.

**Will It Solve the Problem?** "Before deciding on a particular device, make sure it will solve the problem. Identify the tasks the equipment will solve and then thoroughly question vendors to assure that their device can handle those tasks....

**...Get Promises in Writing** "Before committing several thousand dollars to a particular vendor, insist on a demonstration. Do not buy a piece of equipment based on a brochure. If an aid appears suitable, but a demonstration isn't possible, make sure the device can be returned with a full refund. Any reputable vendor will agree to this, but get the agreement in writing. A verbal promise of a device's reliability and capabilities, or the vendor's responsibilities, is no promise. Always save correspondence, letters of agreement and technical information.

**Service and Reliability** "When considering any device, check it out for service and reliability. Ask to talk to satisfied customers using the equipment in a similar application. If a vendor is unwilling to supply customer references, there may be a good (or bad) reason. Find out the cost of a yearly service contract versus the cost of a typical repair bill for the aid. What is the turnaround time for service? If there is not good, timely service available, reconsider the device, particularly if it's needed every day for a job.

**Solving Interface Problems** "Find out what kind of technical support is available for solving interface problems. Interface problems are the most important issues in the effective use of braille and audio terminals. Make sure that support is available from the vendor, your company or an outside organization.

**Proper Training** "Finally, when considering a complex device, find out what training is available and how much it costs. To purchase a device like an electronic braille system, or an audio terminal, without training will usually prove disappointing because of the struggles to learn how to use it. Besides the vendor's technical support, if available, look to user groups; they can be a great source of help when problems arise or new applications are uncovered.

from "Sensory Aids Technology Update", January, 1984. Published by the Sensory Aids Foundation, 399 Sheridan, Palo Alto, CA.

STEPS TO FOLLOW IF YOU HAVE PROBLEMS WITH YOUR ASSISTIVE DEVICE

"Read the instructions and your warranty carefully. If you have not received a copy of a warranty with your device, write to the manufacturer or seller and ask if your device is warranted. Be sure that you don't expect features or performance your device isn't designed to give or expect warranty coverage that was never promised.

"Contact the warrantor. The seller may not be the warrantor. Write or call the company at the address given in the warranty. Describe your problem and explain exactly what you think the company owes you under the warranty -- repair, refund, or replacement. When you call a company, send a follow-up letter to put in writing what was said. Send all letters by certified mail and keep copies. But remember having a warranty doesn't mean you automatically get your money back. If a product is defective, the company is entitled to try to fix it.

"If the company is not helpful, contact a state or local consumer protection office or complaint center. At present, agencies handling problems of the disabled are not accustomed to giving warranty information or resolving warranty problems, but your state consumer protection office or complaint handling center routinely helps people solve warranty problems and gives warranty information.

"If contacting a consumer protection office doesn't resolve the problem and the amount of money involved is small, you can go to a small claims court. The costs are low, procedures are simple, and lawyers are usually not needed. The clerk of the small claims court can tell you how to bring your lawsuit.

"If your device has a written warranty and was manufactured after July 4, 1975, you may want to sue the company under the Warranty Act. You should contact a lawyer or consumer protection office for information. If you win, you can get money damages or any other type of relief the courts choose to give you. This includes the cost of bringing the lawsuit and your attorney's fees. If your device was manufactured before July 4, 1975, you can only sue the company under state law. In California, all assistive devices come with a written warranty which enables you to sue under state and federal law.

"Report violations of the law to the Federal Trade Commission, Warranties, Washington, DC 20580. The FTC cannot help you directly with a warranty problem, but it needs to know if companies are obeying the warranty law. Write the FTC if a company does not make warranty information available, does not label the warranty as required, or does not perform service as promised. While the FTC does not handle individual cases, it does look into business practices which affect many consumers."

from "Warranties Can Save You Time and Money," by Jacqueline Schmitt, Federal Trade Commission. Reprinted with permission from the Spring, 1981 issue of Accent on Living.

**PUBLICATIONS WHICH PROVIDE AN OVERVIEW OF TECHNOLOGY FOR DISABLED PEOPLE**

Some publications cover a broad spectrum of technology applications. To avoid listing these books over and over in each section of the Resource Guide, this general book list is included for your use.

**DISABILITY BOOKS WHICH HAVE USEFUL INFORMATION ON DEVICES**

Disability and Rehabilitation Handbook, Robert M Goldenson, editor. McGraw-Hill Book Company 1221 Avenue of the Americas, New York, NY 10020 846 pages \$27.50 1978. The book is organized in four parts. Part I, Foundations of Rehabilitation, explores the practical approaches to aiding the disabled, such as the role of the family, the development of social and sexual relationships, arrangements for independent living, housing and transportation adaptations, employment possibilities, educational and recreational programs, legal rights, and financial assistance. Part II, Disabling Disorders, covers all the major handicapping diseases and defects. Part 3 comprises Illustrative Cases. Part 4 is the Data Bank, an extensive compilation of statistics, names and addresses of relevant national organizations, federal agencies and programs, periodicals and directories, and major sources of information and supplies. Chapter 5, "Independent Living Ways and Means," describes the broad range of devices available, within the context of independent living.

Disabled? Yes. Defeated? No. K. Cruzic. Prentice-Hall, Englewood Cliffs, NY 07632 211 pages 1992. Contains information resources for disabled persons, their families, and therapists. Chapters discuss daily living aids, clothing, housekeeping, and cooking, as well as educational programs, recreation, finances, careers, and community services.

Resource Guide to Literature on Barrier-Free Environments with Selected Annotations 1980. Prepared by Architectural and Transportation Barriers Compliance Board, Washington, DC 20202 (A&TBCB) 79-00004. Available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402 279 pages. Lists access information for schools, parks and recreation, transportation and housing. Also contains a section on Aids and Devices.

The Source Book for the Disabled: An Illustrated Guide for Easier and More Independent Living for Physically Disabled People, Their Families, and Friends, Glorvya Hale, Ed. Paddington Press, 95 Madison Avenue, New York, NY 10016 288 pages, illustrations \$15.95 cloth, \$14.95 paper 1979. Consumer-oriented, comprehensive guide to independent living. Includes discussions of equipment, accessibility, home adaptations, personal care, leisure, recreation, sexuality, and disabled parenting.

**SELECTED PUBLICATIONS SPECIFICALLY ON TECHNOLOGY**

Aids to Independent Living: Self-Help for the Handicapped, Edward Lowman and Judith L. Klinger. McGraw-Hill, 330 42nd Street, New York, NY 10036

796 pages, many illust., bibliography \$41.00  
Out of print, but available in rehab departments

Aids to Make You Able: Self-Help Devices and Ideas for the Disabled, Wendy M. Davis Beaufort Brooks, 9 E 40th Street, New York, NY 10016 81 pages \$8.95 1981. The occupational therapist who compiled this book compares assistive devices to recipes: "You learn a few basic ones, invent your own, and try those of other people." Her informative book presents self-care aids to help disabled people resume activities of daily living and encourages others to invent new equipment. Illustrated with simple drawings, the aids are grouped into nine categories: communication, eating and drinking, dressing, bathroom aids, household aids, transportation, leisure and pleasure, sexuality, and smoking. A concluding section contains sources for additional information on specific topics, a bibliography, and addresses of medical suppliers.

The Best of Helpful Hints, Courage Center Auxiliary. Courage Center, 3915 Golden Valley Road, Golden Valley, MN 55422 86 pages \$3.50

An Easier Way Handbook for the Elderly and Handicapped, Jean Vieth Sargent. Iowa State University Press, Ames, IA 50010 220 pages \$10.50 1981. Simple equipment that can be readily made or bought to help meet daily living needs.

Equipment for the Disabled. National Fund for Research into Crippling Diseases, 2 Foredown Drive, Postslade, Brighton, England 1973-1980. 10-booklet series which provides guidelines to help in the selection of equipment. "Personal Care," "Home Management," "Disabled Mother," "Clothing and Dressing for Adults," "Housing and Furniture," "Hoists and Walking Aids," "Wheelchairs," "Outdoor Transport," "Communication," "Leisure and Gardening," and "Disabled Child." Pictures of commercially available and do-it-yourself aids.

Functional Aids for the Multiply Handicapped J.P. Robinault, Editor. Harper & Row, Hagerstown, MD. Prepared under the auspices of the United Cerebral Palsy Associations, Inc., this book discusses where to buy or how to construct items that would enable a multiply handicapped person to function more independently. Aids are classified according to function: transfer, travel and mobility, personal care, including feeding and eating equipment, clothing and dressing aids, and personal hygiene aids, communication and learning, and recreation. Includes a list of resources for aids and information.

A Handbook of Ideas for the Disabled: Ideas and Inventions for Easier Living, Suzanne Lunt. Charles Scribner's Sons, New York, NY 276 pages \$17.95. This handbook has hundreds of devices and ideas to make life easier and more active. You'll find directions for simple homemade aids as well.

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as information on equipment available on the market; devices that help you sit up, get out of bed, dress, walk, handle household chores, travel, cook -- do anything more easily than you thought possible. Written by a layperson for the general reader, the book's aim is to tell you what is available rather than persuade you to buy anything. The final section of the book helps you deal with the cost of equipment and medical help. You'll find suggestions and the names of organizations that will help you obtain jobs, government money, home care, tax breaks, and other assistance. The appendix, "Sources of Equipment and Information," provides a complete directory of the suppliers mentioned throughout the book and helpful organizations. This book was inspired by the needs of the author's terminally ill mother, who was nursed at home, and the information's practicality reflects that fact.

Helping the Handicapped: A Guide to Aids Developed by the Telephone Pioneers of America Telephone Pioneers of America, 195 Broadway, New York, NY. For availability, call your local phone company in the US or Canada for the name of the local chapter administrator.

This book probably represents only a small percentage of the devices that the Pioneer group has developed. These are the ones that were documented.

Groups of Pioneer volunteers serve the people of their communities in innumerable ways, but this book is dedicated to the hundreds of Pioneers and Future Pioneers who have used their ingenuity, their know-how, and countless hours of volunteer time to develop and build aids to help their handicapped neighbors.

This handbook is not a catalog of aids and devices for sale. In many cases the items described are available only in the area where the chapter listed under "CONTACT" operates. However, "how to make it" information (drawings, diagrams, parts lists, etc.) is available from these chapters. We suggest that anyone who needs a particular device shown in the book contact first the Administrator of the local Pioneer chapter to inquire whether one can be made available locally. A list of headquarters locations of each chapter, by state, is included. The Administrator can be reached by calling the telephone company headquarters in the city indicated and asking for the chapter by name.

With a few exceptions, the amount shown under the "COST" heading is not a selling price. It is the approximate cost of the materials required to build the device. Most aids built by Telephone Pioneers are donated to local schools, hospitals or agencies which serve handicapped people.

Technology for Independent Living: Proceedings of the 1980 Workshops on Science and Technology for the Handicapped, Virginia Stern and Martha Redden, editors. American Association for the Advancement of Science, 1776 Massachusetts Ave NW, Washington, DC 20036. 262 pages. 1982.

Technology for Independent Living II: Issues in Technology for Daily Living, Education and Employment. Project on the Handicapped in Science

Virginia Stern and Martha Redden, editors. American Association for the Advancement of Science, 1776 Massachusetts Avenue NW Washington DC 20036 1983

PRODUCT DIRECTORIES

Accent on Living Buyer's Guide, (1984-85 ed) Accent Special Publications, P.O. Box 700, Bloomington, IL 61701 1983. Manufacturers and distributors of equipment listed by category, as well as addresses of national organizations and associations concerned with disabilities. Published annually.

Catalog of Aids for the Disabled Nancy Kreisler and Jack Kreisler. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020. 246 pages. \$24.95. 1982. Over 600 separate pieces of equipment are described in this text, listing the latest in equipment needs from the kitchen to your automobile, from children to adults, for all manner of disabilities. Each equipment entry includes a photograph if deemed necessary, a brief description, a price category, and the name of a supplier; the appendix then lists the addresses of all suppliers, addresses of helpful organizations, and periodicals that might be useful.

Design for Accessibility: Equipment and Aids Catalog (The 1979 edition was Barrier Free Design: Equipment and Aids Catalog) Michigan Center for a Barrier Free Environment, West Bloomfield, MI 48321. Guide to equipment and aids available to help create a barrier-free environment. Includes standing aids, aids for the blind, auto or van adaptations, building equipment, doors, floor surfaces, kitchen and laundry, plumbing accessories, windows, and other special equipment. This is not a commercial catalog, you can't buy things from it.

Product Inventory of Hardware, Equipment and Appliances for Barrier Free Housing Design National Handicap Housing Institute, Inc., 12 S 6th Street, Suite 1216, Minneapolis, MN 55402. \$25.00. 1979. Catalog with 418 pages provides descriptive summaries, prices and pictures of approximately 200 products. It includes products in general use as well as those specifically designed for disabled persons.

NOTE: The Green Pages, and Rehabilitation Purchasing Guide (RPG) which replaced it, are no longer being produced.

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A DIFFERENT APPROACH TO ASSISTIVE DEVICES

The Comfortably Yours catalog isn't your typical rehab products catalog. It distributes "Aids for Easier Living" and does not specifically focus on the handicapped/health care audience. It's a mass market catalog for "just folks." About half the products are clever convenience products. The other half are the kinds of things we'd expect to see in a clinical catalog -- bathtub benches, tub safety bars, reachers, an adult bib, eating aids, etc.

What makes this catalog fun to read is how the products are described. It's hard to remember that there is a difference between the "rehab" products, and all the other gadgets that their copy writer has you so eager to buy (is there really a difference?) I personally find the catalog somewhat dangerous -- I have to exert real self-control not to buy something from almost every page.

We can all learn from the catalog's marketing approach. It could teach us how to talk about technology for people with physical limitations in a way that doesn't intimidate or alienate the people who need them. It provides a way for people to think about their equipment as "aids for easier living" rather than stigmatizing signs of being "crippled" or weak.

Comfortably Yours, Aids for Easier Living, 52 West Hunter Avenue, Maywood, NJ 07607, 201/368-0400

Some examples of the Comfortably Yours' product descriptions.

"How many times in the middle of the night do you have to put the light on? You fumble under the shade for the switch, hoping you won't knock something over, turn on the light -- and blind yourself! This lamp dimmer is actually for any room, but I want you to put it by the bed. It glows in the dark. All you do is open one eye just a little bit, push down on the glowing knob, and the light is on -- as soft as you like. This is great, too, for a sick room, for children, or for anyone who has trouble moving about and can't turn knobs. UL listed. 6 foot cord.

"A few years ago my mother stopped using fitted sheets, even though she preferred them, because her arthritic hands hurt whenever she pulled at the tight corners. We found these cotton terry sheets in Europe and brought them back for her. She was thrilled. They have fitted elasticized corners and, because the terry material has a natural stretch, there is no strain when putting them on the bed. These long wearing quality sheets absorb perspiration, feel comfortable year round, and machine wash and dry beautifully. Available in champagne and blue, please specify color. PS Mom, who wastes nothing, now uses her old flat bottom sheets as top sheets.

"Being able to take care of yourself by yourself is a wonderful thing -- especially when it comes to bathing and personal hygiene. The new open-front design of this chair allows you to cleanse more effectively and independently. You can reach more areas, even while seated. The open design also allows you to place your foot directly behind you as you get in and out of the bath, giving you an extra measure of safety. The molded seat is contoured for comfort and the legs adjust in height easily by push button from 14 1/2" to 22" and have non-slip rubber tips. The chair is corrosion resistant and is also available without a back. A special chair for special needs with features well worth the cost.

We received this good-looking eating smock in the mail recently. The lady who sent it to us says she designed it for her father who needs it to protect his clothing while eating but wouldn't dream of wearing a bib. She chose this up-to-date blue denim fabric and styled it so that it goes on easily and stays on securely with ties in the back. He accepted it so readily that she felt others might prefer it too. The terry front has a water-proof backing and a generous pocket across the front to catch food crumbs. It measures 21 1/2" across the front and is machine washable and dryable. One size fits all.

SOURCES OF CURRENT INFORMATION

Trade and consumer magazines offer one of the most timely means for learning about new equipment availability. Scanning periodicals on a regular basis can be an effective means to acquire product information and remain generally aware of equipment and service availability.

Each of the periodicals listed below regularly features a section devoted to new products/ideas. Each item entry in the periodical generally includes a description and picture of the device.

Accent on Living  
 "New Products and Services"  
 Cheever Publishing Company  
 Gillum and High Drive  
 P.O. Box 700  
 Bloomington, IL 61701

Communication Outlook  
 "News on Aids"  
 Artificial Language Laboratory  
 Computer Science Department  
 Michigan State University  
 East Lansing, MI 48824

The Coordinator  
 "New Products"  
 Coordinator Publications, Inc.  
 11417 Vanowen Street  
 North Hollywood, CA 91605

Homecare/Rehab Product New  
 Miramar Publishing Company  
 2048 Corner Avenue  
 Los Angeles, CA 90025

ICTA Inform  
 "Technical Aids"  
 Swedish Institute for the Handicapped  
 Box 303  
 S-161 26 BROMMA  
 Sweden

Medical Device & Diagnostic Industry  
 "New Products"  
 Canon Communications, Inc.  
 2422 Wilshire Blvd  
 Santa Monica, CA 90403

Paraplegia News  
 "Innovations"  
 5201 N. 19th Avenue, Suite 111  
 Phoenix, AZ 85015

Rehabilitation Digest  
 "Let's Get Technical"  
 Canadian Rehabilitation Council for the Disabled  
 One Young Street, Suite 2110  
 Toronto, Ontario M5E 1E5  
 Canada

Rehabilitation Literature  
 "New Products"  
 National Easter Seal Society  
 2023 W. Ogden Avenue  
 Chicago, IL 60612

Rehabilitation Technology Review  
 "Left To Our Own Devices"  
 Rehabilitation Engineering Society of North America  
 Suite 402  
 4405 East-West Highway  
 Bethesda, MD 20814

RX Home Care  
 "Product Gallery"  
 "Equipment Spotlight"  
 Barrington Publications, Inc.  
 825 S Barrington Avenue  
 Los Angeles, CA 90049

Sports 'N' Spokes  
 "Nifty New Stuff"  
 5201 N. 19th Avenue, Suite 111  
 Phoenix, AZ 85015

These journals also periodically have technology-related information.

Bulletins on Science and Technology for the Handicapped  
 American Association for the Advancement of Science  
 Office of Opportunities in Science  
 1776 Massachusetts Avenue NW  
 Washington, DC 20036  
 No subscription charge  
 Quarterly

Journal of the Association of the Severely Handicapped  
 The Association for the Severely Handicapped  
 7010 Roosevelt Way, NE  
 Seattle, WA 98115

Rehab Brief  
 National Institute of Handicapped Research  
 Office of Special Education and Rehab Services  
 Department of Education  
 Washington, DC 20201

Rehabilitation Gazette  
 Gazette International Networking Institute  
 4502 Maryland Avenue  
 St. Louis, MO 63108  
 Annual  
 Back issues, \$8 each  
 Volume 25, \$10

Rehabilitation Literature  
 National Easter Seal Society  
 2023 W. Ogden Avenue  
 Chicago, IL 60612  
 Bi-monthly \$21

Two of the six issues in 1983 were technology related "Technology & Disability," March-April 1983 (44, 3-4) and "Technology & Disability II," November-December 1983 (44, 11-12)

Rehabilitation World  
 Rehabilitation International USA  
 1123 Broadway  
 New York, NY 10010



Report and Access Information Bulletin  
 National Center for a Barrier Free Environment  
 1140 Connecticut Avenue NW  
 Suite 1006  
 Washington, DC 20036  
 Subscription \$25.00/year  
 Bimonthly

**AUDIOVISUALS**

Approach to Independence Functional Adaptations, James Mueller Available from Rehabilitation Research and Training Center, The George Washington University, 2300 Eye Street NW, Suite 714, Washington, DC 20037 3/4" color videocassette, 33 minutes. 1978 Illustrates simple solutions to functional problems of the severely disabled that can be found through imaginative adaptations of common materials and products

Assistive Devices for the Rehabilitation Patient Rehabilitation Institute of Chicago, Education and Training Center, 345 East Superior St., Chicago, IL 60611 Videotape, 30 minutes Presentation discusses and demonstrates common adaptive equipment used in dressing, feeding, grooming, avocation, and wheelchairs, as well as the carry-over of the use of adapted devices from a rehabilitation setting to an acute setting

Devices for Self-Help Performance Bureau of Education for the Handicapped Available from National Audiovisual Center, National Archives and Records Service, General Services Administration, Order Section/RT, Washington, DC 20409 16mm color film, 18 minutes Illustrates the problems of persons with multiple physical handicaps and demonstrates supportive devices for task performance Includes moving from place to place, sitting, standing, writing, turning pages, communicating and eating

It's A New Day, Fern Field South Bay Mayors' Committee for Employment of the Handicapped, 2409 N Sepulveda Blvd #202, Manhattan Beach, CA 90266 16 mm color film, 9 minutes 1981 Celebration of new attitudes and new technologies available to disabled people to increase their integration into the mainstream of life Shows braille menu, elevating wheelchair, talking calculator, Opticon, and so on

One Giant Step, Michael McFarland Canadian Rehabilitation Council for the Disabled, Suite 2110, One Young Street, Toronto, Ontario M5E 1E5, Canada 16 mm color film, 40 minutes 1981 Demonstrates the range of technical aids available, from environmental control systems to communications aids, showing how they can be used in various settings to increase independence and mobility of disabled people First Prize, Technical Aids, 1981 International Rehabilitation Film Festival.

To Find Answers United States Social Rehabilitation Services Available from National Audiovisual Center, National Archives and Records Service, General Services Administration Order Section/RT, Washington, DC 20409 16 mm color film, 29 minutes Discusses research for the handicapped Demonstrates several devices to

illustrate how science is improving life for the disabled

**NATIONAL ORGANIZATIONS**

These groups can provide more information on technical aids, write for their publication lists

Muscular Dystrophy Association  
 810 Seventh Avenue  
 New York, NY 10019

National Easter Seal Society for Crippled Children and Adults  
 2023 W Ogden Avenue  
 Chicago, IL 60612

Easter Seals produces several excellent publication bibliographies on all phases of rehabilitation

United Cerebral Palsy Association  
 66 E 34th Street  
 New York, NY 10016  
 212/481-6300

Sister Kenny Institute  
 Division of Abbott-Northwestern Hospital  
 800 E 28th at Chicago Avenue  
 Minneapolis, MN 55407  
 612/874-4149

Publishes a variety of materials for the disabled Books about aids and equipment include Communication Aids for the Brain Damaged Adult, Introduction to Bowel and Bladder Care, Living Comfortably with Your Ileostomy, and Wheelchair Selection More Than Choosing a Chair with Wheels. "Equipment" and "Some Adaptive Devices" are audio-visuals available from the Institute.

DISABILITY SPECIFIC PUBLICATIONS

Many books written about specific disabilities have chapters and/or extensive references to technical aids. Some examples include

**ARTHRITIS**

Aids and Adaptations (2nd Edition) K.P. MacBain, editor. The Canadian Arthritis and Rheumatism Society, 1976. Describes items which have been used successfully by patients in an occupational therapy department. Part I contains drawings and instructions for self-help aids, Part II covers environmental adaptations. Bathing, toileting, homemaking and ambulation or transfer are emphasized.

Rheumatic Disease: Occupational Therapy & Rehabilitation. Chapter 27: "Assistive Devices" Second edition. J Melvin, editor. FA Davis Co., Philadelphia, PA.

"Self-Help Manual for Patients With Arthritis" Prepared by the Arthritis Health Professions, Section of the Arthritis Foundation, 1315 Spring Street NW, Atlanta, GA 30309. May be obtained from local chapters of the Foundation. 1980

**CEREBRAL PALSY**

Functional Aids for the Multiply Handicapped Isabel P. Robinault, Editor. Medical Department, Harper & Row Publishers, Hagerstown, MD 1973. \$3.50 paperbound edition printed for and available only through: United Cerebral Palsy Association, Inc., 66 East 34th Street, New York, NY 10016. A revised second edition is to be available soon.

Handling the Young Cerebral Palsied Children at Home N.R. Finnie. EP Dutton, New York, NY \$5.95 1975. This book is a classic. It provides information on home management of children with cerebral palsy for parents, teachers and therapists. Contains suggestions on do-it-yourself devices as well as commercially available equipment, particularly mobility aids. Also includes lists of resources for equipment and accessories.

Resource Guide to Habilitative Techniques and Aids for Cerebral Palsied Persons of All Ages E.C. High. George Washington University, Job Development Laboratory, Washington, DC (NARIC Call No 0102) 1977. Contains resources for aids, equipment, techniques and programs to help people with cerebral palsy. Lists print and nonprint material about cerebral palsy. The guide is divided into sections covering general information, positioning and seating, feeding, dressing, hygiene, and household and community involvement. Lists suppliers of aids and equipment, and publishers. Illustrated.

Treatment of Cerebral Palsy and Motor Delay, Second Edition. Sophie Levitt. Blackwell Scientific Publications, Ltd., 52 Beacon Street, Boston, MA 02108. \$21.95. A practical and comprehensive guide on the handling, understanding, and treatment of the cerebral palsied child and the child with developmental motor delay. Methods of treatment are suggested, but special emphasis

is given to the underlying principles involved. The second edition has been widely revised, with new material added on the visually handicapped child, behavioral therapy for movement, the development of play, feeding techniques, the clumsy child, and equipment.

**DISABLED CHILDREN**

Aids for Children International Committee on Technical Aids, Housing and Transportation (ICTA), Information Centre, S-161 03, Bromma 3, Sweden 1972. An international catalog of children's assistive devices.

Caring for Your Disabled Child Benjamin Spock and Marion O Lerrigo. Collier MacMillan International, Inc., 866 Third Avenue, New York, NY 10022. \$1.95 1965. Part VII, Tools and Techniques for Daily Living, has information on self-help aids, crutches, braces, wheelchairs, etc.

Disabled Child Book 9 in the series Equipment for the Disabled National Fund for Research into Crippling Diseases, 2 Foredown Drive, Postslade, Brighton, England. One of a 10 booklet series which provides guidelines to help in the selection of equipment. Lists and describes, with photographs, equipment to aid in the care of disabled children and to increase their independence. Covers categories such as home design, mobility, wheelchairs, personal hygiene, feeding and dressing. Includes reference and resource lists. Pictures of commercially available and do-it-yourself aids.

Easy to Make Aids for Your Handicapped Child - A Guide for Parents and Teachers Don Caston. A Spectrum Book, Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632. Revised American edition 1982. \$6.95. A clear description of a variety of aids that a parent could build for his child, aids can be made for the child's specific needs, and are much cheaper and sometimes more appropriate than commercially produced aids. Simple plans for building more than 60 multi-purpose aids.

Environmental Design for Handicapped Children J.S. Sandhu and H. Hendricks-Jansen. Gower Publishing Co., Old Post Road, Brookfield, Vermont 05036. 1976.

Environments for All Children Access Information Bulletin. National Center for a Barrier Free Environment, Suite 1006, 1140 Connecticut Avenue, N.W., Washington, DC 20036. This bulletin summarizes some of the accessibility issues that include all children, regardless of their disabilities.

Functional Aids for the Multiply Handicapped Isabel P. Robinault, Editor. Medical Department, Harper & Row Publishers, Hagerstown, Maryland 1973. The \$3.50 paper cover edition printed for and made available only through United Cerebral

Palsy Association, Inc. 66 East 34th Street, New York, NY 10016 A revised second edition is to be available soon.

Handling the Young Cerebral Palsied Child at Home N R Finnie. EP Dutton, New York, NY \$5.95 1975. Equipment suggestions are made throughout the book for commercially available and do-it-yourself devices. Also, a list of resources for equipment and accessories is included

Handicapped Children - Strategies for Improving Services Gary Breuer and James Kakalik McGraw-Hill, 1221 Avenue of Americas, New York, NY 10020 1979

Handi-Sitters How to Sit for the Handicapped M Cohn and K Caffey Available from: Melissa Cohn, OTR, 1812 Mapleleaf Blvd., Oldsmar, Florida 33557 63 pag. 3. 1979 Chapter 4 Special Equipment Introduction to special apparatus a caregiver needs to understand, simple sketches and reasons for use. A companion teaching manual is also available

Helping the Severely Handicapped Child: A Guide for Parents and Teachers P B Doyle, J F Goodman, G.N. Jeffrey, and Lester Mann Thomas Y Crowell, Publishers 10 East 53rd Street, New York, NY 10022 1979 This book will help parents, teachers, and others responsible for the care of children with severe physical and mental impairments to obtain the best public education available and assist in solving specific problems, including the handling of daily at-home activities Chapter on Special Equipment, pp 93-108

Home Care for the Chronically Ill or Disabled Child: A Manual and Sourcebook for Parents and Professionals Monica Loose Jones. To be published by Harper & Row, January 1985 Several chapters focus on uses of assistive devices Positioning Your Child Beds, Wheelchairs and Orthopedic Equipment, Exercises and Orthopedic Appliances, Vision, Hearing, and Communication Problems, Bathing, Toileting, and Personal Hygiene; How and in What to Dress Your Child, How and What to Feed Your Child

Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children, Second Edition, and More Homemade Battery Devices for Severely Handicapped Children with Suggested Activities. Linda Burkhardt, 8315 Potomac Avenue, College Park, MD 20740 50 pages \$5.00 plus \$1.00 postage and handling 1982 This book gives simple directions for constructing toys and switches that can be easily operated by severely and profoundly handicapped children This book has a wide range of applications and should be useful to parents, teachers, specialists of vision, hearing, speech, physical and occupational therapists

How to Build Special Furniture and Equipment for Handicapped Children Ruth B Hofman Charles C Thomas, Publisher, 190J S First Street, Springfield, IL 62717, 100 pp. \$10.95 1974 Explicit instructions including pictures, measurements and materials for making a standing board, a cut-out table, a standing table, chair inserts, a potty chair, etc.

Inexpensive Equipment for Activities of Daily Living Kathryn S. Csorvenyansky, C.O.T.A. Occupational Therapy Department, Job Development Laboratory, George Washington University Medical Center, 2300 Eve Street NW Room 20 Washington, DC 20037 18 pages \$1.00 1973 Manual of easily made aids for feeding, dressing, hygiene

Let Me Do-It-Yourself: A Curriculum Guide for Teaching Daily Living Skills to Orthopedically Handicapped Children Joan McCollom Available from Albert Schweitzer School, 6991 Balboa Ave., San Diego, CA. Pub #1B785 1978 Includes suggestion for assistive devices and a checklist for evaluation of daily living skills evaluation for school age and preschool children

Occupational Therapy for Mentally Retarded Children, M Copeland, L Ford, and N Solon University Park Press, Baltimore, MD 226 pp 1976 Chapter 6, Adapted Equipment Suggestions, sketches and construction details for low cost aids that can be constructed in the clinic, classroom or home

Physically Handicapped Children A Medical Atlas for Teachers Eugene E Bleck, MD and Donald A Nagel, MD Grune & Stratton, Inc., 111 5th Ave., New York, NY 10003 2nd edition, 1982 Fundamental medical facts are accompanied by practical suggestions for teachers Assistive devices are included where appropriate

Please Help Us Help Ourselves. Inexpensive Adapted Equipment for the Handicapped. Carol Nathan, OTR Available from: OT Program, Indiana University Medical Center, 1232 W Michigan Street, Indianapolis, IN 46202 \$2.00 Illustrates the fabrication of inexpensive adaptive equipment for disabled children

Project PROJIMO A Villager-run Rehabilitation Program for Disabled Children in Western Mexico The Hesperian Foundation, Box 1692, Palo Alto, CA 94032.

Products for People with Vision Problems American Foundation for the Blind, Consumer Products Department, 15 W 16th Street, New York, NY 10011. Section on Preschool Products, as well as other devices used by children with vision problems.

Raising Your Hearing-Impaired Child A Guide for Parents Shirley McArthur Alexander Graham Bell Association for the Deaf, 3417 Volta Place NW, Washington, DC 20007 256 pages \$10.95. 1982

Special Technology for Special Children Paul Goldberg University Park Press, 300 North Charles St, Baltimore, MD 21201 1979 Computers to serve communication and in education of both cerebral palsy and hearing impaired children

Specially Adapted and Individually Made Hearing Aids for Children International Commission on Technical Aids (ICTA) ICTA Information Center, Box 303, S-161-26, Bromma, Sweden. 1982

Teaching Individuals with Physical and Multiple Disabilities J L Bigge and PA O'Donnell Charles E Merrill, A Bell and Howell Company, Columbus, OH 43216 279 pages Assistive devices

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## INFORMATION SERVICES AND RESOURCES

are included, especially in the chapters on Academics; Severe Communication Problems and Self Care. Sketches and photographs are used to show device applications; advantages and disadvantages of equipment are listed.

Technical Aids for Handicapped Children Rehabilitation Centre for Children, Winnipeg, Canada. A resource book of both commercially available and custom made equipment.

### Additional Sources of Information for Parents of Disabled Children

The following associations and agencies are among many that provide resources. Write for a list of their publications.

American Academy of Pediatrics  
P.O. Box 1034  
Evanston, IL 60204

American Medical Association  
Bureau of Health Education  
525 N. Dearborn Street  
Chicago, IL 60610

The Association for the Severely Handicapped  
7010 Roosevelt Way, NE  
Seattle, WA 98115

Council for Exceptional Children  
1920 Association Drive  
Reston, VA 22091

Library of Congress, Division for the Blind and Physically Handicapped  
1921 Taylor Street NW  
Washington, DC 20542

National Congress of Parents and Teachers  
700 N. Rush Street  
Chicago, IL 60611

National Foundation of Dentistry for the Handicapped  
726 Champa  
Denver, CO 80202

National Information Center for Handicapped Children and Youth  
155 Wilson Blvd.  
Suite 600  
Rosslyn, VA 22209

### DISABLED ELDERLY

Easier Way: Handbook for the Elderly and Handicapped. Gean Sargent. Iowa State University Press, 2121 South State Avenue, Ames, IA 50010 515/294-5280. 223 pages \$11.50 1981. This book describes devices and adaptations both commercially available and homemade to help elderly disabled persons who want to remain as independent as possible. It is arranged by subjects such as cooking, cleaning, bathroom, dressing, grooming, relieving aches, sewing and handwork, and mobility. Related publications are listed.

A Handbook of Assistive Devices for the Handicapped Elderly New Help for Independent Living Joseph Breuer. Haworth Press, 28 East 22nd Street, New York, NY 10010 212/228-2800 80 pages \$20.00. 1982. This illustrated book describes a broad array of devices designed to assist handicapped elderly persons. A major emphasis is given to devices to help the bedridden elderly with limited strength and mobility in performing activities of daily living. Devices are classified under such topics as sitting, communicating, dressing, eating, toileting, and walking. Each chapter has an accompanying bibliography.

### LARYNGECTOMY

Aids and Devices for Laryngectomees Speaking Devices for Laryngectomees Supply Sources for Items Used by Laryngectomees. Available from International Association of Laryngectomees, American Cancer Society, 777 Third Avenue, New York, NY 10017 212/371-2900. The Association's Annual Directory includes local sources of supplies for the laryngectomee patient. Reprints and fact sheets include Aids and Devices for Laryngectomees, Supply Sources for Items Used by Laryngectomees, and Speaking Devices for Laryngectomees.

### MULTIPLE SCLEROSIS

"Aids to Ease the Activities of Daily Living," Chapter 8. K. Robbins and A. Abramson. In Multiple Sclerosis: A Guide for Patients and Their Families, Labe C. Scheinberg, M.D., editor. Raven Press, 1140 Avenue of the Americas, 1983.

### ONE-HANDED

"Adapted Living Aids for a Bilateral Shoulder Disarticulation." M.A. Marker. American Journal of Occupational Therapy, #9, 584, 1977.

Handbook for One-Handers. A.L. Danzig. 3rd edition. Federation of the Handicapped, 211 West 14th Street, New York, NY 10011 \$1.00 1966. Description of a wide variety of actions involved in everyday living, with detailed advice to the one-handed person for easy performance.

The One-Hander's Book: A Basic Guide to Activities of Daily Living. Veronica Washam. Harper & Row Publishers, 10 E. 53rd Street, New York, NY 10022. Also available from Independent Living Research Utilization Project, The Institute for Rehabilitation and Research, 1333 Moursund Avenue, Houston, TX 77030.

Single-Handed Devices and Aids for One-Handers and Sources of These Devices. Betty Garee, ed. Cheever Publications, P.O. Box 700, Bloomington, IL 61701. 25 pages, illustrations \$3.50 1978. This book is primarily product-oriented, i.e., it lists devices which could be useful to a one-hander and the various sources of these devices.

**OSTOMY**

The Ostomy Book: Living Comfortably with Colostomies, Ileostomies, and Urostomies Barbara Dorr Mullen and Kerry Anne McGinn Bull Publishing Company, P O Box 208, Palo Alto, CA 94302 236 pages, illustrations \$7 95 1980.

United Ostomy Association, Inc, 2001 W Beverly Blvd, Los Angeles, CA 90057, 213/413-5510 The Association provides a list of manufacturers and suppliers of equipment for the ostomy patient

**PARKINSON'S DISEASE**

"Aids, Equipment, and Suggestions to Help the Patient with Parkinson's Disease in the Activities of Daily Living" (pamphlet) American Parkinson Disease Association, 147 East 50th Street, New York, NY 10022 212/421-5890

"Aids to Daily Living for the Patient with Parkinson's Disease." Alison Beattie British Occupational Therapy Journal, February, 1981

"Team Management of Parkinson's Disease" American Journal of Occupational Therapy, 31, 300-308 1977

**STROKE**

Do It Yourself Again Self Help Devices for the Stroke Patient American Heart Association, National Center, 7320 Greenville Avenue, Dallas, TX 75231 45 pages 1969 Practical aids for eating, dressing, reading, housework, using the bathroom and walking are described and illustrated Suggestions for selection of a wheelchair and rearrangement of the home are provided

"Handy, Helpful Hints for Independent Living after Stroke" Julius D Lombardi, National Easter Seal Society, 2023 W Ogden Avenue, Chicago, IL 60612 15 pages 40 cents plus 25 cents postage & handling Rev ed, 1980 Practical solutions to everyday problems -- eating, dressing, gardening, and other adaptive activities -- shared by the man who developed them

Help Yourself A Handbook for Hemiplegics and Their Families Butterworth, Inc., 3700 Pearl Street, Washington, DC 20014 1972

"I'd Rather Do It Myself" N Wall Occupational Therapy Department, Massachusetts Rehabilitation Hospital, 125 Nashua Street, Boston, MA 02114 \$2 00 A 12-page booklet containing descriptions and illustrations of devices and equipment

Stroke Bibliography Available from National Easter Seal Society, 2023 West Ogden Ave, Chicago, IL 60612 Has information on books, pamphlets, reprints to read, catalogs to order

**FOR INFORMATION SPECIALISTS**

Academic Library Facilities and Services for the Disabled J.L. Thomas and CH Thomas Oryx Press, 2214 North Central at Encanto Phoenix, AZ 85004 \$70 00.

Access Problems with Computer-Based Services. E.J Desautels. University of Wisconsin, Department of Computer Sciences Technical Report #516 16 pages. \$1 70. October, 1983. Available from Trace R&D Center, Reprint Service, 314 Waisman Center, 1500 Highland Ave., Madison WI 53705 Automated library catalogs which students interrogate through computer terminals are becoming commonplace. This report examines the situation at the University of Wisconsin-Madison campus, and analyzes the general computer access problem in libraries as it impacts upon severely handicapped students

Information Services to Disabled Individuals Drexel Library Quarterly, Drexel University, Philadelphia, PA. April 1980, Volume 16, no. 2. Available from NARIC, 4407 Eight Street NE, Washington, DC 20017 \$6 00

Library Aids. Gaylord Brothers, Inc, P.O. Box 4901, Syracuse, NY 13221, 800/448-6160 Some items include. study carrel, convenient height revolving displays for newspapers, magazines, paperbacks, records and cassettes, aids for partially sighted individuals, including free-standing desk and floor model high-intensity magnifying lamps

Library Services for the Handicapped Adult Carol H Thomas and James L Thomas, editors The Oryx Press, 2214 North Central at Encanto, Phoenix, AZ 85004. 152 pages \$25 00 Part I of this multi-authored book presents a background overview and discussion of needs and approaches to preparing librarians in serving handicapped people The bulk of the work is contained in Part II, which addresses programs and services to special populations Part III reproduces a detailed resources listing, subdivided in various categories, such as books, articles, retrieval systems, equipment sources, and nonprint media

The Mainstreamed Library Barbara H Baskin and Karen H. Harris, editors American Library Association, 50 East Huron, Chicago, IL 60611 293 pages \$35 00 1983

Meeting the Needs of the Handicapped: A Resource for Teachers and Librarians C Thomas and J. Thomas, editors. Oryx Press, 1980, Phoenix, Arizona

That All May Read: Library Service for the Blind and Physically Handicapped 518 pages Free. Available from Publication and Media Section, National Library Service for the Blind and Physically Handicapped, Library of Congress Washington DC 20542

# The Equipment Selection Process

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## EQUIPMENT SELECTION PROCESS

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All of us who have been involved in the field of rehabilitation have heard "horror stories" of equipment problems -- devices that take forever to be built and then cannot be used by the client, custom duplication of design at many times the cost of a commercially available item, and clients who have one problem solved only to have the solution prevent them from functioning independently in another aspect of the task. And all of us have probably been involved in at least one case which became overwhelming in complexity of problems, number of personnel involved and questionable client use of the end product. Some of these situations may be unavoidable, but utilization of a systematized process for equipment selection can hopefully keep them to a minimum. Such a selection process should include a functional assessment of the client and determination of equipment needs utilizing appropriate personnel.

### Importance of a Systematic Selection Process

What does a selection process accomplish? To begin with, a systematized approach specifically defines the problem in the context of other activities. A client may be referred for one item, say, for example, a means of getting paper into a typewriter. Upon further investigation of the problem, it may become clear which exact aspects of this activity are difficult, and why, in reference to the client's capabilities. This would certainly affect the type of equipment needed. In addition, it may be determined that the client's problem is affected by fatigue of having to first position the typewriter, or that, indeed, all aspects of desk activities are difficult for him. The original equipment request is dealt with not in a void, but in a context which may reveal other areas of investigation which are also needed to improve functioning.

A key focus of the selection process is utilization of a functional assessment of the client as a basis for determining equipment needs. Knowledge of diagnosis such as "spinal injury C-6 level" or "muscular dystrophy early stages" is helpful, but hardly adequate. The functional assessment is a thorough evaluation of the client's problem areas, compensatory methods and strongest assets in terms of physical and mental skills. This often includes muscle strength, active ranges, pain limitations, sensory abilities, visual skills including perception, coordination and cognitive abilities. The functional assessment goes a step further than information found in many medical charts of muscle grades and range degrees in that it is done in the context of activity. A description of what problems affect hand use, for example, and why it then makes it difficult to perform certain activities, is much more helpful than the degree of range in the joints of the fingers.

A selection process helps to ensure use of the simplest, most cost-effective solutions. With the vast array of commercial products on the market, and constant changes in technology, it is imperative that a means of search be utilized to avoid "re-inventing the wheel" with each case. Design and fabrication of custom equipment is time-consuming and costly, and assurance that it is indeed the only means of providing needed technology is essential in our budget-conscious society.

The client should be actively involved in the selection process. This not only ensures that the end product will actually be useful, but may serve as a learning experience for the client. Many are then able to extrapolate from this experience and apply problem solving to future situations, approach new obstacles in an organized manner and identify appropriate resources when equipment needs arise in the future.

Experience in using a selection process results in the accumulation of information which may be useful for future clients. The knowledge of means of solving a particular problem, the actual equipment design, and resources for obtaining devices grow with each case and become a rich resource for future clients, provided the information is organized and obtainable within a system.

### Project Threshold

#### Implementation of a Selection Process

In order to discuss the application of a selection process in detail, I am going to describe the program I am most familiar with, Project Threshold. To begin with some background, Project Threshold is a client service delivery program designed to meet the needs of the severely disabled person who requires specialized assistance in performing daily life tasks. It was originally funded in 1976 by the California State Department of Rehabilitation. Following this initial Innovation and Expansion grant, a contract was awarded in 1978 which established Project Threshold as a block-funded vendor of services for the Department of Rehabilitation. Similar case service contracts have been awarded each year since 1978. In addition, as of July 1981, private clients may also be referred to Project Threshold on a fee-for-service basis.

Project Threshold's staff consists of a core team who are responsible for the coordination and follow-through of all cases. As part of the Rancho Los Amigos Rehabilitation Engineering Center, we have a supporting staff of engineers available for custom design and fabrication, and facilities of a prototype shop and electronics lab. The staffs of Rancho Los Amigos Hospital and Department of Rehabilitation Training and Evaluation Program are also available to lend their expertise as needed to augment the core staff abilities. Outside consultants, including occupational therapists, physical therapists, other allied health professionals, vendors and contractors, are utilized when appropriate. Community resources such as independent living centers and agencies related to specific disabilities are used

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### for resources and referrals

A key factor in Project Threshold's utilization of a selection process is use of a case coordinator. While a team of personnel may actually be involved in providing services, one staff member is in charge of reviewing referral information, contacting the client and counselor, presenting the case for team discussion, coordinating the evaluation, researching solutions, and determining final recommendations. Having one person in this role lends itself to ensuring an organized approach to equipment selection and avoids duplication.

Another facet of the program which facilitates the selection process is use of a Model Home for equipment demonstration and use. As part of the REC, the Model Home houses the Rehabilitation Equipment Demonstration unit established under a grant from the National Institute of Handicapped Research. The Model Home is designed to look like a home, and is stocked with equipment and home modification examples in a realistic environment. The majority of equipment has been obtained primarily from manufacturers as a donation or on a loan basis for demonstration purposes. Certain other equipment has been obtained from the Veterans' Administration Prosthetic Center in conjunction with equipment evaluation programs. Several charitable organizations have also provided financial assistance. Several hundred inexpensive commercially available items, which have been purchased or donated, are used extensively in independent living evaluations. Use of the Model Home is invaluable in augmenting proper selection of equipment.

A final key of the Project Threshold's organization is resource material. Catalogues and brochures on commercially available equipment useful to the disabled have been collected from over 1,000 manufacturers and incorporated into a master cross-reference file. In addition, equipment search is done through ABLEDATA, a computerized data base of rehabilitation products accessed through the National Rehabilitation Information Center. This product information is delivered through an information broker who is housed in the same facility as Project Threshold. It includes descriptions and evaluation comments from users as well as basic data on the product.

### Steps in the Selection Process

The first step of the selection process which Project Threshold uses is receipt and review of the referral information by the case coordinator. The information required for referral includes basic data on the client such as age, diagnosis, medical background information, a statement of problem areas, and functional changes expected as a result of the evaluation. Appropriateness of the referral is determined, some cases are referred to outside facilities or community resources, where services required are less complex or more appropriate for a local resource.

The necessary background information is collected, and clarification or elaboration on any of these aspects is accomplished by verbal collaboration with the referring person, be it rehabilitation

counselor, rehabilitation consultant for an insurance company, or allied health professional. For some private clients, referral may be solely the client himself.

The next step in the process is to interview the client. An in-depth interview, usually done by telephone, obtains information about the client's functional abilities and limitations, personal care schedule, use of attendants, current living situation, and use of adaptive behavior or equipment. All areas are covered utilizing an interview sheet, even if the referral specified only one area of need. Often problems are identified which were not included as a referral reason, but directly or indirectly affect the original problem.

Completion of the interview allows the case coordinator to identify the problems and set tentative goals. Gathering detailed information from the client prior to the actual evaluation allows formulation of a total picture of the client's needs in the context of his daily life style, and a beginning plan that will make the actual evaluation quality time.

The case is then presented by the case coordinator to a team meeting within one week of the interview. This meeting of the Project Threshold staff and the liaison person with the Department of Rehabilitation Training and Evaluation Unit is a problem-solving session. The goal for the evaluation, location (such as Model Home, client's home, or job site visit), need for specialized equipment, and personnel to be included are all determined. An occupational therapist is always included, as this profession makes up the majority of the Project Threshold staff. The need for early involvement of engineering personnel may be established, depending on the type of technology it appears will be needed. It is also determined if outside consultants such as a physical therapist should be brought in for the initial evaluation or at a later point. An agenda is prepared for the evaluation.

The staff member involved in the case then organizes and prepares for the evaluation. Scheduling is done with the client, counselor, and consultants, and appropriate equipment is obtained. When not available in the Model Home, manufacturers may be contacted to provide equipment on a trial or loan basis. In some cases, the initial evaluation must be done prior to determining possible equipment needs, so identification of equipment for trial may come at a later point.

Next the client is evaluated. Every attempt is made to include the referring person in the evaluation as well. Most evaluations take place in the Model Home, but home and job site visits are conducted when there is an identified need for that environment. The actual evaluation includes a functional assessment of the client, problem identification specifically through observation beyond the initial referral and interview, demonstration of alternate methods of performing activities, and equipment trials. Solutions may be apparent quickly as the client performs tasks, or may require an extensive trial-and-error process, with input from many personnel. In complex cases,



several problem-solving sessions and an extensive search for outside equipment resources may be necessary.

In any case, the final outcome of the evaluation is to determine recommendations. Solutions to problems may fall under any one of these categories: adaptive behavior, commercial equipment, custom equipment and training. Solutions always begin with the possibility of the client learning an alternate technique or adapting his behavior, such as learning to dress in the wheelchair. Second, commercially available equipment that could solve the problem is identified and hopefully located for trial use. Identification of the appropriate device may, in some cases, be made only after an exhaustive search utilizing the resources mentioned earlier. Only after these first two avenues are exhausted is custom design and fabrication of devices considered. In these cases, engineering personnel then become extensively involved in the whole process, from the point of evaluation to end product. In addition to these three types of solutions, the need for training, either in adaptive behavior or use of the equipment once obtained, is identified. Extensive training such as would be needed for one-handed typing is beyond the scope of Project Threshold, and the client and referring persons are then provided with appropriate community resources.

The next step in the selection process is a written report, two to four weeks following the last session with the client. The evaluation results and recommendations are summarized, and details given of the specific tasks evaluated. When commercially available equipment is recommended, exact model numbers, local sources, and approximate costs are given. Every attempt is made to justify equipment identified in functional terms to provide clear documentation of need, assist the referring person with financial considerations, and make clear expectations of the results in terms of the client's change in abilities with the device, and how that will affect his performance at home, work, or school. Arrangements for fabrication of custom devices are clearly stated, and cost estimates given.

The last step in the process is follow-up with the referring person and client to ensure that Project Threshold recommendations were relevant and easily understandable. The avenue is left open for further refinement of information and modification of custom devices when indicated. Clients are sometimes re-referred to the program if their situation changes and new goals are established, or problems arise.

#### Case Example

This case is that of a 53-year-old woman, four years post-stroke with right hemiplegia. Shirley was referred to Project Threshold by her Department of Rehabilitation counselor, and had a vocational goal of homemaker. She was residing in a board and care home, and evaluation was needed, particularly in the area of kitchen activities, to determine her potential to live independently. Clarification of the referral revealed that the

reason for evaluation was not only to identify equipment needs in relation to one-handed use, but also to determine if behavior problems such as confusion with memory loss would affect safety in performance.

During the interview, the client revealed that she had had little opportunity to attempt homemaking activities since onset of her disability, but that she was independent in her personal care. It was noted that her speech was rambling and often tangential, causing the case coordinator to question her organizational abilities.

After discussion in team meeting, a plan for evaluation in the Model Home by an occupational therapist was determined. Emphasis was to be placed on task performance in cooking an actual meal to determine appropriateness of commercially available devices and the client's ability to adapt to new methods and use one-handed equipment. Of particular concern was an assessment of her judgement, problem solving and organization in the kitchen, and safety with environmental distractions. After the appropriate equipment was located, preparation was made for a cooking evaluation, and staff and client were scheduled. Functional assessment showed Shirley to be ambulatory for short distances, but that she sat frequently in the wheelchair to perform activities. She was left-dominant with good dexterity, but non-functional in the upper right extremity. The evaluation revealed that the client's task performance outweighed her verbal skills, and that she was organized, attentive, and safe in home skills. As she had no use of the right arm, she was an ideal candidate for commercial devices designed for one-handed use, and learned quickly how to utilize them in the equipment trial. Overall problem-solving and planning skills were noted as being adequate for independent living, despite verbal distractibility. Adaptive behavior was introduced to her in methods of kitchen organization and performing activities once it was determined she was capable of making changes. Resource reading material and commercially available equipment were recommended for her. These recommendations were included in the written report to the rehabilitation counselors, and local vendors for specific pieces of equipment were listed.

The report also included recommendations for further professional input once Shirley obtained her apartment, as she would not have the adapted bathroom facilities of the board and care home. After several months, she was re-referred to Project Threshold, and a home visit was made for equipment recommendations for toileting and bathing. She had already obtained a frame for the toilet and a small tub bench, but assessment revealed she needed additional equipment, including a raised toilet seat and tub safety rail, for greater ease and safety in these activities. An additional report with description of performance and specific equipment recommendations was sent, and the case was closed.

This case is an example of a relatively simple evaluation in terms of personnel, time, complexity and cost of solutions. Even so, use of the selection process was valuable in determining evaluation parameters early, assuring a thorough rele-



## THE EQUIPMENT SELECTION PROCESS

vant evaluation and appropriate follow-up. To Shirley, this intervention was a major factor in her change in lifestyle to a happier, independent existence.

### Implications of Selection Process

The steps of this process have evolved over the first six years of Project Threshold's existence. We have felt the implications of use of this systematized approach in noting growth and changes in the program. Initially, the vast majority of solutions involved custom devices, now the majority of solutions are found in adaptive behavior and/or commercially available equipment.

Service Categories	Percentage of Cases
Problem identification and/or adaptive behavior recommendations	20%
Evaluation and recommendation of commercially available equipment	57%
Evaluation and modification of commercially available equipment	9%
Evaluation and custom design and fabrication of equipment	14%

Service Category Statistics for Project Threshold 1981-1982 (Total = 80 clients)

It is significant to note that despite the fact that all clients served are severely disabled, in 77% of these cases the solutions involved adaptive behavior and/or commercially available devices. This resulted in lower average costs per client. When these more conservative methods have been exhausted, however, custom modification and fabrication of equipment become crucial to problem solution. This occurred in 23% of the cases.

## EVALUATION FORMATS

The following evaluation forms are two examples of client assessments that can be used in the selection process to identify problem areas prior to the formulation of solutions. The first is from Project Threshold, it provides guidelines for an initial client interview, and would be completed by the service provider. The second has been used at the Center for Independent Living, it could be filled in by the client prior to meeting with the service provider. Both lend themselves well to preparing written reports.

PROJECT THRESHOLD

Guidelines for Initial Client Interview

I. General Information

Client's Name \_\_\_\_\_ Height \_\_\_\_\_ Weight \_\_\_\_\_  
 Telephone \_\_\_\_\_ Age \_\_\_\_\_

Disability \_\_\_\_\_

Previous Rehabilitation \_\_\_\_\_

Current Living Situation  
 Alone \_\_\_\_\_ With Attendant \_\_\_\_\_ With Family \_\_\_\_\_

Other \_\_\_\_\_  
 House \_\_\_\_\_ Apartment \_\_\_\_\_ Other \_\_\_\_\_  
 Own \_\_\_\_\_ Rent \_\_\_\_\_

Assistance Provided  
 Attendant \_\_\_\_\_ Homemaker Chore Services \_\_\_\_\_

Other \_\_\_\_\_  
 Number of Hours \_\_\_\_\_ per \_\_\_\_\_

II. Mobility

Ambulation Yes \_\_\_\_\_ No \_\_\_\_\_

Devices used \_\_\_\_\_

Wheelchair Yes \_\_\_\_\_ No \_\_\_\_\_  
 Manual \_\_\_\_\_ Type \_\_\_\_\_

Method of Propulsion \_\_\_\_\_

Powered \_\_\_\_\_ Type \_\_\_\_\_

Method of Control \_\_\_\_\_

Describe use \_\_\_\_\_

Ability to get in and out of house (ramps, steps, doors, locks) \_\_\_\_\_

Transportation  
 Drive Yes \_\_\_\_\_ No \_\_\_\_\_  
 Type of Vehicle \_\_\_\_\_

Equipment Used \_\_\_\_\_

Transfer \_\_\_\_\_

Public Transportation Use \_\_\_\_\_

Other \_\_\_\_\_

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**III. Description of Extremities Use**

Upper Right \_\_\_\_\_

Left \_\_\_\_\_

Lower Right \_\_\_\_\_

Left \_\_\_\_\_

Devices used \_\_\_\_\_

**Sensation**

Upper Right \_\_\_\_\_

Left \_\_\_\_\_

Lower Right \_\_\_\_\_

Left \_\_\_\_\_

**Other Factors Affecting Use**  
**ROM/Contractures** \_\_\_\_\_

Endurance \_\_\_\_\_

Other \_\_\_\_\_

**IV. Body Handling Skills**

**Sitting Balance**

Bed Supported \_\_\_\_\_ Unsupported \_\_\_\_\_

Wheelchair Supported \_\_\_\_\_ Unsupported \_\_\_\_\_

Roll from side to side Yes \_\_\_\_\_ No \_\_\_\_\_

Come to sitting from supine Yes \_\_\_\_\_ No \_\_\_\_\_

Stand from sitting position Yes \_\_\_\_\_ No \_\_\_\_\_

Bed Transfers \_\_\_\_\_

Position self in bed Yes \_\_\_\_\_ No \_\_\_\_\_

Relief of ischial pressure \_\_\_\_\_

**V. Activities of Daily Living**

**A Eating** Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Describe methods/equipment used \_\_\_\_\_

**Light Hygiene/Grooming** Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_

**B Dressing**

Upper extremity Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Lower extremity Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_

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C. Toileting

Bladder control Yes \_\_\_\_\_ No \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Bowel control Yes \_\_\_\_\_ No \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Toilet Transfer Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Hygiene/Management of Clothing  
Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

D Bathing Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Bathtub \_\_\_\_\_ Bathtub with Shower \_\_\_\_\_

Shower Stall \_\_\_\_\_ Bed \_\_\_\_\_

Transfers Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

E Homemaking

Cooking Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Marketing Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Laundry Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Light Housekeeping Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Heavy Housekeeping Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

**THE EQUIPMENT SELECTION PROCESS**

**VI. Vocational Information**

Current Activities/Plans \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Skills**

Writing Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Typing Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Phoning Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Filing Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Managing books and papers Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Note Taking Independent \_\_\_\_\_ Assisted \_\_\_\_\_ Unable \_\_\_\_\_

Methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

Other \_\_\_\_\_  
\_\_\_\_\_

**VII. Leisure**

Describe leisure activities \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe methods/equipment used \_\_\_\_\_  
\_\_\_\_\_

**VIII. Description of a typical day** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**IX. Preliminary goal setting for Project Threshold intervention** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

INDEPENDENT LIVING SKILLS CHECKLIST

Please check (X) the appropriate box; if equipment is used, mark the box (E), if personal assistance is used mark the box (P); if either (E) and/or (P) is marked, please describe in the last column

	FUNCTIONAL ABILITY					DESCRIPTION Where relevant, please describe the aid, either personal or mechanical, that you use
	Always independent	Can, but usually don't	Absolutely can't	Want to change	Not applicable	
<b><u>ACTION OR ACTIVITY</u></b>						
<b><u>Dressing</u></b>						
Dress upper body						
Dress lower body						
Shoes, socks						
Buttons, zippers, bras						
<b><u>Transfers</u></b>						
Getting into bed						
Getting out of bed						
Positioning yourself in bed						
Getting on toilet						
Getting off toilet						
Getting into car						
Getting out of car						
<b><u>Grooming &amp; Hygiene</u></b>						
Getting into tub/shower						
Getting out of tub/shower						
Washing hands & face						
<b><u>Light Grooming</u></b>						
Washing hair						
Brushing teeth						
Toilet hygiene						

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**THE EQUIPMENT SELECTION PROCESS**

Please check (X) the appropriate box, if equipment is used, mark the box (E), if personal assistance is used mark the box (P); if either (E) and/or (P) is marked, please describe in the last column.

	FUNCTIONAL ABILITY					DESCRIPTION
	Always independent	Can, but usually don't	Absolutely can't	Want to change	Not applicable	
<u>Light Grooming, cont.</u>						
Nail care						
Make-up						
Ear care						
Brushing hair						
Shaving						
Feminine hygiene						
<u>Eating &amp; Drinking</u>						
Feeding self						
Cutting						
Drinking						

**PROBLEMS (describe)**

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**Bowel & Bladder**

Controlling urination  
(describe, day & night)

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If catheter, reserve set available?

Yes \_\_\_\_\_ No \_\_\_\_\_

Controlling defecation  
(describe)

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Please check (X) the appropriate box, if equipment is used, mark the box (E), if personal assistance is used mark the box (P), if either (E) and/or (P) is marked, please describe in the last column

	FUNCTIONAL ABILITY					DESCRIPTION
	Always independent	Can, but usually don't	Absolutely can't	Want to change	Not applicable	
<b>Physical Mobility</b>						
Mobility aids						
Walking - inside home						
Walking - outside home						
Up/Down Stairs						
Escalators						
Elevators						
Curbs						
<b>Wheelchair</b>						
Manual - propelling inside home						
Manual - propelling outside home						
Electric - functions in rain						
<b>Using Public Transportation</b>						
Bus						
BART (rapid transit)						
Airplanes/trains						
<b>Using Private Transportation</b>						
Drive self						
Own vehicle						
Valid driver's license						
DP plates						

**THE EQUIPMENT SELECTION PROCESS**

Please check (X) the appropriate box, if equipment is used, mark the box (E), if personal assistance is used mark the box (P), if either (E) and/or (P) is marked, please describe in the last column

	FUNCTIONAL ABILITY					DESCRIPTION Where relevant, please describe the aid, either personal or mechanical, that you use
	Always independent	Can, but usually don't	Absolutely can't	Want to change	Not applicable	
<b>COMMUNICATION SKILLS</b>						
Writing - signature						
Speaking						
Reading						
Listening						
Signing						
Typing						
Work board						
Telephone						
<b>ADL TASKS</b>						
<b>Cooking</b>						
Using range						
Using oven						
Using refrigerator						
Using freezer						
Using sink - faucets						
Transporting cookware, ingredients, etc						
Using can openers						

Kitchen accessibility (describe)

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Safety precautions (describe)

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THE EQUIPMENT SELECTION PROCESS

Please check (X) the appropriate box, if equipment is used, mark the box (E), if personal assistance is used mark the box (P), if either (E) and/or (P) is marked, please describe in the last column

	FUNCTIONAL ABILITY					DESCRIPTION
	Always independent	Can, but usually don't	Absolutely can't	Want to change	Not applicable	
<u>Cleaning</u>						
Washing dishes						
Laundry						
Housecleaning						
Vacuuming						
Dusting						
Floors						
<u>Other</u>						
Opening/closing doors						
Problem door openings						
Keys						
Light switches						
Pay phones						
Money handling						
Checking account						

**THE EQUIPMENT SELECTION PROCESS**

Please check (X) the appropriate box, if equipment is used, mark the box (E), if personal assistance is used mark the box (P), if either (E) and/or (P) is marked, please describe in the last column

FUNCTIONAL ABILITY					DESCRIPTION
Always independent	Can. but usually don't	Absolutely can't	Want to change	Not applicable	Where relevant, please describe the aid, either personal or mechanical that you use

**ADL - HEALTH**

**Taking medications**

Diet/nutrition (describe)

Range of Motion - Exercise (frequency)

On-going therapy

Skin care (pressure sore prevention)

**ADL - EQUIPMENT**

**Wheelchair Maintenance**

General

Water in battery

Air in tires

Recharging battery on electric chair

Maintenance of mobility aids

Maintenance of assistive devices


## SELECTED PUBLICATIONS: DEVICE SELECTION, BASIC USE AND TRAINING

The following resources have more information on assessment and the selection process

Assistive Devices for Handicapped Students, A Model and Guide for a Statewide Delivery System National Association of State Directors of Special Education, Washington, DC 1980 27 pp \$4.50

Equipment for the Disabled National Fund for Research into Crippling Diseases 2 Foredown Drive, Portslade, Brighton, England 10 booklet series which provides guidelines to help in the selection of equipment. Pictures of commercially available and do-it-yourself aids, 1973-1980

Independence through Environmental Control Systems David Symington, et al Canadian Rehabilitation Council for the Disabled, Toronto, Ontario, Canada 1980 64 pp \$5.00

Occupational Therapy Willard & Spackman's 5th Edition Helen Hopkins and Helen Smith, Editors JB Lippincott Co, Philadelphia 1978

Project TEACH Technical Education Aids for Children with Handicaps A Model and Demonstration Project Memphis City Schools, Division of Special Education, Department of Pupil Services, Memphis, Tennessee

Project Threshold A Model System for Delivery of Rehabilitation Engineering Services Rancho Los Amigos Rehabilitation Engineering Center, Downey, California April 1979

Project Threshold A Model System for Delivery of Rehabilitation Engineering Services Annual Report 1980 Rancho Los Amigos Hospital, Rehabilitation Engineering Center, Downey, California

Rehabilitation Engineering Sourcebook Institute for Information Studies Falls Church, Virginia 1979, updated annually

"A Systematic Approach to Evaluating Physical Ability for Control of Assistive Devices" Proceedings of the Fourth Annual Conference on Rehabilitation Engineering, 1981 Rehabilitation Engineering Society of North America 4405 EastWest Highway, Bethesda, Maryland 20814

Team Assessment of Device Effectiveness Rehabilitation Engineering Center Children's Hospital at Stanford, Palo Alto, California October 1980

These publications offer information on selection, training and use of devices

Aids Decision and provision A Systematic Approach to the Selection of Assistive Devices for the Disabled Person (2nd ed) Community Occupational Therapy Assoc., 1974 Wilson Avenue #201, Toronto, Ontario, Canada M5M 3A7 1982 \$50.00 List and comparison of commercially available wheelchairs, communication aids, self-help devices, and guidelines for environmental access

Aids to Independent Living Self-Help for the Handicapped Edward Lowman, MD, Judith Klinger, OTR McGraw Hill Book Company, Blakeston Division, New York The American compendium of assistive devices, also describes adaptive techniques and innovative ways to use devices (Out of print, but available in most rehab dept libraries, OT depts, etc) 1969

Basic Rehabilitation Techniques A Self-Instructional Guide Robert D Sine et al, editors Aspen Systems Corporation, 1600 Research Blvd., Rockville, MD 20850 1981 268 pages \$20.95 This book was written for nurses who work with disabled persons. Its goal is to provide the nurse with the basic rehabilitation techniques to enable him/her to train disabled people in ordinary functional activities. This includes self-care activities, mobility, pressure relief pain, etc. The techniques described are simple and utilize equipment that is readily available. The text is written in clear language. Excellent drawings and pictures add to comprehension of details of the technique. Because the techniques include training in the use of assistive devices, this book is also useful to more than just nurses as an introductory guide to the equipment most commonly used by the disabled. It discusses selection, use and training with the devices

Exercises and Selfcare Activities for Quadriplegic People Accent Special Publications, Box 700, Bloomington, IL 61701

Handling the Young Cerebral Palsied Child at Home NR Finnie, FCSP, A Sunrise Book, EP Dutton, 2 Park Avenue, New York, NY 10016 \$5.95 1975

Mealtime Manual for People with Disabilities and the Aging Institute of Rehabilitation Medicine, New York University Medical Center and Campbell Soup Company, Box (MM) 56, Camden, NJ, 1978

Physical Management for the Quadriplegic Patient J Ford and B Duckworth FA Davis Company, Philadelphia, PA (Out of print, look for it in an OT or PT or a rehab dept) 1974 \$16.95 This textbook on the physical management of quadriplegic patients includes an appendix which describes do-it-yourself aids for these individuals

Providing Early Mobility Intermed Communications, Inc., 132 Welsh Road, Horsham, PA 19044 1980 This book is part of a series of training manuals for nurses. It includes detailed instruction needed to use the following pieces of transfer and positioning equipment: cradle boots, hand rolls, footboards, hand splints, transfer boards, and mechanical lifters. In other sections of the book concise captions and how-to-do-it photos show you how to safely transfer a patient with halo traction, how to select the proper crutches, cane, walker, or wheelchair for your patient, and how to teach him to use the equipment correctly. It also includes step-by-step procedures and photos for turning and positioning, range-of-motion and isometric exercises, and transfer techniques. This is an excellent training manual for anyone, for instance, a disabled person could use

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## THE EQUIPMENT SELECTION PROCESS

it to train a personal care attendant. The photos are so explanatory, the text is almost unnecessary.

### The Selection of Toilet Aids for Disabled People

Results of an Evaluation Study and Guidelines for the Selection of Toilet Aids for Adult Disabled People. The Institute for Consumer Ergonomics, 75 Swingbridge Road, Loughborough, Leicestershire, LE11 0JB, England. 1981. This booklet is the first of two, and deals only with toilet aids. A second booklet will be concerned with bath aids.

### Self-Help Manual for Patients with Arthritis

Arthritis Health Professions Section of Arthritis Foundation, 3400 Peachtree Road, N.E. Atlanta, Georgia 30326. 1980.

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## Technology At Home



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## TECHNOLOGY AT HOME

It seems that once you open the door to (information about) the home, the room gets very unorganized. A great deal has been written in this area -- about assistive devices, adaptive techniques, ideas, inventions, designs. Most books have a little of everything in them. An attempt to separate publications by function -- e.g. cooking, self-care -- is no more successful than trying to categorize according to type of aid (furniture, bathing aid).

In this section, a few more obvious categories of devices and/or applications have been pulled out from the general publication guide, and listed as separate categories. But to save space, most home-oriented devices remain joined together. The list of references to self-care aids looked a lot like the books on bathroom aids. The categories that did stand out in the available literature are often also covered in the general topic publications, so you should refer to Information Resources section, too.

### HOSPITAL BEDS COME HOME

For the person who needs a hospital bed at home, the available options make careful selection essential.

This list of HOSPITAL BED OPTIONS and considerations for selection is excerpted from the article "Hospital Beds Come Home" by Helen Cioschi, RN, and Mary Pat Erdner, RN, which appeared in the May, 1984 issue of Rx Home Care, Vol 6, No 6, pp 70-76. It is reprinted here with permission of Barrington Publications, 825 Barrington Avenue, Los Angeles CA 90049. For more information, please refer to the article.

"Once the need for a hospital bed has been determined, a thorough assessment of the patient's bed and mattress requirements is necessary. Equipment is selected on the basis of its suitability to the patient's level of function, home environment, and access to funding.

#### "Factors in Bed Choice

"Will the bed and mattress meet the medical and functional needs of the patient? Will they provide safety and support?

"Can the patient use the equipment to maximize independence? Are the bed controls accessible to the patient? Can the bed and mattress height be adjusted for a safe wheelchair-to-bed transfer? Would it be helpful to the patient to have side rails that adjust up or down? Is the mattress durable, comfortable, and easy to maintain? Is it more important for the patient to have functional mobility or skin pressure relief?

"What kind of repair and delivery service will the dealer provide? What kind of service is offered after the warranty expires?

"Is it more cost-effective to rent or purchase this equipment?

#### Hospital Bed Options

##### Optional Features Characteristics & Indications

##### Side Rails

- |                        |   |
|------------------------|---|
| 1 Full length          | <ul style="list-style-type: none"><li>o Ensure safety of neurologically impaired, confused or sedated patients</li><li>o Increase bed mobility of patients when turning side to side</li><li>o May limit transfer mobility</li></ul>  |
| 2 Half length          | <ul style="list-style-type: none"><li>o Ensure safety of patients with minimal neurologic impairment by reminding them to seek assistance</li><li>o Increase bed mobility of patients when turning side to side</li><li>o Easier than full-length side rails for patients to put up and down for independent transfer</li></ul> |
| 3 Half length tuckaway | <ul style="list-style-type: none"><li>o Recess under the bed when in down position</li><li>o Facilitate transfers by allowing wheelchair to be moved closer to bed</li><li>o Appear less conspicuous than fixed side rails</li><li>o May be less secure than fixed side rails when not in locked position</li></ul>             |
| 4 Home-style           | <ul style="list-style-type: none"><li>o Can be placed on a non-hospital bed</li><li>o Cost-effective for patients who do not require a hospital bed but who need the security of side rails</li><li>o Adjust to an up or down position</li><li>o Ensure safety of neurologically impaired, confused,</li></ul>                  |

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- o comatose or sedated patients
- o Must be secured properly to side of bed to ensure optimal safety

**Bed Controls**

- 1 Located on side rail
  - o Easily accessed
  - o Patients must have good hand control
  - o Patients must be cognitively intact
- 2 Hand
  - o Can be reached easily by patients who are cognitively intact or can be placed out of reach of patients who are confused
  - o Control buttons can be recessed, raised, or touch-controlled depending on patient's fine motor function
- 3 Environmental control unit
  - o Assists patients who lack finger or upper extremity strength to control both the bed and and electrical elements such as lighting
  - o High cost may be prohibitive
  - o Sophistication of unit may result in complex repairs in the event of breakdown

**Bed Deck**

- 1 Link
  - o Holds mattress adequately
  - o May puncture a water or gel mattress
  - o Time-consuming to clean
- 2 Pan
  - o Flat surface will not puncture a water or gel mattress
  - o Easy to clean

**Bed Size**

- 1 Single
  - o Least expensive
  - o Will fit into a small room
  - o Size does not allow for optimal positioning
- 2 Double
  - o May enhance mobility, especially for larger clients
  - o Adequate space for bedmate
- 3 Queen
  - o Preferred by many patients
  - o Size may interfere with bed mobility
  - o Adequate space for bedmate
- 4 King (two single beds side by side)
  - o Allows patient to use hospital bed while bedmate uses nonhospital bed
  - o Allows patient to use water mattress while bedmate uses standard foam mattress

**Mattresses**

- 1 Standard foam
  - o Available in various densities and thicknesses
  - o Those with vinyl covers resist staining
  - o Do not distribute weight or decrease skin pressure
  - o Patient's position must be changed frequently
- 2 Water
  - o Distribute weight and decrease skin pressure
  - o Useful for patients with skin "breakdown" or high risk of skin breakdown
  - o Will not enhance and may interfere with functional mobility
  - o May be heavy and require additional motors or reinforced frame to support the weight
- 3 Air
  - o Distribute weight and decrease skin pressure
  - o Provide a poor base of support
  - o May interfere with the function of patients
- 4 Gel
  - o Distribute weight and decrease skin breakdown
  - o Useful for patients with skin breakdown or high risk of skin breakdown
  - o Provide a firm base of support for functional mobility
  - o Available in sections or as a whole mattress

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## Mattress Surfaces

A study, "Pressure Relief Characteristics of Six Therapeutic Mattress Surfaces," by I. Herszkowicz et al., was reported in the Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego, 1983.

"The objective of this study is to compare the effectiveness of various bed support surfaces in providing pressure relief and redistributing loads away from areas of bony prominence and to determine if body build affects related effectiveness."

The team evaluated these six mattress surfaces: Stryker, ROHO, Puff Pak 2", Puff Pak 4", Gaymar (low cycle) and Lapidus (low cycle), and reached these

### CONCLUSIONS

"1 All of the therapeutic mattresses appear to be significantly more effective in producing lower pressures than the standard mattress, especially under the trochanters.

"2 The ROHO mattress appears to be slightly more effective in reducing the maximum pressures under the trochanters than the other therapeutic mattresses tested. However, even though the ROHO appears to be more effective in producing lower pressures, it may be impractical from the nursing care standpoint, due to the difficulty of using it.

"3 When considering all of the pressure areas monitored in the study, the therapeutic mattresses are all of statistically equal value in reducing pressures. However, a particular mattress should be matched to a specific patient, since, as can be seen from the ranges noted from each mattress, each subject did do better on one mattress than on the rest.

"4 The Lapidus has the disadvantage of a large pump, which cannot be placed under the patient's bed due to its size. This may be a potential problem in some hospitals or home settings, as it is a safety hazard for those taking care of the patient.

"5 Females generally have lower maximum pressure than males on all the mattresses tested.

"6 There appears to be a slight difference between the "thin" and "average" body type subjects, with thin subjects generally having high pressures under the trochanters and the sacrum.

"7 The magnitude of the pressure under the sacrum is often dependent on the patient's lower back curvature which causes the pressure to shift to the coccyx."

Please refer to the article for more specific information on methodology and results.

## HOME MANAGEMENT

There are many devices on the market designed to help able-bodied people perform household tasks more efficiently. Because of their design, some require no adaptations for use by disabled people. Other commercially available products need only simple adaptations to be usable.

There are also products made especially to help the disabled person to be more independent. These available gadgets are too numerous to include here. Product information can be obtained from ABLEDATA, or by paging through some of the books in the publications list.

**Selected Publications**

These two free booklets about designing environments for disabled people, "Aids to Independent Living" and "Designs for Independent Living," show how everyday tools and household products can be adapted for easier use by disabled people. Available free from Appliance Information Service, Whirlpool Corp, Administrative Center, Benton Harbor, MI 49022.

**Aids to Independent Living** Suggestions for installing and operating home appliances for easier use by disabled persons. In many instances, a special tool, control or installation may be needed so someone with a disability can use an appliance most conveniently. While most of these modifications are made by the user, some manufacturers do offer special aids to help owners adapt their appliances to meet the need of a specific disability. Such aids include soft adaptor knobs for those with arthritic hands and Braille controls and instructions for blind consumers. Some manufacturers and appliance retailers offer these aids at no charge or at a very moderate cost.

**Designs for Independent Living** This booklet addresses the problems of selecting, positioning, and installing major home appliances in a kitchen or laundry room for most convenient use by homemakers with physical disabilities. While it is designed primarily for those who must work from wheelchairs, many of the designs and ideas can be readily adapted to kitchens and laundries for use by those whose disabilities -- strokes, arthritis, multiple sclerosis, heart disease, visual impairment, and many others -- impose other limitations.

**Adaptations and Techniques for the Disabled Homemaker** K. Hodgeman and A. Lundberg. Sister Kenny Institute, 811 E 27th Street, Minneapolis, MN 55404. 4th edition. 30 pages.

**Cooking Without Looking: Food Preparation Methods and Techniques for Visually Handicapped Homemakers** Esther Knudson Tipps. American Printing House for the Blind, Louisville, Kentucky. 1978.

**The Disabled Homemaker** Hoyt Anderson. Charles C. Thomas Publisher, 2600 S. First Street, Springfield, IL 62717. 1981. Opening chapters focus on psychological need for independence, while realistically pointing out the risks involved in independent living. The following chapters provide advice on personal care and homemaking tasks for both ambulatory and nonambulatory individuals. Also included are architectural considerations.

**Homemaking Manual: A Reference Manual for Rehabilitation Teachers** Western Michigan University, Kalamazoo, Michigan. 1980. A reference manual for rehabilitation teachers of blind homemakers. Chapters cover personal care techniques, identification of personal and household items, cleaning, laundering, cooking, and household record-keeping.

**Homemaking Unlimited Series** AM Burton and V Trotter. Independent Living Rehabilitation, Dept of Human Development and the Family, University of Nebraska, Lincoln, Nebraska. 68583. \$0.10 each.

- 1 Easy-to-Use Kitchen
- 2 No Stoop, No Stretch Kitchen Storage
- 3 Easy-to-Use Sink Center
- 4 Easy-to-Use Cooking and Serving Center
- 5 Easy-to-Use Mixing Center
- 6 Streamlined Household Tasks
- 7 The Bathroom Made Safe and Usable
- 8 Cleaning Supplies -- Keep Them Handy

Brief descriptions of principles and applications for persons with physical disabilities.

**Home Management (Equipment for the Disabled Series)** Oxford Regional Health Authority. 2 Foredown Drive, Postslade, Brighton BN4 2BB, ENGLAND. Lists and describes, with photographs, devices and equipment for the physically disabled homemaker. Covers categories such as safety, kitchen planning, storage, food preparation and cooking, cleaning and refuse disposal. Includes reference and resource lists.

"Kitchen Aids: Resources for the Visually Impaired Cook" Mary Beth Caruso. **Aids and Appliances Review**, Issue No. 8, Spring 1983. The Carroll Center for the Blind, 770 Centre Street, Newton, MA 02158. 617/969-6200. This issue presents the most commonly used aids designed for the visually impaired and some alternative uses for everyday cookware. The text is divided into sections dealing with the various aspects of kitchen management and food preparation. A resource guide follows sections where appropriate. Each resource guide is a sampling of the types of aids explained within the text. For simplicity, many of the common use items have been selected from national mail order houses, however, most of these items are also commercially available in local retail stores. The modified or adapted aids listed are available from distributors, nationally and internationally, who specialize in aids and appliances for the visually impaired and blind individual.

**The Kitchen Book** Terence Conran. Crown Publishers, New York. \$30.00. 360 pages. 1974. Small concise section on design ideas for the disabled and elderly.

**A Manual for Training the Disabled Homemaker** H.A. Rusk, E.L. Kristletter, J.S. Judson, G.M. Hunt, and M.E. Zimmerman. Institute of Rehabilitation Medicine, New York, NY. 1974. Reprint of a 1955 manual which described hints and devices for disabled homemakers which are still useful. The emphasis is on low cost, easily made equipment rather than electronic gadgets.

Mealtime Manual for People with Disabilities and the Aging Prepared by Institute of Rehabilitation Medicine (New York University Medical Center) Available from Campbell Soup Company, Box (MM) 56, Camden, NJ 08101 1978. Principles, techniques and equipment suggestions for meal preparation and homemaking Updated to include information on food processors, etc This is a highly recommended book

On Your Own Division of Continuing Education, University of Alabama Published monthly from January, 1970 through December, 1980 Produced as a special project of the Continuing Education in Home Economics program at the University of Alabama, this newsletter provided information about methods of adapting the home environment for use by disabled people Designed for use by disabled homemakers and professionals working with them

Preprimer Cooking or Cooking Techniques for the Blind, 2 volumes Sally Jones American Printing House for the Blind, Louisville, Kentucky 1978

Rehabilitation Medicine Howard Rusk, M.D. Fourth edition CV Mosby Company 1977 \$28.50 Note chapters on Principles of Homemaking and Housing

Resources in Home Economics for the Blind Homemaker, Rev 1 Cooperative Extension Service, Amherst, Massachusetts

Running Your Own Home Royal National Institute for the Blind, London, England

A Student's Notebook A Cooking Manual for Teenagers Who Like to Cook Eleanor Beissell Martin American Printing House for the Blind, Louisville, Kentucky 1977

The Wheelchair Gourmet A Cookbook for the Disabled Mary Blakeslee Beaufort Books, 9 E 40th Street, New York, NY 10016 1981 192 pages spiralbound \$8.95

The Wheelchair in the Kitchen Paralyzed Veterans of America, Inc., 801 18th Street, NW, Washington, DC 20006 1973

**Audiovisuals**

The Handicapped Homemaker Series New York University Medical Center, Learning Resources Facility, Institute of Rehabilitation Medicine, NY, New York Available from Rehabfilm Rental Catalog, Rehabfilm, 20 West 40th Street, New York, NY 10018 16 mm color film, each film 28 minutes long Rental \$25.00/film 1971 Series includes "The Homemaker with Arthritis," "The Homemaker with Incoordination," "The Homemaker with the Use of One Arm," "The Homemaker with Weak Upper Extremities."

The Homemaker with the Use of One Hand Station K, Atlanta GA 30324 National Medical Audio-Visual Center (Annex), M-2243-X 16mm color, sound, 28 minutes Free on short-term loan Describes equipment, kitchen planning, and techniques of one-handed cooking and kitchen work

**Modifying Major Home Appliances**

At least three manufacturers now offer braille overlays for control panels of their microwave ovens The overlays do not impede the use of controls by sighted users, and can be easily removed for cleaning

Whirlpool provides a panel that fits over its touch panel models along with a Braille use and care guide

Amana offers an overlay for its control panel that makes it easy to set the times and temperatures and to check timing progress Included are seven audio cassette tapes "pre-indexed" for quick reference The cassettes contain use and care information, general cooking guidelines, and recipes

GE will send braille panels for microwaves Send model and serial number of the appliance and kitchen plan requests to GE Consumer Relations, GE Appliance Park, Louisville, KY 40225 In addition, a service technician will put braille-style knobs on GE Hotpoint ranges and home laundry equipment free of charge for visually-impaired consumers

**Help is Available from Manufacturers**

A good source of help for modifying a major home appliance is its manufacturer If you do not have the address or telephone number of the company which manufactured your appliance, write to

Association of Home Appliance Manufacturers (AHAM)  
20 North Wacker Drive  
Chicago, IL 60606

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**PERSONAL CARE**

Bowel Management Accent Special Publications, Box 700, Bloomington, IL 61701

Disabled Eve Aids in Menstruation Disabled Living Foundation, 346 Kensington High Street, London, W14 8NS ENGLAND

Personal Care Equipment for the Disabled Series, Oxford Regional Health Authority, 2 Fore-down Drive, Postslade, Brighton BN4 2BB ENGLAND Lists and describes, with photographs, personal care aids for disabled persons. Covers categories such as grooming, bathing, toilets, incontinence and pressure sore prevention. Discusses do-it-yourself materials and includes a section on problem solving.

A Step by Step Guide to Personal Management for Blind Persons American Foundation for the Blind, New York, NY 1974

**CLOTHING**

Clothing For Handicapped People An Annotated Bibliography and Resource List Naomi Reich, Patricia Otten, Marie Negri Carver University of Arizona, Tucson, AZ 85721 Available from President's Committee on Employment of the Handicapped, Washington, DC 20210 1979 This book is comprehensive, it seems to list everything related to clothing prior to its publication date in 1979. If you are interested in any aspect of clothing, start with this book.

**Other Publications On Clothing**

These have been printed since 1979, and are therefore not in the above bibliography.

Accessible Fashions S Voorhees and A Thompson 23 pages National Access Center, 1419 27th Street NW, Washington, DC 20007 1981 Illustrated booklet addressing the psychological aspects of clothing, fashion design alterations and shopping patterns for persons with physical disabilities. Resource listing is included.

Adapted Shirts to Fit Over a Halo Vest V A Moratz American Journal of Occupational Therapy, #8, 524-525 1979

Clothes for Disabled People Maureen Goldsworthy B T Batsford, Ltd., North Pomfret, VT 05053 117 pages \$11.95 1981

Clothing and Dressing for Adults ER Wilshire, Editor Oxford Regional Health Authority, 2 Fore-down Drive, Postslade, Brighton BN4 2BB ENGLAND 67 pages \$11.05 1981 Booklet includes a variety of readily available clothes, a range of patterns showing different styles and features which may provide ideas for the home seamstress, as well as various specially designed clothes and adaptations.

"Clothing for the Disabled" Rehal Brief, February 27, 1981 Available from National Institute of Handicapped Research, Office of Special

Education and Rehabilitative Services, Department of Education, Washington, DC 20201

Clothing for the Handicapped, the Aged, and Other People with Special Needs A Hoffman Charles C Thomas, Publisher, 2600 South First Street, Springfield, IL 62717 176 pages \$14.75 1979 A comprehensive volume providing information on all aspects of clothing needs of the physically disabled, aged, chronically ill, and mentally retarded. Included are psychological aspects, selection and adaptation of clothing, and sources of specially designed clothing.

Clothing for Handicapped People An Annotated Bibliography and Resource List Naomi Reich University of Arizona Cooperative Extension Service, Tucson, Arizona 85721 Also distributed by the President's Committee on Employment of the Handicapped, Washington, DC 20210

The Cover-up Neckware for the Laryngectomee and Other Neck-Breather Dan H Kelly and Peggy Wellborn College-Hill Press, 4580 E Alvarado Canyon Road, San Diego, CA 92120 98 pages \$15.00 1980

Information Systems for Clothing and Daily Living Needs of Handicapped People N Reich, P Otten and J Mott University of Arizona, Division of Clothing, Textiles, and Interior Design, School of Home Economics, Tucson, AZ 85721 93 pages \$5.00 1980

A Manual for Solving Clothing Problems for Persons with Physical Disabilities Kay Caddel, Route 8, Box 12T2 Lubbock, TX 79407 \$3.00 Describes how to take body measurements of a disabled person, to identify fitting problems and to adjust patterns for home sewing.

**SHOES**

Cinderella of Boston 6507 Canoga Avenue Canoga Park, CA 91304 Cinderella Shoes specialize in sizes 1 1/2 through 5.

Helen's Shoe Service, Route 4, Red Wing, MN 55066 File of information and service to individuals who wear two different size shoes or only need one shoe. Correspondence carried on between those who have available shoes and those who need them to facilitate exchange.

Hill Brothers, 99 Ninth Street, Lynchburg, VA 24504 Free catalog of hard-to-find ladies' shoes. Sizes 2 1/2 to 14, AAAA to EEE.

National Odd Shoe Exchange, 3100 Neilson Way, Apt 220 Santa Monica, CA 90405 You send your name in to seek a mismatch with whom to exchange shoes. Does not handle the shoes themselves, only names of people.

Jeanne L Sallman, Odd Shoe Exchange, RR4, Indianola, IA 50125 \$15 registration fee, plus annual dues of \$7.50.

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## ARCHITECTURAL ADAPTATIONS

Access Information Bulletins, National Center for a Barrier Free Environment, 1015 Fifteenth Street NW, Washington, DC 20005 May, 1981

Accessibility Assistance A Directory of Consultants on Environments for Handicapped People National Center for a Barrier Free Environment, Washington, DC \$3.25 1978

Barrier Free Design Equipment and Aids Catalog Michigan Center for a Barrier Free Environment, 6879 Heather Heath, West Bloomfield Michigan 48033 1978 \$5.00

Design for Accessibility Robert James Sorenson, Architect McGraw Hill Book Company, New York NY 1979

"Designing for the Handicapped" Better Homes and Gardens Building Ideas Spring 1983 Issue \$2.50 pp 97-111

Design for Independent Living Raymond Lifchez and Barbara Winslow Watson-Guptill Publications, 1515 Broadway, New York, NY 10036 1979 208 pages \$25.00 (also available in softcover)

Designing for the Disabled Selwyn Goldsmith RIBA Publications, Ltd, 66 Portland Place, London, England 3rd Edition, 1976 525 pages, 478 diagrams \$70.00

Home in a Wheelchair Joseph Chasin, Jules Saltman, Editor Paralyzed Veterans of America, 801 18th Street NW, Washington, DC 20006

The House Book, 1974, 448 pages Terence Conran New York, NY \$30.00 Small concise section on design ideas for the disabled and elderly

Housing and Furniture Equipment for the Disabled Series Oxford Regional Health Authority, 2 Fore-down Drive, Postslade, Brighton, BN4 2BB, ENGLAND Lists and describes, with photographs, adaptive furniture and housing accommodations for physically disabled persons. Covers categories such as ramps, handrails, doors, stairs and lifts, windows, electrical fittings, beds, chairs, and other furniture adaptations and accessories

Housing Interiors for the Disabled and Elderly Bettyann Paschko Van Nostrand Reinhold, New York, NY 1982 360 pages \$34.50

Ideas for Making Your Home Accessible B. Gahee, editor Accent Special Publications, Cheever Publishing, Inc, P O Box 700, Bloomington, IL 60701 1979 104 pages \$6.50 Describes architectural adaptations to make houses accessible to people who use wheelchairs. Discusses costs, location, garage, entrance, general interior, kitchen, bathroom, living room, mobile homes, ramps and lifts. Lists sources of equipment and devices, publications on accessibility, and ideas about funding. Illustrated with drawings and photographs

Resource Guide to Literature on Barrier Free Environments with Selected Annotations Architectural and Transportation Barriers Compliance

Board, Washington, DC 20202 Superintendent of Documents, U.S. Government Printing Office Washington, DC 20202 1980

Tools for Accessibility A Selected List of Resources for Barrier Free Design National Center for a Barrier Free Environment, 1015 Fifteenth Street NW, Washington, DC 20005 May 1981

Wheelchair Bathrooms Paralyzed Veterans of America, Inc, 801 18th Street, NW, Washington, DC 20006 1971

Wheelchair House Designs Eastern Paralyzed Veterans Association, 432 Park Avenue South, New York, NY 10016

Wheelchair Interiors Sharon Olson and Diane Meredith National Easter Seal Society, 2023 W Ogden Ave., Chicago, IL 60612 1973

## Organizations

Adaptive Environments Center  
621 Huntington Avenue  
Boston, MA  
617/739-0088

Architectural and Transportation Barriers Compliance Board (A&TBCB)  
330 C Street SW  
Room 1010 Switzer Building  
Washington, DC 20202  
202/245-1591

National Center for a Barrier Free Environment (NCBFE)  
1015 Fifteenth Street NW #700  
Washington, DC  
202/466-6896

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## MORE PUBLICATIONS ON AT-HOME TECHNOLOGY AND TECHNIQUES

Access Lilly Bruck Consumers Unit Edition, Orangeburg, New York 10962 \$5.50

Access The Guide to a Better Life for Disabled Americans Lilly Bruck Random House, 201 East 50th Street, New York, New York 10022 1978

Aids and Adaptations KP MacBain, editor The Canadian Arthritis and Rheumatism Society, 45 Charles Street East, Toronto M4Y 1S3, Ontario, CANADA \$2.00 1975 Describes items which have been used successfully by patients in an occupational therapy department Part I contains drawings and instructions for self-help aids, and Part II covers environmental adaptations Bathing, toileting, homemaking and ambulation or transfer are emphasized

Aids and Appliances American Foundation for the Blind, 15 W 16th Street, New York, NY 10011 21st ed., 1975-1976 34 pages, illustrations \$2.00 Various aids and home products (braille globes, pressure cookers, etc) helpful to blind consumers are discussed, and order information is included

Aids Decision and Provision A Systematic Approach to the Selection of Assistive Devices for the Disabled Person (2nd edition) Community Occupational Therapy Association, 194 Wilson Avenue #201, Toronto M5M 3A7 416/485-6384 \$50.00 1982 List and comparison of commercially available wheelchairs, communication aids, self-help devices, and guidelines for environmental access

Aids to Independent Living Self-Help for the Handicapped Edward Lowman and Judith L Klinger McGraw-Hill, New York, NY 10036 1969 796 pages \$41.00 (Out of print)

Aids to Make You Able Wendy Davis Fred Sammons, Inc., Brookfield, IL 1979 114 pages \$6.95

Aids to Make You Able -- Self Help Devices and Ideas for the Disabled Beaufort Books, New York 1981

Bathroom Facilities Accommodating the Physically Disabled and the Aged Owens-Corning, c/o Fiberglass Tower, Toledo, Ohio

The Bed and Bath Book, 1978, 360 pages

The House Book, 1974, 448 pages

The Kitchen Book, 1974, 360 pages

Terence Conran Crown Publishers, New York \$30.00 each Small concise section in each book on design ideas for the disabled and elderly

Disabled? Yes Defeated? No Kathleen Cruzic Prentice-Hall, Inc., Englewood Cliffs, NJ 1982 212 pages \$6.95 Resource guide that includes product information and do it yourself adaptations Sections on ADL, housework, clothing

Devices for Visually Impaired Diabetics Alex H Townsend American Foundation for the Blind, 15 West 16th Street, New York, NY 10011 1978 8 pages

Do It Yourself Again Self Help Devices for the Stroke Patient American Heart Association, 44 E 23rd Street, New York, NY 10010 1969 47 pages

An Easier Way Handbook for the Elderly and Handicapped Jean V Sargent Iowa State University Press, Ames, Iowa 50011 1981 220 pages \$10.50

Functional Aids for the Multiply Handicapped Isabel Robinault Harper & Row, Hagerstown, MD 1978

Getting Organized, Part II, Storage Stephanie Winston Warner Books, Inc., New York, New York 1978

Handicapped at Home Sydney Fontt Quick Fox Press, 33 West 60th Street, New York, NY 10023 1977 71 pages

Help Yourselves A Handbook for Hemiplegics and Their Families Ian Henry Publications, 38 Parkstone Avenue, Hornchurch, Essex, England 3rd edition, 1979 161 pages

Helping the Handicapped A Guide to Aids Developed by the Telephone Pioneers of America Call Telephone Company headquarters in your city and ask for the local chapter of the Telephone Pioneers of America Though many of the devices are for the communication impaired, there are also sections on mobility aids, ADL equipment and toys

Home Security TimeLife Books Home Repair and Improvement Series Time-Life Books, Alexandria, Virginia 1979 136 pages \$11.95 The section on accident-proofing a house includes 13 pages of directions and sketches for diminishing the dangers of bathrooms and stairs Includes installation of grab bars, creating a slip resistant surface, adding a rail to a stairway wall, and building an outdoor access ramp

Housing and Home Services for the Disabled Guidelines and Experiences in Independent Living Gina Laurie Harper & Row, 2350 Virginia Ave., Hagerstown, MD 1977 434 pages \$20.00

How To Create Interiors for the Disabled A guidebook for family and friends Jane R Cary Random House, 201 East 50th Street, New York, NY 10022 1978 127 pages

Independent Living for the Handicapped and the Elderly Elizabeth May, Neva R Waggoner, and Eleanor B Hotte Houghton Mifflin Company, 2 Park Street, Boston, Mass 02107 271 pages \$11.50 This book demonstrates ways in which work simplification techniques used by industrial managers may be applied to the home by handicapped persons The care of young children by physically limited parents and the design and adaptation of clothing are covered It includes a bibliography of over 400 citations classified by subject

Instructional Materials in Independent Living A Bibliography B C Smith Materials Development Center, Stout Vocational Rehabilitation Institute,

University of Wisconsin-Stout, Menomonie, WI  
54751

International Guide to Aids and Appliances for  
Blind and Visually Impaired Persons, 2nd edition  
American Foundation for the Blind, 15 W 16th  
Street, New York, NY 10011 Printed by Port City  
Press, Baltimore MD 21208 255 pages This is  
a comprehensive guide to more than 1 500 devices  
of 270 distributors in 28 countries Listings for  
each item include name, manufacturer's address,  
price, availability, description (Out of print)

It Isn't Always Easy But It's Possible T O  
Lipton, Inc, Englewood Cliffs, New Jersey 1976  
A booklet that describes how to teach food prepara-  
tion skills to blind people

The One Hander's Book, A Basic Guide to Activities  
of Daily Living Veronica Washam The John Day  
Co, 10 East 53rd Street, New York, NY 10022

Physically Handicapped, Aids to Self-Help in Home-  
making, Grooming, and Clothing ES Hinshaw and  
DL Barrier Agricultural Extension Service,  
North Carolina State University at Raleigh, State  
University Station, Raleigh, NC 27604 \$0 25

Product Inventory of Hardware, Equipment and Ap-  
pliances for Barrier Free Design Second edition,  
1981 National Handicap Housing Institute, 12  
South Sixth Street, Minneapolis, MN 55402

Rehabilitation Engineering Sourcebook Institute  
for Information Studies, 200 Little Falls Street,  
Suite 104, Falls Church, VA 22046 1979

Rehabilitation for Independent Living A Selected  
Bibliography President's Committee on Employment  
of the Handicapped, Washington, DC 20402 \$4 50

Self Help Manual for Arthritis Patients Judith  
Lannefeld Klinger Prepared by the Allied Health  
Profession Section, Arthritis Foundation, 3400  
Peachtree Road NE, Suite 1101, Atlanta, GA 30326  
Available from Arthritis Foundation, 221 Park  
Avenue South, New York, NY 10003 1974 \$1 50

The Source Book for the Disabled Gloria Hale,  
editor Paddington Press, Ltd Distributed by  
Grosset & Dunlop, New York 1979

Therapeutic Devices, 1956-1976 J Bellman, et  
al American Journal of Occupational Therapy,  
American Occupational Therapy Association, Inc.,  
6000 Executive Blvd, Rockville, MD 20852 Do-  
it-yourself instructions for devices which have  
appeared in AJOT, includes wheelchair trays, ADL  
devices, communication aids, etc 112 pp 1977

Toward Independence The Use of Instructional  
Objectives in Teaching Daily Living Skills to the  
Blind Anne Yeardon American Foundation for the  
Blind, New York, New York 1978

What You Can Do For Yourself Hints for the Handi-  
capped Patricia Galbraith Drake Publishers,  
Inc, New York, New York 1974

You Can Do It From A Wheelchair A E Gilbert  
Arlington House Publications, New Rochelle, New  
York 1973

#### Other Resources

More information useful to disabled people in  
their homes is available from these national  
organizations

American Council of the Blind  
1221 Connecticut Avenue NW  
Washington, DC 20036  
202/833-1251

American Foundation for the Blind  
15 West 16th Street  
New York, NY 10011  
212/620-2000

American Heart Association  
7320 Greenville Avenue  
Dallas, TX 75231  
214/750-5300

Arthritis Foundation, Inc  
1314 Spring Street NW  
Atlanta, GA 30309  
404/872-7100

National Easter Seal Society  
2023 West Ogden Avenue  
Chicago, IL 60612

Paralyzed Veterans of America  
801 18th Street, NW  
Washington, DC 20420  
202/872-1300

President's Commission on Employment of the  
Handicapped  
Washington, DC 20402

United Cerebral Palsy Associations, Inc  
66 East 34th Street  
New York, NY 10016  
212/481-6300

## ENVIRONMENTAL CONTROLS AND OTHER ELECTRONIC DEVICES FOR THE HOME

## WHAT IS AN ENVIRONMENTAL CONTROL SYSTEM?

"As a result of severe physical impairment, many people are unable to perform tasks normally suited to able bodied people. When operation of electrical devices is desired, frequently the device or the method of operation can be adapted to fit the capabilities of the physically handicapped.

An environmental control system permits a physically disabled person to control his or her immediate surroundings without assistance. The person becomes able, independently, to turn lights, radio and television on and off, to answer or initiate telephone calls and to unlock a door. Virtually any aspect of the environment can be controlled depending upon the complexity of the system used. A variety of switches ensures that the equipment can be operated easily regardless of the disability. The objective is to use modern technology to enable physically disabled people to gain greater personal independence, a better quality of life and to add a new dimension to the rehabilitation process.

"The technical components of an environmental control system are the switch, the control box, the feedback information display, and the appliances to be controlled. The complete environmental control system also includes the disabled person and the environment over which he/she is able to exercise control."

from Independence through Environmental Control Systems, Canadian Rehabilitation Council for the Disabled, 1 Youngie St Toronto M5E 1E8, CANADA

For devices which assist a blind or deaf person to control his/her environment, see **Sensory Aids in CONTROL, COMMUNICATION & SENSORY AIDS**

## HOME CONTROL SYSTEMS WHICH HAVE BEEN ADAPTED TO THE NEEDS OF THE SEVERELY DISABLED

"New environmental control systems for the severely disabled which have become popular utilize a controller (energized from a 110 volt outlet) which transmits push-button commands over the house wiring to appliance modules which are also plugged into 110 volt outlets. The controller-module systems\* were originally developed for home use by the general public and require no special home installation or wiring. These systems have now been adapted for use by severely disabled persons through the use of rocker, 'puff' and 'sip' switches, or other low force switches.

"The controller-module systems have the advantage of low cost. The following prices are all approximate and as of July 1982. Modules \$17.00 to \$20.00 each, four-function controller \$116.00, eight-function controller \$136.00, rocker lever switch \$43.00, 'puff' and 'sip' pneumatic switch \$90.00.

"A few words of caution in the utilization of home controller systems. Care must be taken in the handling of the molded plastic controller encl-

sure which is somewhat fragile and may crack when dropped. When used in an apartment house, it is possible for a controller in one apartment to affect the modules in an adjacent apartment. A wireless intercom system may cause spurious operation of the modules. The system may also be affected by a "noisy" line resulting from the operation of a refrigerator or other motor driven devices. For this reason remotely controlled devices or appliances should be set up so that problem situations cannot occur, for example if an unused heater has clothing draped over it and is then turned on by remote control, a fire may result.

"It is not recommended that life supporting equipment be controlled from these systems. All appliances should be unplugged from their modules when leaving for a vacation."

\* Two of these systems are the System X-10, BSR (USA) Ltd, Blauvelt NY 10903, and the Home Control System, Leviton Manufacturing Co, Inc, Consumer Products Division, 59-25 Little Neck Parkway, Little Neck, New York 11362.

from A Know-How Manual on Electricity for the Severely Disabled and their Families, pp 100-102

A Know-How Manual on Electricity for the Severely Disabled and their Families. A Auchincloss and M Youdin. Institute of Rehabilitation Medicine, New York University Medical Center. Rehabilitation Monograph No 65. 115 pages, \$12.00.

"This book has been written to provide enough information for the severely handicapped and their families so that sensible and economically sound choices can be made concerning the electrical assistive systems that will give the greatest independence and improved life style for the disabled persons.

"Severely disabled persons may not have the physical function to perform the operations necessary to do minor electrical work in the home. With some knowledge about the electrical systems in their house or apartment, they can ask and help instruct a family member to make simple repairs. Or, they may decide that professional help is necessary.

"This book attempts to answer most usual questions that people ask about their electrical systems. It also describes various options that a disabled person or his family may choose in order to make his home safer and more convenient. And finally, it describes some basic devices and resources that are particularly useful for those with disability.

"This book also emphasizes safety regulations and precautions both for patients and for those who are making simple repairs. Some of the information presented can be found in other "how-to" electrical books. It is re-stated in laymen's language to give the reader a source of information that is directed specifically to the handicapped and their families."

HOME ACCESS AND MODIFICATIONS

Jim Tobias  
Rehabilitation Engineering Volunteer (REV) Network

FUNCTION	DEVICE	COST	NOTES
ENVIRONMENTAL CONTROL	BSR X-10 Standard	\$50-\$120	Available in several models: 16-appliance master control or ultrasonic remote control with small, push-buttons similar to a calculator, and mini-controller for 4 appliances, larger and easier buttons. Both versions have bright and dim functions for lights. You need one master and as many modules as appliances as you want to control. Modules to replace wall switches (for overhead lights) are available. Sold as "Plug n' Power" "Home Controller"
	(see Note 2)		
	BSR X-10 Modified	\$160-\$240	Can control four or eight devices (2 models). Good rocker-type switch, 4-device master, 3 modules, \$190. With 8-device master, \$210. Other switches, such as sip-and-puff, can be used. They require a 5-pin DIN plug. Contact BSR or REV Network for wiring information. Available at some medical houses, Prentke-Romich, or BSR, Rt3 303, Blauvelt, New York 10913, phone (914)358-6060.
	Touchplate Switch	\$20/kit	Available from Heath-Kit (see phone for local store) or other electronics sources. Relatively easy to build with soldering iron, a few tools. Plug appliance into switch box, plug switch box into wall. Current limits are:  Lamps & Heaters = 300 watts TV Receivers = 225 watts Fans, Blowers, etc = 180 watts  Small metal disk can be placed anywhere, requires just a light touch to turn device on or off. Can use more than one in the same dwelling. Not recommended for radios and some stereos, due to audio interference.
	Whistle Switch	\$20	Available from electronics or some department stores, also Carol Wright Gifts, Box 8502 Lincoln, NB 68544, or Neil H. ... Co., Box 132, Jackson, MO 63755. As above, plug appliance into wall. Transmitter is really squeeze whistle. Device may be triggered accidentally by jangling keys, dog whistle, etc. Only one per room. Do not use with a dog in the house.
	Computer environmental controls	\$100-\$400	All brands of home computers now offer plug-in peripherals designed to work the BSR modules described above. If you use a computer already, this may be an inexpensive way to go. Cast-off low-cost computers can also be found as donations. Some software is available to make these easy to use. See Trace Center's International Software/Hardware Registry. Contact REV Network for suggestions and software help.
TELEPHONE	Various Dealers	\$40-\$120	Many electronic outlets offer automatic dialers, which can store 5-40 commonly used phone numbers, recalled and dialed automatically. Some can repeat dial if there is a busy signal, some are complete with telephone handsets and touch-tone pads. Radio Shack sells one for 16 numbers for \$50.00.

FUNCTION	DEVICE	COST	NOTES
TELEPHONE, cont			<u>Suggestion</u> Check all local stores and try them all out, don't buy more storage than you really need
	Phone Directories	\$6-\$25	Stationary stores, Radio Shack sell motorized personal phone directories that can hold several hundred names and addresses, they operate by push-button to either scroll or flip pages like a Rolodex. Perfect for other uses, such as work-place modifications
	Amplifiers	\$10-\$150	"Speaker phones" can be obtained from the telephone company, and many electronics stores sell them. Depending on your set-up, an inexpensive model may work. Beware of feedback and loud background noise, try them out if you can. Panasonic makes attractive model for about \$100
	Cordless Telephones	\$50-\$200	These are mobile phones with a stationary base unit. You can mount the portable part on your wheelchair for hands-free private conversation (an advantage over speaker phones). Find a model with a hand-up/lift-up switch you can use, or modify it. Prices of the models are indicative of reliability, range, and resistance to interference. Beware of the cheapest ones. (See warning on cordless phones)
	Visual Phone	\$20	Radio Shack offers a "Form Flasher" which lets you connect a lamp (or whatever) to your phone line such that when your phone rings, the lamp flashes
TELEVISION	Mechanical Channel Selector	\$17	This is a mechanical device that attaches to the stem of the channel knob. A long cable like the one on a bicycle brake runs to a hand-held unit that has a rotary lever. To operate, you turn the lever, it takes a good amount of force. It would be possible to extend the lever arm to minimize force required. Another disadvantage is having the cable lying around and getting in the way. No permanent modification to the TV, and you can move it from one set to another. Available from Starcrest of California, 3159 Redhill Avenue, Costa Mesa, California 92626. Get their catalog before you order, or contact manufacturer RAMCO, 7271 N Cicero, Lincolnwood, Illinois 60646
TELEVISION, cont	Electronic Channel Selector	\$60-\$120	Available in at least two models from Jerrold, should be at your local TV repair or specialty store. Both models are remote-wired push-button channel changers, one for standard broadcast, the other for cable. Easy to install. You can put the box wherever you want it. Buttons are relatively stiff. No commercially available keyguards
UNLOCKING DOOR	Electric Door Lock		Available through average lock shop. Manufacturer is Trine Company. Many models available
	1 Electric Strike	\$25-\$30	If you are installing it yourself you will need good tools and good measurements. Lock shop will charge \$7.50 to install it
	2 Transformer 12 VAC, 1 amp	\$10	Should be enclosed in chassis box and equipped with a 2 amp fuse (slow blow)



FUNCTION	DEVICE	COST	NOTES
UNLOCKING DOOR cont	3 Radio Control	\$40-\$90	Generally, the more expensive ones have more codes on the transmitter for more security. Sears garage door kits cost \$75.00 for transmitter and receiver. (See Note 1)

**NOTE 1** Test transmitter and receiver before mounting. Be sure user can operate transmitter button, or modify it with a big plastic plate, etc. Mount the receiver near the door. User can probably push door easily, make sure he/she can pull door (as is, with a door knob strap, or convenient pulley arrangement).

**NOTE 2** Some disabled people may be able to use the standard models, with or without a keyguard (not commercially available). Modified design has no ultrasonic remote control. These devices are inexpensive, but they have some drawbacks: limited current (no heaters or air conditioners, for example) interference (from wireless intercoms, heavy motors, etc.), but they are easy to install and change, since they plug into the wall outlets.

#### GENERAL INFORMATION

**Knobs** Sometimes all you need is a big knob to fit the same control stem. Most TV and radio repair shops have a box of junk for this: old knobs, plastic parts, etc. Bring your knob to ensure a match in sizes. If that doesn't work, glue or screw an extender arm onto the knob.

**Switches** Toggle switches can be adapted with a short length of stiff plastic or metal tubing to add leverage. You may have to replace the switch, however. Make sure you get one that matches the chassis hole size, current limit, number of poles, type of activation, etc. Ask for help at an electronic store.

**Pushbuttons** A small pushbutton can be adapted by using a flat lever over the button to make a bigger "target", or by gluing on a slightly larger plastic plate, or by putting a sort of keyguard on the chassis if the problem is hitting more than one button at a time. Otherwise, you may have to replace the button with a bigger or softer-action one. See above for matching information.

#### Where To Get Help

- Put up a sign in an electronics shop
- Trade unions (ask about retired workers apprentices)
- High school shop department
- Telephone Pioneers (ask telephone company business office for their number)
- Vocational schools
- Local technology companies (try the public relations office)
- Colleges, especially engineering and industrial design department

- Special education schools
- Computer user groups

Remember, with all of these people, make sure you define the problem and keep tabs on their designs. These little gadgets should be cheap, unbreakable, attractive, and useful. Only the user can guarantee use. Often people doing a project as a hobby want to experiment with components and devices for their own amusement. That's okay, but it shouldn't get in the way of the service you are requesting.

If you turn up a "live one," someone competent and attuned to the user's needs, cultivate them. Also, have them contact us for information exchange.

Jim Tobias  
Rehabilitation Engineering Volunteer (REV)  
Network  
201 W 85th Street #2E  
New York, New York 10024  
212/874-0312

Also see sections on **CDN, RDL, COMMUNICATION, MICROCOMPUTER APPLICATIONS**



A CONSUMER ALERT was reported by Judy Berke in the April 1984 issue of The Coordinator Magazine

**CONSUMER ALERT**

"We have received communiques from some readers telling us about repair problems in electronic protection systems. These are the systems in which a device -- either part of a "terminal" or worn as a pendant -- signals a self-dialer to connect into a hospital, police station or central computerized office or worn as a pendant -- signals a self-dialer to connect into a hospital, police station or central computerized office (The devices can be either one or two way). Most of these systems seem quite valuable to the elderly or infirm who spend a lot of time alone.

"However, it now seems that many of the systems are sold by independent operators. In some of these cases, neither the sales person nor the parent company is taking true responsibility for repairs, service and replacements of the system although some of them offer what looks like a good warranty -- until the customer needs to use it. Then the complications begin.

"If you or any of your patients are contemplating the lease or purchase of one of these systems, ask the following questions:

1. How long is the warranty, and does it cover both labor and parts?
2. Where will the repairs be made? If the location is in another town, is postage or shipping covered in the warranty?
3. Will the local rep pick up the machine for mailing? (Sometimes it is difficult for a patient or older person to get to a post office.)
4. Will the rep or company supply a 'loaner' while the system is being repaired?
5. Is reprogramming of the machine (usually phone numbers) difficult? Can the consumer do it? If a service rep must reprogram, can it be done in the home or must the machine be transferred somewhere else? If reprogramming must be done by special equipment, does the local rep have that equipment? In either case, again, if the machine will be out of order for any amount of time, is there a loaner?
6. If the representative refuses to handle the equipment, is there another representative in the area who will take over service?

"These questions arise because of past problems some of our readers have had with servicing of their protective systems. Most of the systems we have seen seem to be of excellent quality, but quality is also measured by service reliability and consumer safety. Quality is certainly not directed [sic] if one is without the system because of repair or reprogramming service problems."

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**WARNING ON CORDLESS TELEPHONES**

The following warning on cordless telephones, by Congressman Henry A. Waxman, appeared in The Coordinator, April 1984.

"Users of cordless or portable telephones should always make certain that the phone is in the 'Talk' position before bringing the phone to their ear. Should the phone ring while still in the 'Listen' position, the user may be exposed to an extremely loud ring.

"Some cordless phone users have complained that the ring was so loud as to be painful. Some doctors speculate that the ring might result in some hearing loss.

"To file complaints or obtain additional information, consumers should call the Consumer Product Safety Commission toll-free hotline at 1-800-638-CPSC. The teletypewriter number for the hearing impaired is 1-800-638-8270."

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**Some Publications on Environmental Controls and Accessible Home Hardware**

"Design Considerations for an Environmental Control System for the Severely Handicapped" R Block Proceedings of the Seminar on Electronic Controls for the Severely Disabled, Vancouver, B.C., Canada, 1974. The Kinsmen Rehabilitation Foundation of British Columbia, 2256 W 12th Ave., Vancouver, B.C. V6K 2N5, Canada

Design for Accessibility: Equipment and Aids Catalog, revised 1981. Michigan Center for a Barrier Free Environment, 6879 Heather Heath, West Bloomfield, MI 48033, \$20.00

Design for Independent Living Raymond Lifchez and Barbara Winslow. Watson-Guptill Publications, 1515 Broadway, New York, NY 10036. 1979. 208 pages. \$25.00 (also available in soft cover)

Environmental Control Systems and Vocational Aids for Persons with High Level Quadriplegia. Institute of Rehabilitation Medicine, New York University Medical Center, Rehabilitation Engineering Center, 400 E 34th Street, New York, NY 10016. 1979. Clinical evaluation of electronic devices

Home Security Time-Life Books Home Repair and Improvement Series. Time-Life Books, Alexandria, Virginia. 1979. 136 pages. \$11.95. The section on accident-proofing a house includes 13 pages of directions and sketches for diminishing the dangers of bathrooms and stairs. Includes installation of grab bars, creating a slip resistant surface, adding a rail to a stairway wall, and building an outdoor access ramp.

Housing Interiors for the Disabled and Elderly Bettyann Raschko. Von Nostrand Reinhold, New York, NY. 1982. 360 pages. \$34.50

How to Build and Use Electronic Devices without Frustration, Panic, Mountains of Money, or an Engineering Degree Stuart A Hoenig. Little, Brown, & Company, Boston, Massachusetts. 1980

How to Create Interiors for the Disabled. A Guidebook for Family and Friends Jane Randolph Cary. Pantheon. 128 pages. \$5.95. 1978

Independence Through Environmental Control Systems David Symington, et al. Canadian Rehabilitation Council for the Disabled, 1 Yonge St. Suite 2110, Toronto, Ontario M5E 1E8, CANADA. 64 pages

Installing Your Own Telephones Reston Publishing Company, Reston, VA. 168 pages. Available from local Radio Shack, \$5.95. 1983. Well-illustrated, step-by-step installation instructions that are easy to read and understand.

Manual on Management of the Quadriplegic Upper Extremity Available from Fred Sammons, Inc., Brookfield, Illinois. 201 pages. 1978. Includes a section on environmental control systems, wheelchair control systems and criteria for selection of orthoses, controls and power sources.

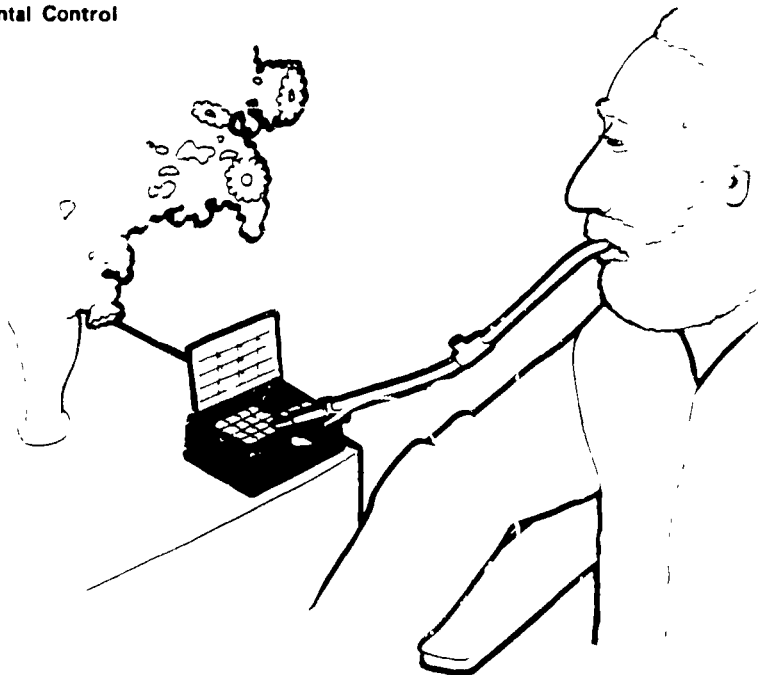
Product Inventory of Hardware, Equipment, and Appliances for Barrier-Free Housing Design

National Handicap Housing Institute, Inc. 12 S 6th Street, Suite 1216, Minneapolis, MN 55402. 1981. The section on Hardware (pp. 193-276) covers door levers, door and cabinet pulls, hinges, automatic doors, shelf brackets, grab bars.

**Film**

The Box and I Canadian Rehabilitation Council for the Disabled. Available from Marlin Motion Pictures, 1 Yonge Street, Suite 2110, Toronto, Ontario M5E 1E8, Canada. 16 mm color, 22 1/2 minutes. 1978. Illustrates the use and benefits of environmental control units in various settings.

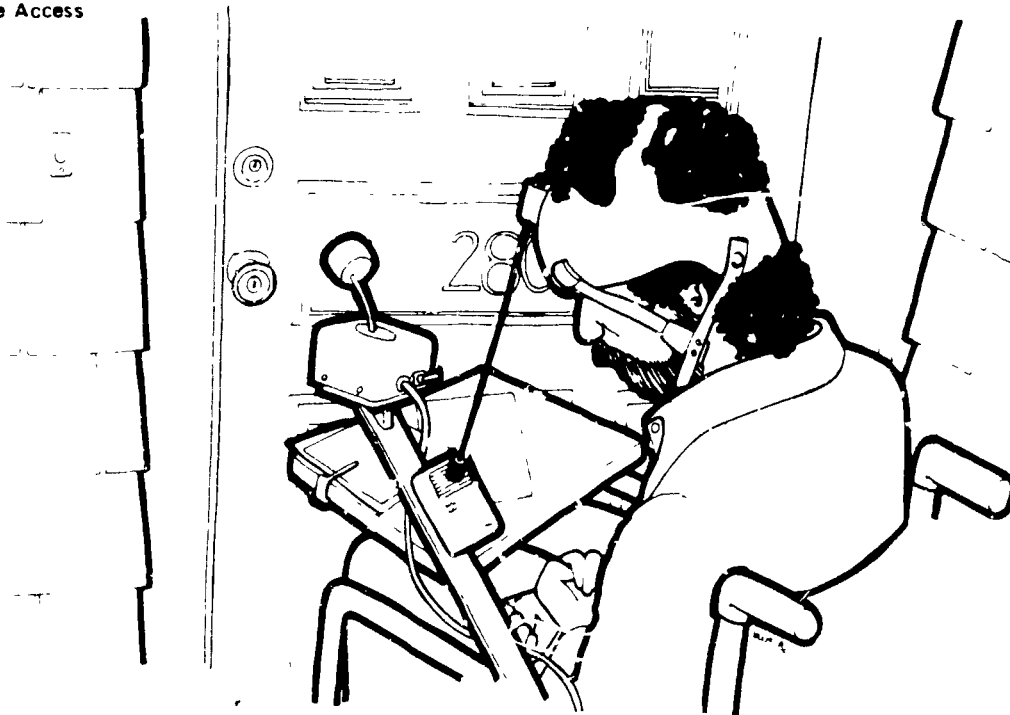
Environmental Control



Mouthstick and holder allow use of inexpensive general consumer marketplace environmental control unit (BSR-10)

Drawing reprinted from A Guide to Controls, Children's Hospital at Stanford

Home Access



Bracket and transmitter allow independent home entry, using garage door opener modified for front door use

Drawing reprinted from: A Guide to Controls, Children's Hospital at Stanford

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# Educational and Vocational Technology

25

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**INTRODUCTION**

Technical aids can be beneficial to students at all levels of the education process, from kindergarten to post-secondary. In the existing literature, the emphasis for the elementary school child seems to be on finding the most appropriate aid for communication, positioning, mobility and self-care. A good deal of the literature focuses on the most severely disabled children, and the emphasis tends to be on personal aids for the individual child. As the high school years are reached, and it is assumed that basic needs are met, the approach changes to finding technology to make the classroom useable for the disabled teenager. This same orientation holds through the college years, with increase emphasis on making the entire campus accessible.

This section contains references to all three stages. It is hoped that those seeking information about technology that can aid education will look beyond their immediate target age range or disability. There is benefit to be gained in crossing disciplines. You may find that you can readily apply much of this information to your own area of interest.

There are some glaring gaps in the literature. I would like to find more information about adapting existing classrooms at the primary school level and about approaches to meeting basic needs, such as mobility and written communication, for the secondary school age group. Additionally, there is a dearth of information about how devices could be better used by less severely disabled kids. Attention to the benefit to be gained from applying technology in all three areas relevant to education -- person, classroom, and campus -- needs to occur throughout the education process, not one step at a time. (editor)

**TECHNOLOGY SERVICE DELIVERY**

"For this technology to be most beneficial, an effective and coordinated delivery system of technological services is essential. The objective is to assure that students in need of adaptive aids and equipment have access to them and are trained in their most efficient use.

"In the past, a variety of agencies have been involved in securing assistive devices for handicapped children, ranging from Easter Seal Societies and the March of Dimes to service clubs and others. With the advent of federal and state mandates and funding, university programs, hospitals and rehabilitation centers, state and local education agencies, and regional resource centers have also become concerned with service delivery. This has resulted in an increase in the availability of services, but still in a real concern that such fragmented, piecemeal service might be neither comprehensive nor cost-effective.

"Although there have been significant technological advances in the development of assistive devices, there still remains the task of assuring

that they become available to those persons who could benefit from them. To accomplish this goal, it is essential that all related disciplines -- researchers, engineers, educators, manufacturers, therapists, and medical personnel [and parents] -- coordinate their efforts on a statewide and national basis."

Assistive Devices for Handicapped Students: A Model and Guide for a Statewide Delivery System, 1980. National Association of State Directors of Special Education, 1201 16th Street NW #610E, Washington, DC 20036

**ARE WE LOOKING FOR PROBLEMS?**

Joseph J. Stowitschek adds a voice of concern in the forward to that issue.

"As we develop technology, we must continue to ask ourselves: Are we developing, testing, and using technology to solve problems? Or, heady with enthusiasm, do we produce solutions for which we must then find problems? For instance, the growing interest in microcomputer assisted instruction may tend to foster the development of a solution for which a problem must then be located. In this mood of enthusiasm over the technology itself, we tend to treat each technological device as an entity in and of itself, instead of as part of a whole range of instructional options. The questionable logic behind this tendency is as follows: "The (microcomputer) is becoming popular and can be used to teach. We need assistance in teaching handicapped children, therefore, the (microcomputer) should be used to teach ( ) skills to ( ) children." Instructional alternatives should not be ignored."

Technological Advances in Special Education, the Winter 1984 issue of Exceptional Education Quarterly

**PROJECT TEACH: A MODEL APPROACH**

"The provision of appropriate technical aids within an educational setting can have a profound impact on improving the educational achievement experienced by severely handicapped children. In some cases, the support of technical services can lead to the mainstreaming of children that otherwise would not be candidates.

"Technical aids can assist the handicapped child to actively participate in the educational program. Federal and state policy makers need to be made aware of the potential of technical resources to supplement the goals mandated by Public Law 94-142 -- Education of the Handicapped Act -- so that these resources can be planned into budgetary allocations for implementation in the future."

Project TEACH (Technical Educational Aids for Children with Handicaps) was a cooperative project by Memphis City Schools Division of Special Education and University of Tennessee Rehabilitation Engineering Program that developed a model program for providing appropriate technical aids within a regular educational setting in 1978-1981.

## EDUCATIONAL AND VOCATIONAL TECHNOLOGY

The following summary comments on technical components of the project are taken from the final report

The provision of technical aids, whether it be a commercially available device, a modified commercial device, or a custom-designed device, should be preceded by a multi-disciplinary evaluation in which the abilities, potential, and needs of the child are carefully defined

When attempting to meet the educational needs of severely handicapped children, commercial technical devices as the sole source will rarely be sufficient to meet the wide ranging needs of these children. Additional technical resources which will permit the custom modification of commercial devices and/or the design of unique customized devices will be necessary

The provision of specialized technology, upon which the child and the special educator become dependent, must be supplemented by a maintenance and repair capability that can rapidly respond to malfunctions or breakdowns in the equipment

The more sophisticated the technology, the more essential the need for liaison personnel to explain the operation and features of the devices, and provide immediate support if it appears that the "gadget tolerance" of the teacher or student is being exceeded

That there be a person or persons within the educational setting that have been assigned the responsibility for the ongoing evaluation, updating, maintenance, trouble-shooting and liaison related to the technical aids being used by children and teachers in the educational setting

Liaison support be provided to facilitate the mainstreaming of children with specialized technical aids, especially during the critical periods when the child first enters the regular classroom

That the necessary arrangements be made, particularly related to seating, powered mobility, and communication aids, so that a child can benefit from the devices during evenings, weekends, and summer vacations; i.e., so that the devices can truly become integrated into the child's total activities

That the most expensive devices are not necessarily the most appropriate devices, i.e., there is no linear relationship between cost and effectiveness. When all factors are considered, the choice of the most appropriate aid is based on the child's abilities, potential and needs, and not on the potential offered by the features of a sophisticated device

Since breakdowns with lengthy repair delays can severely interrupt and demoralize a student, durability of equipment should be a major consideration during the evaluation and equipment selection process

Routine maintenance and repair of technical devices is necessary for their proper functioning. Our experience indicates an additional 20% expense above cost of provision of technical aids should

be budgeted for this ongoing maintenance and repair

The full report is available for \$5.00 from Memphis City School, Division of Special Education, 259 Avery Avenue, Memphis, TN

A movie about the project, "A Special Magic," is also available

Also see **Service Delivery Models**, page 257, in the section on **FUNDING, MODELS, POLICY, STATISTICS**

## ORGANIZATIONS

These groups have a particular interest in disabled children and technology in the classroom

Artificial Language Laboratory  
Department of Computer Science  
Michigan State University  
East Lansing, Michigan 48824  
512/332-1970

Assistive Device Center  
California State University-Sacramento  
6000 J Street  
Sacramento, California 95813  
916/454-6916

Children's Hospital at Stanford  
Rehabilitation Engineering Center  
520 Willow Road  
Palo Alto, California 94304  
415/327-4800

The Communication Aids and Systems Clinic  
University of Wisconsin Madison  
1500 Highland Avenue  
Madison, Wisconsin 53705  
608/253-7726

Educational Technology Center (ETC)  
Box 64  
Foster, Rhode Island 02825  
401/822-4622

The Non-Oral Communication Center  
Plavan School  
9675 Warner Avenue  
Fountain Valley, California 92708  
714/425-6220

Ontario Crippled Children's Centre  
350 Rumsey Road  
Toronto, Ontario M4G 1R8  
Canada  
416/425-6220

PAM Assistance Centre  
601 W Maple Street  
Lansing, Michigan 48909  
517/371-5897

Tufts University  
Rehabilitation Engineering Center  
171 Harrison Street  
Boston, Massachusetts  
617/956-5036



University of Tennessee  
 Rehabilitation Engineering Center  
 682 Court Avenue  
 Memphis, Tennessee 38163  
 901/528-6445

Also see Service Centers in the sections on  
 Seating and Communication.

#### **A RESOURCE CENTER AND DATABASE PROVIDING EDUCATIONAL AND VOCATIONAL ACCESS TO TECHNICAL FIELDS FOR PERSONS WITH DISABILITIES**

"Students with disabilities are underrepresented in the fields of science and engineering. One reason for this is a lack of information regarding methods by which they can complete educational programs (particularly involving laboratories) and successfully complete careers. Specifically, information regarding adaptive equipment, altered instructional formats and resources appropriate to aiding students and faculty is not readily available to these people. All too often, college students with disabilities are advised against entering specific fields or taking certain classes for fear their disability will prevent them from full participation.

"Much of this situation is the result of 1) lack of knowledge regarding adaptive aids, and 2) the failure to procure or develop/modify aids in time for the student to access the class or the employee to meet job requirements. The irony and indeed tragedy of this situation is that an abundance of information on aids exists. Rehabilitation professionals are virtually inundated with information on new products from a variety of sources, including conferences, workshops, computer fairs and expositions. With this information explosion, the problem is one of information storage and retrieval.

"As a response to these problems, we developed a resource center, including a computer database, that provides information helpful to disabled individuals desiring to study science or engineering."

From a paper by Helen E. Woodall and Albert M. Cook in the proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego, 1983.

The database is now available to other institutions and the general public: see ADDS in the **INFORMATION RESOURCES** section, page 9.

## EDUCATIONAL AIDS INFORMATION RESOURCES

## MANUFACTURERS OF CLASSROOM AIDS

For information on **Manufacturers & Distributors** of equipment for children and the classroom, see **AbleData Information System**

## ORGANIZATIONS

Council for Exceptional Children (CEC)  
1920 Association Drive  
Reston, VA 22091

For more information on CEC, see the **Microcomputer Applications** section, page 243

**HEATH (Higher Education and the Handicapped) Resource Center**  
One Dupont Circle NW  
Washington, DC 20036  
202/833-4707 (voice/TTY)

The HEATH Resource Center is a national clearing-house on postsecondary education for disabled people. A program of the American Council on Education, it is funded by the US Department of Education. It publishes a regular newsletter.

**National Association of State Directors of Special Education (NASDSE)**  
1201 16th Street NW, Suite 610E  
Washington, DC 20036

**Technology and Media for Exceptional Individuals**  
Charles MacArthur, Membership Chairperson, TAM  
Institute for the Study of Exceptional Children  
Department of Special Education  
University of Maryland  
College Park, MD 20742

Technology and Media for Exceptional Individuals (TAM) is an international organization which facilitates closer relationships between educators and others concerned with the application of technology to meet the needs of gifted persons, senior citizens and individuals experiencing handicaps. TAM, a division of the Council for Exceptional Children, will develop new technologies and will disseminate this information through professional meetings, training programs and publications. The organization will also cooperate with education and government agencies as well as business and industry in research, demonstration, review and validation, among other professional studies.

TAM will publish a journal and newsletter, conduct training programs, conferences and workshops, and develop a new technology and media network. It also plans to evaluate and field test equipment and software.

**The Association for the Severely Handicapped (TASH)**  
1600 W Armory Way  
Seattle, V.A. 98119  
206/283-5055

Information and materials requests on all aspects of education and services for people who are

severely handicapped are answered by TASH's Information Department. TASH maintains a library of resource materials. The Information Department also conducts surveys of integrated schools and parent needs.

## DATABASES AND INFORMATION NETWORKS

These systems have a strong educational focus. For more information on these and other electronic information exchanges, also see **Information Resources** and on **Microcomputer Applications**.

**The Assistive Device Database System (ADDS)**  
American International Data Search, Inc.  
2326 Fair Oaks Boulevard, Suite C  
Sacramento, CA 94825  
916/925-4554

**Handicapped Education Exchange (HEX)**  
11523 Charlton Drive  
Silver Spring, MD 20902  
301/681-7372

HEX is a computerized bulletin board, available through the public telephone network. It is primarily intended as a free service to those involved in the education of, or communications with, the handicapped. HEX serves as a means of exchanging ideas and information concerning application of technology to aid the handicapped.

**Handicapped Learner Materials Distribution Center**  
Audio-Visual Center, Indiana University  
Bloomington, IN 47405  
812/337-1511

The Handicapped Learner Materials Distribution Center (HLMDC) is a part of the Special Materials Project established by Indiana University. HLMDC loans, free (except for return postage), selected materials such as films, videotapes, kits, games and adaptive devices relevant to the general special education population. Materials are divided into three collections represented by separate catalogs: 1) teacher training materials in special education and media production (mostly of 16mm films), 2) handicapped learner collection (mostly classroom curricular materials, primarily for examination and evaluation), and 3) videotapes that are duplicated into other formats at cost. These services are available to anyone in the USA involved with education a handicapped learner.

**SpecialNet**

SpecialNet, a special education communication information network, is part of a computer network accessed by a terminal with telephone communication capability. It provides information on special education, improving programs and skills, and a network of educators and organizations involved in special education. It also features personal correspondence and information retrieval access to major databases, as well as data collection and information management systems. At least two of sections of SpecialNet will be focused on technical aids: **EDUTECH** and **ASSISTIVE DEVICES**.

## TECHNOLOGY IN THE CLASSROOM: RESOURCES

Able Scientists -- Disabled Persons Biographical Sketches Illustrating Careers in the Sciences for Able Disabled Students. S Phyllis Stearner Foundation for Science and the Handicapped, 154 Juliet Court, Clarendon Hills, IL 60515 312/323-4181. \$12.95. The major objectives of this publication are to illustrate possible career options open to physically disabled students and to encourage teachers, counselors and parents to help scientifically talented and disabled students to get the education they need to prepare for scientific careers

Accommodating the Disabled Student James Muelier Job Development Lab, George Washington University Rehabilitation R&T Center, 2300 Eye Street NW, Suite 714, Washington, DC 20037 \$10.00 1981

Adaptive Equipment for the Handicapped Student A Resource Manual Michigan Alliance of Physical and Occupational Therapists, c/o Wing Lake Center, 6490 Wing Lake Road, Birmingham, MI 48020 \$8.00. 1982

Aids for Handicapped Readers Reference and Information Section, Division for the Blind and Physically Handicapped, Library of Congress, Washington, DC 20542 Free Devices and techniques for handling books, writing, and typing

Aids to Independent Living Self-Help for the Handicapped. Edward Lowman, MD and Judith Klinger, OTR McGraw-Hill Book Company, New York, NY 1969 (Out of print, but usually available in OT/PT departments)

Aids for the Severely Handicapped K Copeland Spector Publishing Co., Ltd, London, England 1974 This book is often referred to, however, it is quite out of date

Assistive Devices for Handicapped Students A Model and Guide for a Statewide Delivery System ASDE, 1201 16th Street NW, Washington, DC 20036 27 pages \$4.50 1980

Auxiliary Aids. A Resource Guide for Postsecondary Schools, Rehabilitation Agencies, and Handicapped Individuals Office of Handicapped Concerns, United States Education Department, Washington, DC 20202. Free 1980

Bibliography of Children's Books About Disabilities Pediatric Projects, Inc., P.O. Box 1399, Santa Monica, CA 90406 No charge

Biology for the Blind Dorothy Tombaugh Available from ERIC Document Reproduction Service, P.O. Box 190, Arlington, VA 22210 1973

Captioning Shared Perspectives Proceedings of a National Captioning Conference, June, 1978 National Technical Institute for the Deaf Rochester Institute of Technology, Rochester, NY Available from National Technical Information Services, 5285 Port Royal Road, Springfield VA 1981

Classroom-Made Movement Materials Tom Hall

\$6.95 From Front Row Experience, 5000 Every Bay Blvd, Byron, CA 94514-9454 415/634-5710 Easy "how to" illustrated instructions for making and using simple, inexpensive, and effective perceptual motor equipment right in the classroom Preschool, elementary and special ed students make and have fun using Pocket Parachutes, Zoomers, Touchy Bags, Funny Feet, Handy Hands, Footsies, Deck Rings, and on and on

Communication Outlook Quarterly publication Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824

Creating an Accessible Campus Maggie Coons and Margaret Milner Association of Physical Plant Administrators of Universities and Colleges (APPA), 11 Dupont Circle, Washington, DC 20036 \$12.50 1979

The Disabled Child Equipment for the Disabled series National Fund for Research into Crippling Diseases, 2 Foredown Drive, Postlade, Brighton, Sussex BN4 2BB, England

Educational Products for the Exceptional Child Shellie Roth, editor A catalog of products funded by the Bureau of Education for the Handicapped Oryx Press, Phoenix, AZ 987 pages 1981

Educators with Disabilities A Resource Guide Joanne Gilmore, Diane Merchant and April Moore American Association of Colleges for Teacher Education (AACTE), One Dupont Circle, Washington, DC 20036 Available from U.S. Government Printing Office, Washington, DC 20402 1981

Environmental Design for Handicapped Children JS Sandhu & H Hendricks-Jansen Gowar Publishing Co., Brookfield, VT Recommends improvements in the environment of the child with severe disability Discusses design criteria for architectural and environmental elements, and problems of adapting existing facilities A separate section deals with "inflatable" Appendices treat design and construction of worktables, mobiles, displays, partitions, etc

Fact Sheet Access to the Science Laboratory and Classroom M Zimmerman, M R Redden, S B Forman, Editors HEATH Resource Center, One Dupont Circle, Washington, DC 20036 Directed towards disabled high school and college students science instructors, and college administrators, this sheet provides advice and encouragement on making the science lab and classroom accessible to disabled students Includes examples of coping strategies, disability-related accommodations with references, and selected resources

Functional Aids for the Multiply Handicapped Isabel Robinault Medical Department, Harpe, & Row, Hagerstown, MD 1973

A Guide to Developing a Classroom Curriculum for Visually Impaired Multihandicapped Infants Stocking Publisher, 1350 South Kostner Avenue, Chicago IL 60623

Handicapped How Does It Feel Gregory La More  
BL Winch & Assoc. 45 Hitching Post Dr., Rolling  
Hills Estates, CA. 70 pp \$5.95 1981 A program  
for the classroom teacher to help able-bodied  
students understand how it feels to be handi-  
capped. Written at second/third grade level in  
large type with many pictures. Section on how  
special equipment helps disabled children.

Higher Education and the Handicapped Resource  
Directory HEATH Resource Center American Coun-  
cil on Education, One Dupont Circle, Washin-  
gton, DC 20036 202/833-4707 (voice/FDD) Free  
1982

Inexpensive Movement Materials Tom Hall Front  
Row Experience, 540 Discovery Bay Blvd, Byron, CA  
95614-9454 415/634-5710 \$6.95 Follow-up to  
Classroom-Made Movement Materials (listed above)  
Includes all new movement materials that are not  
only inexpensive, but fun to use and easy to make  
with simple illustrated instructions. Guidebook  
is loaded with plenty of fun-filled illustrated  
activities for Tilt-O-Board, Roll-O-Balance, Bat-  
ting Tees, Color Squares, Dexterity Rod, Flying  
Foam Saucers, Isobands, and much, much more.

"How We Do It" Journal of College Science  
Teaching National Science Teachers Associa-  
tion (NSTA), 1742 Connecticut Avenue NW, Washin-  
gton, DC 20009 Volume X No. 6, May 1981

Mainstreaming Practical Ideas for Educating  
Hearing-Impaired Students Milo E. Bishop, Edi-  
tor Alexander Graham Bell Assn for the Deaf,  
Inc., 3417 Volta Place NW, Washington, DC 20007  
\$10.95 1979

Management of Accessibility for Handicapped Stu-  
dents in Higher Education David W. Jacobson  
National Association of College and University  
Business Officers (NACUBO), One Dupont Circle,  
Washington, DC 20036 1981 Available from  
U.S. Government Printing Office, Washin-  
gton, DC 20402

Materials and Aids for Special Education Danish  
Folk-School's Materials and Aids Research Centre,  
Herning, Denmark Also available from NARIC  
1982 Catalog of teaching materials and aids for  
disabled students, including aids and machinery  
for learning, solo-performance aids, furniture and  
related accessories, domestic science aids, school  
subject materials and training materials.  
Includes drawings.

Meeting the Needs of the Handicapped A Resource  
for Teachers and Librarians CH Thomas and J.L.  
Thomas, editors Oryx Press Phoenix, AZ 440  
pages 1981

The Modification of Educational Equipment and  
Curriculum for Maximum Utilization by Physically  
Disabled Persons Educational and School Equipment  
for Physically Disabled Students Human Resources  
Study Number 9 Human Resources Center,  
Albertson, NY 1967 Discusses non-limiting  
school equipment and attempts to provide guide-  
lines for modifying and selecting equipment that  
presents no barriers or removes barriers for dis-  
abled students. Examples from the experiences of

the Human Resources School are presented. To be  
used in coordination with other volumes in the  
series on school design, transportation of dis-  
abled students, staffing, and curriculum and  
instructional techniques. Includes bibliography.

Modifying the Existing Campus Building for Access-  
ibility Accessible Products Catalog, and  
Construction Guidelines and Specifications  
Stephen Richard Cotler Association of Physical  
Plant Administrators of Universities and Colleges  
(APPA), 11 Dupont Circle Washington, DC 20036  
1981

Multi-Sensory Educational Aids from Scrap  
Kendrick Coy Charles C Thomas, Publisher, 301-  
327 East Lawrence Avenue, Springfield, IL 62717  
216 pages 1980 Describes learning tools for  
disabled children that can be developed by  
parents, teachers, therapists and others at low  
cost from scrap or inexpensive materials. Pat-  
terns and instructions are included for language,  
mathematics, and science aids.

Perceptual-Motor Development Equipment Inexpen-  
sive Ideas and Activities Peter Howard Werner &  
Lisa Rini John Wiley & Sons, Inc., 605 Third  
Avenue, New York NY 10016 194 pages 1975

Ready, Willing and Disabled Norman Kunc  
Personal Library Publishers, Suite 439, 17 Queen  
Street East, Toronto, Canada M5C 1F9 111 pages  
\$7.95 1981 Describes the process of inte-  
grating a physically handicapped student into the  
regular school system. Includes specific sugges-  
tions for equipment and adaptations for classes in  
math, social science, electives, etc. Written by  
a college youth with cerebral palsy who entered  
mainstreamed programs at age 3.

Rehabilitation Engineering Sourcebook Institute  
for Information Studies 400 N. Washington Street,  
Falls Church, VA 22046

Science for the Handicapped An Annotated Biblio-  
graphy Ben Thomason, editor Science for the  
Handicapped Association Available from SMEAC  
Information Reference Center, Ohio State Univer-  
sity, 1200 Chambers Road, 3rd Floor, Columbus, OH  
43212 \$3.50 1980

Special Education in Transition (No. 2), Education  
Hard of Hearing Children Mark Ross and Linda W.  
Nober, editors Alexander Graham Bell Assn for  
the Deaf, 3417 Volta Place NW, Washington, DC  
20007 128 pages \$9.50 1981

Special Technology for Special Children Computers  
to Serve Communication and Autonomy in the Educa-  
tion of Handicapped Children E. Paul Goldenburg,  
Ed.D. University Park Press, 300 N. Charles  
Street, Baltimore, MD 21201 183 pages \$12.95  
1979 Emphasis is on how the computer can become  
the tool of the child instead of the tool of the  
teacher. Instead of the computer being used as a  
medium for a program designed by the teacher to  
lead the child through a sequence of steps to  
learn some desired behavior, this author views it  
as a prosthetic medium through which the child can  
explore. A discussion of the use of the computer  
language LOGO for exploration by handicapped  
children is a major focus of the book.

Teaching Biology to Visually Handicapped Students Resource Manual Kenneth S Ricker. Department of Science Education, University of Georgia. Athens, GA 30602. Free 1980

"Teaching Chemistry to the Physically Handicapped". Journal of Chemical Education American Chemical Society 58, No 3, March 1981 Available from: Subscription and Fulfillment Dept., 20th and Northampton Sts., Easton, PA 18042

Teaching Chemistry to Physically Handicapped Students. Kenneth M Reese, editor American Chemical Society, Committee on the Handicapped, 1155 16th Street NW, Washington, DC 20036 Free 1981

Teaching Physically Handicapped Children Methods and Materials. Harold D Love. Charles C Thomas, Publisher, 2600 S. First Street, Springfield, IL 62717. 176 pages. \$15.75. 1978. An informational as well as a resource book including chapters on disabling conditions, educational goals, and architectural barriers in schools.

"Technological Advances in Special Education." Exceptional Education Quarterly, Vol. 4, No. 4, Winter 1984. James M Kauffman, Journal Editor; Joseph J. Stowitschek, Issue Editor. This issue offers an array of articles on technology applied to special education. Some are devoted to the problems that must be addressed in current and future applications of instructional technology; some describe the use of technology to solve particular problems in educating handicapped persons; and still others describe the coming generation of technological devices for which the problem solution potential is only now being demonstrated.

Test Adaptations for the Handicapped. P Wassan T Tynan and P Gardiner. Education Service Center, Region 20, 1314 Hines Avenue, San Antonio, TX 78209. August, 1982. Describes special adaptations for common assessment instruments (standardized tests); includes equipment which is useful for test adaptation.

Testing Physically Handicapped Students in Science: A Sourcebook for Teachers. Harry G. Lang, editor; Dean R. Brown, Kenneth Ricker, E.C. Keller, Jr. Printech, 1125 University Avenue Morgantown, WV 26505. \$4.50. Numerous suggestions are provided to assist in development and administering teacher-developed tests in classes having physically handicapped students. Although specifically written for science teachers, the recommendations are made by the authors to help reduce testing bias are applicable to all areas of the curriculum. Many suggestions are appropriate for standardized testing as well.

Today's Hearing Impaired Child: Into the Mainstream of Education. Vira J. Froehlinger, Editor and Co-Author. Alexander Graham Bell Assn for the Deaf, 3417 Volta Place NW, Washington, DC 20007 240 pages. \$14.95. 1981

See also sections on: SEATING, CONTROL, COMMUNICATION AND SENSORY AIDS, MICROCOMPUTER APPLICATIONS, TOYS & GAMES

95



VOCATIONAL EDUCATION

The resources available in the field of vocational and industrial education are often overlooked both by adult rehab personnel and by special educators. These resources span the transition zone between classroom and employment. It stands to reason that if an equipment modification was needed to train a disabled student in shop, the same adaptation may be needed on the job. Some of the technical aids, adaptations and approaches that are useful at work may also be beneficial in school (and vice versa). Hopefully, exposure to the realm of vocational education will draw us closer to vocational goals, then the transition will be complete.

Publications from the Vocational Studies Center (Publications Unit, University of Wisconsin-Madison, 964 Educational Sciences Building, 1025 W Johnson Street, Madison, WI 53706, phone 608/263-4357) have found their way into "rehab" by the force of aggressive marketing.

Tools, Equipment & Machinery Adapted for the Vocational Education & Employment of Handicapped People. The original guide to modified tools, containing descriptions and illustrations of 283 products modified for use by handicapped people in vocational education and employment. Cross-referenced by disability and by vocational area. 787 pages. 1981. \$33.00.

Tools, Equipment & Machinery: A New Catalog Supplement. Adapted for the Vocational Education & Employment of Handicapped People. The supplement contains descriptions and illustrations of 231 products modified for use in educating and employing handicapped people. There are no duplications from the original Tools (described above), but 671 pages of all new, modified products. A valuable guide for employers, consumers, vocational and special needs educators. 1983. \$32.00.

Others, such as Special Needs Education Material for Vocational and Industrial Education (see below) are not as easy to locate (This book is, however, cited in Tools, Equipment & Machinery).

Special Needs Education Material for Vocational and Industrial Education: Apparatus Plan Book. Kenneth L. Bruwelheide, Project Director. Department of Agricultural and Industrial Education, Montana State University, and Montana State Office of Public Instruction, Vocational Education, Helena, Montana. 1981. "This planbook is a collection of technical drawings, illustrations, and bills of material of apparatus developed to assist the physically handicapped while working in a vocational area laboratory/shop setting. Most apparatus are designed as retrofit items to be placed on, or added to, existing commercial wood-working and metal working tools and equipment."

"Safety and proper tool usage was a prime consideration while developing these apparatus. Every effort was made to preserve correct operational procedures."

"It is noted that these apparatus will not solve machine/tool operation difficulties for all handi-

capping conditions. Each handicapped individual has their own set of abilities and disabilities. Hopefully these plans may serve as a guide for the continued development of such apparatus for many handicapped individuals.

"While planning, constructing and testing these apparatus the following factors were kept in mind:

- A Safety of use
- B Simplicity
- C Availability of materials
- D Expense
- E Ease of construction
- F Not to restrict the use of tools and equipment by the non-handicapped

"Each of the items is complete with an orthographic drawing, an isometric illustration, and a bill of materials. It should be noted that dimensions may need to be changed to fit particular pieces of equipment."

Special Needs Education Material for Vocational and Industrial Education is a four-part series: Apparatus Plan Book, Bibliography, Planning Guide for Vocational Area Teachers, and Classroom Teachers Handbook. Part of the bibliography is included here.

"The purpose of this bibliography is to present references pertinent to Special-Needs--Mainstreaming Topics. In particular, this listing reflects the effects of Public Law 94-142 upon the various disciplines of vocational education and related topics by presenting material published since the law's passage in 1975. Selected earlier references were included when determined to be of particular value."

"Resources examined include:

- "Applied Science and Technology Index
- Business Periodicals Index
- Current Index to Journals in Education
- Dissertation Abstracts International
- Education Index
- Monthly Catalog to United States Government Publications
- Monthly Checklist of State Publications
- Public Affairs Information Service
- Resources in Education (including an ERIC database search)
- Resources in Vocational Education
- Social Sciences Index
- State Education Journal Index
- Subject Guide to Books in Print

"This bibliography is compiled in an effort to assemble as many sources and references related to mainstreaming as possible, it should not be considered complete or comprehensive. Citations have not been systematically evaluated, and no implications regarding quality of materials should be drawn."

96

"Since the first edition of this bibliography was compiled in May of 1980, there has been an explosion of printed material on the subject of mainstreaming. Thus, the above resources have again been searched and the findings have been incorporated to form this second edition."

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## TECHNOLOGY AT THE WORKPLACE

## INTRODUCTION

"Appropriate technology for the workplace becomes an issue when a disabled person takes a new job or when a person becomes disabled and returns to an old job. Questions are often raised about appropriate technology and cost-effectiveness when considering job site modifications and the use of adapted equipment."

Dr. Nancy Crewe lists seven criteria for successful job site modifications for handicapped workers. Each criterion asks a question or series of questions which, if answered correctly, can create a successful job site adaptation to help a worker become more productive. The seven criteria and some related questions are:

- **Function:** Will the adaptation meet the need? Will it do what is expected of it?
- **Adaptability:** Will the modification impair the usefulness of equipment for nondisabled co-workers? What are the attitudes of co-workers toward the adaptation?
- **Availability:** Can the equipment be obtained? Can it be manufactured easily?
- **Cost:** How much does it cost? Can the money be found to pay for it? Is it cost-effective?
- **Maintainability:** Can it be maintained easily? Is it simple enough to minimize maintenance problems?
- **Comparability:** Is this adaptation better than the available alternatives?
- **Acceptability:** Will the handicapped worker use the adaptation?

from Technology for Independent Living II, Project on Science and Handicapped. Available from American Association for the Advancement of Science, 1776 Massachusetts Avenue NW, Washington, DC 20036

## COSTS

For statistics on costs of reasonable accommodation, and the percentages represented by special equipment, refer to:

A Study of Accommodations Provided to Handicapped Employees by Federal Contractors. Commissioned by the Department of Labor.

Excerpts from this study can be found in the **FUNDING** section of this Sourcebook, page 262

## WORKSTATION DESIGN

Samuel R. McFarland  
Southwest Research Institute  
San Antonio, Texas

## A. INTRODUCTION

In the Third Wave, Alvin Toffler predicts that, in the future, the "electronic cottage" will enable people to remain at home while on the job. Electronic communication and materials handling systems will nullify the need for co-workers to be housed under the same roof. Indeed, recent trends in production assembly lines and office architecture toward flexibility in spatial arrangement and furnishings tends to support his forecast. Modular offices are being created so that a work area can be easily rearranged to suit the needs of a specific worker and his job description. By quickly interchanging modular components, a work area can be expanded or contracted and changed from a drafting area to a secretarial area to an electronics assembly area to a recreational area. A great deal of research and innovative design has gone into these new concepts.

But, at present, most offices are fixed by rigid walls, heavy file cabinets, and twin pedestal desks. Manufacturing areas have rigid piping, bolted down workbenches, and crowded floorspace. To change is an expense beyond the present budget. The disabled job applicant must deal with the fact that his prospective work area is inflexible and his prospective employer is cost-conscious. Rehabilitation engineering for workstation adaptation must deal with the practical realities of the irresistible force versus the immovable object. The wheelchair user must be squeezed into a confined space, raised to table height, and his available functional capacity must be augmented with adaptive devices. This must be done at minimal cost with only minor alteration of the employer's work area. The resulting adaptation must be delivered quickly, allow for frequent updating, and last "forever."

As if the mechanical requirements were not stringent, the interfacing systems are even less workable. The vocational rehabilitation agency, in an effort to mix the two extremes of client service and taxpayer accountability, will delay the placement process in order to document the procedures. The potential employer understandably, does not want to modify his building, threaten his insurance program, or alter a worksite for a handicapped applicant, if an able-bodied person has also applied. Besides, the employer probably wants someone "now," not six weeks downstream when all the evaluations and adaptations have been completed.

This presentation will attempt to describe realistic, cost-effective, quick response methods for approaching the challenge of workstation adaptation for persons whose neuromuscular, auditory, or visual function differs significantly from the norms which guided the configuration of an existing worksite.

**B. FUNDAMENTAL PRINCIPLES**

1. Validate in Use

There is no place in our methods for a "disability type." The individual for whom adaptations are planned is unique and must be intimately involved in the process. He alone will determine the success of the adaptation. The prospective employee must ultimately demonstrate, to himself and his potential employer, that he can perform the work required by the job. Only then can the validity of the adaptation be proven.

2. Focus on Function

It is altogether too easy to be distracted by a person's disability. To do so is to dilute the energy directed toward augmenting the ability that is available. By focusing on the work tasks required, we are able to concentrate adaptive resources on the positive, usable functions.

3. Strive for Simplicity

A designer may have a tendency to create elaborate, sophisticated, high-performance adaptive modifications. To do so is to introduce complexity, unreliability, and high-cost. Worse still, there is a significant risk that the adaptation will stymie growth and advancement on the job. Inexpensive, readily purchasable consumer products should be utilized to the ultimate.

4. Generalize

Many worksite adaptations intended for a handicapped person have proven to benefit the non-handicapped co-worker as well. After all, if optimizing work function is the goal, it is likely that anyone's function at the workstation will be enhanced. This can be a strong convincing argument for a potential employer.

**C. CONSTRAINTS**

As a workstation designer, you must realize that you are a small part of the system which is involved with preparing a suitable work situation for its client. Each part of that system is guided by expectations regarding time, cost, documentation, and definition of success. The key participants in that system are the client, his prospective employer, the service provider (counselor, rehab nurse, placement specialist). You must recognize that the needs of each are not necessarily compatible.

1. Client

The person for whom the worksite is being designed is either a "new hire," has not worked for that employer before, or he is a "re-employ," has worked for the employer before, but not necessarily at the same job. If he is already knowledgeable about the job, he is your most important source of information. If not, reserve his input for the trial-use stage mentioned later. He will be concerned with time and appearance, not costs.

2. Employer

If the client is a "new hire," the employer will be concerned about the compatibility of the client and any intended adaptations with his status quo. Unless he is under pressure to provide accommodations for handicapped workers, he will push for minimal changes to the work area and demand that modifications be performed quickly and at small cost to his budget. It will be important for the client to perform competitively with respect to his non-handicapped co-workers.

If the employer is trying to satisfy a requirement that he accommodate handicapped persons, then time and cost may not be serious constraints. His primary mission will be to show good intent, whether he actually hires or not. If he has a strong resistance to hiring handicapped workers, he may wish to extend the period of adaptation.

On the other hand, if the employer is trying to reinstate an experienced employee who has become disabled during a term of employment, he will probably be more seriously motivated toward getting an appropriate workstation adaptation. He will, in this case, be more likely to commit time and money to the task, especially if the adaptation will enable return to the same job function as before the disablement occurred.

3. The Service-Provider

The intermediary in most vocational rehabilitation cases is the agent who attempts to marry the employer and the disabled client. He may be a government employee, a medical professional, or an insurance person. In most instances, the service tends to be either medically or educationally oriented, and almost always requires a great deal of documentation. Typically, a client file contains reports from a medical doctor, a psychologist, one or more therapists, and a vocational evaluator. In most instances, he will have undergone a physical capacities examination, various skills and preference tests, and work adjustment training. At the time he is presented to the prospective employer (and the workstation designer), he has been declared "work ready."

For most of these reports and tests, the professional who wrote the report has been paid according to a negotiated fixed fee schedule or hourly rate. The client passed through this system at a pace set by the professionals. There is no set fee schedule for workstation design, however, so it is usually necessary for the designer to prepare a cost-estimate and be prepared for competitive bidding or a delay pending justification of a sole-source contract.

4. Payment System

The workstation designer will not be paid up front, he must wait as much as several months after completion of the job. In decreasing order of promptness, payment will come most quickly if from the employer, then the insurer, then the government agency. If special adaptive equipment is to be specified by the designer, then purchased by the service-provider, expect to be delayed by the procurement system.

These experienced observations are colored with cynicism, admittedly, but are offered as realistic precautions. If the designer is aware of the pitfalls, he should be better prepared to plan and schedule his design and creative services. He must access a capital base which will allow him to survive until the backlog of work and receivables becomes balanced to the point of being financially self-sustaining and evenly paced.

#### D. DESIGN PROCESS

To ensure that the client is successfully and permanently adapted to his intended work, the designer must consider the worker and workstation as components of a steady work flow process. There are two processes that must interact smoothly, getting to and from the workstation and doing the work itself.

##### 1. Access

A worker is not a permanent attachment to his worksite, he must move to it, away from it, and around it during the course of a work period. If access is a time and energy-consuming struggle, it not only reduces the efficiency of the work period, but it also limits the freedom for occasional stress-relieving breaks. The entire employment environment should be surveyed for accessibility. Not only the main entrance, rest-rooms and water fountains (as is most common), but also the supervisor's office, the coffee urn, the lunchroom, and the emergency exits.

Access space requirements are three-dimensional. A common mistake in examining accessibility is to focus on the floor plan. Remember that barriers can include poor illumination, lack of tactile and audible labels, and overhanging obstacles for visually handicapped workers; time period bells and safety alarms or sirens for hearing impaired workers; and door thresholds, heavy door closers, and dirty or cluttered floors for mobility impaired workers. Of course, there are many other details to be considered for each client such as intolerance to temperature extremes in the SCI quad. It is essential, however, to take time to thoroughly flush out potential barriers. If possible, include the client in your evaluation at the worksite. If not, make a concerted effort to play his role, complete with cane, wheelchair, or whatever adaptive devices may be used by the prospective employee.

##### 2 Positioning

Locating the worker relative to his work function can be a key element in the efficiency and endurance of his daily performance on the job. In many cases, the disabling condition causes a significant deviation from the norms used in the original design of furniture and machinery used by non-handicapped employees. Because of visual impairment, a worker may need to be positioned so that his eyes are very near his work without accessing an uncomfortable sitting, standing, or bending over position. Necessary occasional supplies may have been stored in overhead cabinets that are beyond the reach of a seated person. A cerebral palsied person may require that the work be lo-

cated in her lap or to one side. An arthritic client may not be able to tolerate upright seating for prolonged periods.

##### 3 Interface

Assuming that the client has been accessed to and positioned at his workstation, we can now attempt to plug him into the work flow. As stated previously, the workstation design should neither modify the person nor the work to be done. Both should be considered inviolate. The remainder is the space between the worker and the work, the interface. We can attach to the worker and the workpiece and we can design the linkage between

It is appropriate at this point to bring up and emphasize a common pitfall in adaptive workstation design. When supplied with a limited array of worker functions and a requirement for competitive productivity, there is a tendency to automate, to supplant worker function with machine function. The danger is that "supplant" can easily become "replace" and the outcome of such an evolution is to eliminate the role of the worker. Automation is a usefully ally in workstation design, but, like alcohol, needs to be used in moderation and with a cautious appreciation for the effects of its abuse.

Attachments to the worker are nominally encompassed by the professions of occupational therapy, orthotics, and prosthetics. If a mouthstick, head-pointer, hand splint, torso harness, or leg bracing are required for a workstation system design, the professional should be consulted or retained.

Attachments to the machinery or workpiece are sometimes better understood and produced by the plant engineer or the machine manufacturer. If a keyguard, a switch relocation, or a workbench alteration are needed, these specialists should be contacted. Many times, a rough concept of the required modification is all the workstation designer need to supply. The machine technician can often take it from there.

The linkage between worker and workplace is the most fertile ground for the specialized equipment knowledge and creativity of the adaptive workstation designer. In that arena, the designer can achieve a successful extension and augmentation of available function without changing the worker or the machinery and furniture. Switches, electronic communicators, reaching aids, turntables, adaptive telephones, environmental controls, and specialized tools and material handling equipment are some of the specific linkages which are used.

#### E. SIMULATION

There is no more revealing evaluation technique than real, on-line trial work by the prospective employee. If the employer will cooperate, the trial should be conducted on-site, at a conventional production worksite. If not, in his training area. If not that, then opt for remote simulation, incorporating as much detail as practical.

Since this is probably the most impactful opportunity for the workstation designer, he should attempt to simulate a completed adaptation, if possible. To do so requires access to a broad array of commercially available adaptive equipment and materials for fashioning crude modifications on site. In our experience, there are a few materials that will enable a broad sweep of adaptations, namely duct tape, cardboard boxes, and balsa wood. They can be formed into many shapes, are reasonably durable, and are readily available at most neighborhood hardware stores.

Simulation is a powerful, non-threatening way to test a workstation design concept. If it works, it strengthens the resolve of all concerned, if it doesn't, it is easy to change. The margin between success and failure in adaptation is measured in fractions of an inch, best gaged by actual trial use, which simulation provides. Until it has proven to be functional, a workstation should remain flexible. Size, color, illumination, height, angle, separation, and location of workstation components must be tailored to the user for optimum performance.

### F. TOOLS

This section relates closely to interface design, but is so important it needs to be discussed separately. Tools are machines intended to enhance human performance. Pliers amplify gripping force, a hammer increases impact energy, a template guides a pencil to improve the accuracy of a shape. Force, accuracy, speed, and endurance can be aided by appropriate tool selection.

Tools are often assigned to a specific worker and are considered as expendable and renewable supplies. If a custom adaptation is needed for a disabled worker, it should be applied, if possible, to the tool rather than the worksite. In most areas, the vocational rehabilitation agency will purchase tools and simple modifications for its client. Tools are readily available, inexpensive, easy to service or replace, and familiar to non-disabled co-workers. The last feature aids in the attitudinal adaptation at the worksite. The other features introduce a more general, very important principle.

### G. PROCUREMENT

#### 1 Supply Resources

In adaptive design there is a tension between two principles:

- Custom workstations optimize performance (but are expensive to produce)
- Conventional workstations are less expensive (but may not aid performance)

Realizing that time delays for adaptation and expensive changes are major barriers to successful job placement, we are forced to lean toward the latter principle. A greater success pattern will derive from consistently quick, inexpensive adaptations, even though that may not promote the optimum performance from the worker.

The adaptive designer should develop a knack for identifying common, commercially available tools, materials and components to incorporate into supply houses, and industrial or office supply catalogues are fertile resources for ideas and solutions. The immediate shop or office environment may offer significant clues for adaptive products.

#### 2 Equalizers

There are products in daily use in modern industry that are adaptive in nature, largely insensitive to a disabling condition. They are familiar, commercially available, and relatively inexpensive because of a broad market. While examining a potential employer/worksite, look for and point out the adaptability of:

- modular furniture
- movable partitions
- adjustable furniture (drafting tables)
- electric carts
- intercoms and speaker phones
- microcomputers
- horizontal files
- elevators

### H SUMMARY

As workstation designers, we need to be timely, cost-conscious, and practical. We should emphasize and enhance the "normalcy" of our client.

THREE CASE STUDIES

The Rehabilitation Engineering Center at Wichita, Kansas provides vocational opportunities for severely handicapped people through the medium of engineering. These case studies are a brief outline of the process used in the application of rehabilitation engineering to vocational problems confronting severely handicapped people. They range from the simple to the complex, the relatively inexpensive to the expensive. They are an example of how rehabilitation engineering can be put to work effectively solving problems in living and independent vocational realm.

John Leslie  
Cerebral Palsy Research Foundation of Kansas  
Wichita, Kansas

**I. Case Study One** The development of a head switch to allow a handicapped person to operate a numerically controlled lathe

**A** Definition of the Problem

- 1 The person was unable to open and close the jaws of the chuck of the lathe since he had only one functional arm
- 2 The job necessitated two good arms in order to open and close the jaws of the lathe while, at the same time, handling materials
- 3 The simultaneous use of both hands was necessary in order to perform the job as the machine was originally configured

**B** The Problem Solution

- 1 It was determined that the handicapped employee could open and close the jaws of the chuck of the lathe through a switch that he could control with his head
- 2 By interdicting the existing controls on the machine, the head control switch could be utilized by the handicapped employee and still the machine could be operated by the able-bodied employee in the normal manner
- 3 The cost of such an adaptation which allowed the handicapped person to be productive on the job was less than a total of \$20.00

**C** The Outcome

- 1 Using this device, the individual performing the task was totally productive on a plateau equal to his able-bodied counterparts
- 2 The cost of the adaptation was charged off in a very short period of time due to the high volume rate of production that is characteristic of numerically controlled lathes

**II Case Study Two** Development of adaptive hardware to allow a quadriplegic spinal cord injured person to pursue a professional career in painting

**A** Definition of the Problem

The handicapped person involved desired to pursue a career in professional painting. He performed painting activities through the use of a mouth stick since he was a high level quadriplegic because of an automobile accident

- 1 He needed to be able to adjust a drafting table both up and down and fore and aft
- 2 He wanted to be able to select one specific color from a group of colors on individual magic markers
- 3 These operations had to take place under the control of a head stylus

**B** The Problem Solution

- 1 A commercially available drafting table with "up and down" controls was purchased
- 2 A modification was made in the table through the design of the bracket and the utilization of electric actuator which allowed the table to be tilted fore and aft
- 3 A lazy susan type carousel was designed to accommodate 100 magic markers so that the individual could obtain one magic marker from the selection of 100

**C** The Outcome

- 1 The individual is productive as an artist using the adaptive device
- 2 The cost was approximately \$4,000
- 3 The adaptation was relatively simple and could be performed by local technical personnel

**III Case Study Three** The operation of a three-axis crimper by a severely handicapped cerebral palsied individual

**A** Definition of the Problem

It was desired to have a severely handicapped individual crimp a tube at three places, 120 degrees apart

- 1 The able-bodied person would utilize a punch press and perform three separate crimping operations requiring that the tube be inserted, crimped, extracted and rotated, crimped, extracted, etc.

103 The individual selected for the job had very little functional capability, either handling material or placing the tubes within the



punch press

3 The volume of production was such that 1 800 units per day was needed

**B The Problem Solution**

A three axis crimper was designed in conjunction with a feeding mechanism to allow this severely handicapped individual to perform the job

- 1 The tube was crimped at three places simultaneously thus eliminating any insertion or extraction process
- 2 A feeding mechanism was designed to feed the handicapped employee one tube at a time so that he could place it in the feeding cradle of the machine
- 3 A feeding device was designed to insert the tube onto a crimping device and retract it after the crimping operation took place
- 4 The handicapped person disposed of the tube after the operation was successfully completed

**C The Outcome**

The handicapped individual was assigned to the job and became productive after a relatively short training period

- 1 He easily met or exceeded the 1,800 unit per day criteria
- 2 After working on the job for approximately two years, his posturing and general physical well being improved
- 3 This individual became a valued employee at Center Industries Corporation and received minimum wage or above and has a total fringe benefit package including hospitalization, life insurance, paid vacations, etc

The Cerebral Palsy Research Foundation of Kansas publishes the quarterly Tech Brief - Problem Solving with Rehabilitation Engineering. Some of the articles in this series include

- Pneumatically-Powered Wirebender
- Digital Readout Numerical Counter
- Morse Code Typing Aid
- Reaction and Reach Timing Device
- Cylindrical Parts Selector Feeder
- Spindle Drilling Fixtures
- Floor Sweeping Collector
- Work Station for a Quadriplegic CP Typist
- Intra-Individual Ability Evaluation Using the Available Motions Inventory
- Power Lawn Mower "Dead-Man Switch"
- Water Hydrant Torque Assisting Tool

**FARMING**

Breaking New Ground, Bill Field, Ed Dept of Agricultural Engineering, Purdue University, West Lafayette, Indiana 47907 This quarterly newsletter is published through the handicapped Farmer Project at Purdue University The newsletter reports on developments and resources in the field and carries accounts of farmers who have successfully overcome their disabilities Although there is no subscription fee, donations of \$10 or more are requested for this client supported newsletter

"The Disabled Farmer" Paraplegia News, December, 1981 Paralyzed Veterans of America, Washington, DC

"Nature and Proportion of Physical Impairments Among Indiana's Farm Operators" Roger L Tormoehlen and Bill Field Department of Agricultural Engineering, Purdue University, West Lafayette, Indiana 47907 \$1.00 A summary of a study to determine the nature and proportion of physical impairments affecting Indiana farm operators Selected case histories are included

"Working the Land Adapting Farming for Disabled People" Disabled USA Volume 4, No 6, 1981 The President's Committee on Employment of the Handicapped, Washington, DC

Further information on adapted equipment used by disabled farmers may be found by contacting

Jiri J Vasa  
Rehabilitation Engineering Section  
Biomedical Engineering Unit  
Queen's University  
Kinston, K7L 3N6  
CANADA

William E Field  
Extension Safety Specialist  
Department of Agricultural Engineering  
Purdue University  
West Lafayette, Indiana 47907  
314/494-1191

There have been a series of workshops for handicapped farmers (Lansing, Michigan, March 1983, Grand Forks, North Dakota, July 1983) Field says that it is sometimes difficult to get the farmers to come to the workshops "because they don't see themselves as handicapped" But these independent and self-reliant farmers have quickly come to realize the many benefits to be had from swapping ideas and resources The workshops includes examples of owner-built manlifts and controls for tractors, combines, and other equipment, an overview of agricultural equipment adaptations, and a review of resources available to the farmer/grower or family member

If you would like to have a workshop in your area, or know of an event that would be of special interest to farmers with physical disabilities, please contact Bill Fields at Purdue University



**TECHNOLOGY FOR EMPLOYMENT: RESOURCES**

**ORGANIZATIONS**

These groups focus on employment for the disabled, they can provide information and/or publications on employment related technology

Human Resources Center  
1 U Willets Road  
Albertson, NY 11507  
(516)747-5400

Mainstream, Inc  
1200 15th Street, N W  
Washington, D C 20005  
(800) 424-8089, also for TTY  
(202) 833-1136

Materials Development Center  
Stout Vocational Rehabilitation Institute  
University of Wisconsin-Stout  
Menomonie, Wisconsin

President's Committee on Employment of Handicapped  
1111 20th Street, N W, 6th Floor  
Washington, D C 20210  
(202) 653-5044

Rehabilitation Engineering Center  
Cerebral Palsy Research Foundation of Kansas  
P O Box 8217  
Wichita, KS 67208  
(316) 688-1888

RehabTech (formerly IMPART)  
Texas Rehabilitation Commission  
118 East Riverside Drive  
Austin, TX 78704  
512/445-8375

University of Wisconsin-Stout  
Vocational Rehabilitation Center  
Menomonie, WI 54751  
715/232-1464

**PROFESSIONAL RESOURCES**

American Institute of Independent Engineers  
25 Technology Park-Atlanta  
Nor Cross, Georgia 30092  
(404) 449-0460

American Society of Mechanical Engineers  
345 E 47th Street  
New York, NY 10017  
(212) 644-7722

American Society of Safety Engineers  
850 Busse Highway  
Park Ridge, IL 60068  
(312) 692-4121

International League of Electrical Association  
2101 L Street, N W  
Washington, D C 20007  
(202) 457-8452

National Tool and Die Makers  
75 Airport Road  
Hartford, CT 06114  
(203) 522-7279

**GROUPS CONCERNED WITH COMPUTER EMPLOYMENT AND PROVISION OF COMPUTER-RELATED SERVICES BY SEVERELY HANDICAPPED INDIVIDUALS**

Association of Rehabilitation Programs in Data Processing (ARPD)  
P O Box 2404  
Gaithersburg, MD 20879

The ARPD represents 26 programs across the country which train severely handicapped individuals as computer programmers. Graduates of these programs are placed in competitive employment. As of December 1982, 715 out of 893 students were successfully placed. The Association responds to inquiries concerning the specific needs of disabled programmers. Persons desiring detailed information are referred to the training program nearest to them. A quarterly newsletter is available from VIEWPOINT, Center for Independent Living CTP, 2020 Milvia, Room 470, Berkeley, CA 94704

Business Information Processing Education for the Disabled Corporation (BIPED)  
26 Palmer's Hill Road  
Stamford, CT 06902  
203/324-3935

Non-profit educational project for computer programming and related information processing skills for the disabled

Iowa Computer-Assisted Rehabilitation Group (ICARG)  
Apt B  
Northgate Manor  
Waukon, IA 52172

Georgia Computer Programmer Group  
2201 Glenwood Avenue, SE  
Atlanta, GA 30316

LIFT, Inc  
350 Pfingsten, Suite 103  
Northbrook, IL 60062  
312/564-9004

Not-for-profit contract programming company which identifies, trains and hires physically handicapped to major corporations

Pearson Computer Assessment Centre  
Pearson Hospital  
700 West 57th Avenue  
Vancouver, BC V6P 1S1 CANADA

Test Fast Services, Inc  
245 Bedford Road  
Pleasantville, NY 10570  
914/747-1311

Gerald Warren & Associates  
4825 Stanford Avenue NE  
Seattle, WA 98105

A RESOURCE FOR DEVELOPING ACCESSIBLE JOBSITES

**DESIGNING FOR FUNCTIONAL LIMITATIONS**

James Mueller  
The Job Development Laboratory, George Washington  
University, Washington, DC

**"How to Use This Resource**

"The following is an example of how **DESIGNING FOR FUNCTIONAL LIMITATIONS** can be used

"Paul has applied for the job of information receptionist at a large government office. Paul has cerebral palsy. He is qualified for the job, but he and his employer feel that some modifications to the worksite may help. The job requires access to a large directory of employees which must be accessed quickly for visitors seeking a specific office or telephone number. There is considerable use of the telephone involved, and verbal assistance must occasionally be given to visitors.

"Paul and his prospective employer have reviewed **WORKSITE 1** and **2** illustrations on pages 5 and 7 to check for any major barriers in the general work environment. It is noted that the most serious barriers have already been removed, but door knobs will have to be replaced with levers.

"They then review further modifications as illustrated for functional limitations on pages 13 through 74. On the reverse side of each illustration are listed any disabilities which may require the modifications printed in dark over the **WORKSITE** illustration. Although Paul has cerebral palsy, he has no difficulty in interpreting information, no limitation of speech, no incoordination, or difficulty in moving his head, therefore, these modifications were not considered. His functional limitations which may affect job performance include poor balance, difficulty in using lower extremities, and difficulty in handling and fingering. The illustrations for these limitations (pp 41, 39, 33, 73, 71, 65) suggested modifications which could help Paul be more independent at work.

"Handle assists can be placed at the desk to aid him in sitting down and rising from the chair. The stool at the worksite can be replaced with one having full arms and a backrest. Quick access to the office directory is done with a microfilm viewer and a microfilm version of the director. The viewer controls can be converted to push-button operation. A headset receiver will make use of the telephone easier. Paul and his employer agree that these modifications will be useful and cost-effective for this job/client match. In this situation, **WORKSITE 1** was used. However, had the job required it, **WORKSITE 2** illustrations might also have helped.

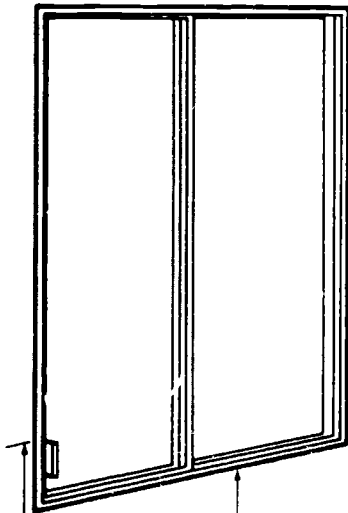
"Counselors and evaluators will find **DESIGNING FOR FUNCTIONAL LIMITATIONS** helpful in job planning with their clients. Employers can use it in planning affirmative action programs. Designers and engineers, as well as students of these professions, can use it to plan environments and products more suitable for use by able and disabled consumers alike. **DESIGNING FOR FUNCTIONAL LIMITATIONS** is a workbook, not a textbook. It is offered in looseleaf format to encourage additions, notes, and convenient use. Your comments on its usefulness to you are welcome."

The following six pages are reprinted here with the permission of the Job Development Laboratory, George Washington University, Washington, DC

**WALLS**

USE SLIP-RESISTANT, NON-GLARE SURFACES  
AVOID ROUGH SURFACES AND PROTRUDING OBJECTS  
AVOID TOTAL SOUND ABSORPTION

SLIDING WINDOWS PREFERRED



WINDOW CONTROLS  
20 - 54" (508 - 1372mm)  
MAX OPERATING FORCE  
5 LB (22.2 N)

23.5 - 35"  
(598 - 889mm)

18 - 48"  
(457 - 1219mm)

LOCATE BULKIEST OBJECTS  
ON LEVEL WITH DESK

9 - 12" (227 - 305mm)  
MAX SHELF HEIGHT  
63" (1600mm)

**TELEPHONES**

RECEIVER WITH VOLUME CONTROL  
HANDSET CORD 36" (914mm) MIN

16.5" MIN  
(419mm)

29 - 38"  
(737 - 965mm)

**WORK STATION**

AVOID CENTER DRAWERS  
24" (610mm) MIN KNEE WELL WIDTH  
AVOID SHARP EDGES AND CORNERS  
NON-GLARE LIGHTING TO MINIMIZE FATIGUE

**SEATING**

ADJUSTABLE HEIGHT AND SUPPORT FOR LOWER BACK  
(FEET SHOULD REST ON FLOOR OR OTHER SUPPORT)

**INTERIOR SIGNS**

LOCATE NEAR DOOR FRAME ON LATCH SIDE  
LABEL USABLE FACILITIES WITH ♿ SYMBOL

**LETTERING**

LIGHT-ON-DARK PREFERRED  
0.625 - 1" (16 - 25mm) HELVETICA TYPE (ALL CAPS)  
RAISED 0.03" (1mm)  
MAY BE ACCOMPANIED BY BRAILLE  
SIGN HEIGHT 54 - 66" (1372 - 1676mm)

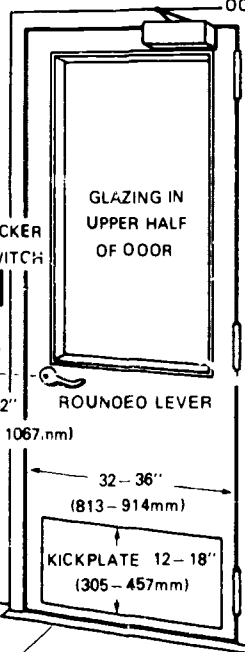
DIAL THERMOSTAT

ROCKER SWITCH  
36 - 48"  
(914 - 1219mm)

36 - 42"  
(914 - 1067mm)

**EMERGENCY**

FLASHING VISUAL ALARM (less than 5 Hz)  
8000 Hz AUDIOTORY ALARM (120 db max)  
DOOR CLOSER RESISTANCE  
5 - 15 LB (22.2 - 66.7 N)  
pref adjustable  
or automatic



**DOORS**

CLEAR SPACE ON BOTH SIDES OF DOOR  
SIDE-HUNG PREFERRED TO SLIDING TYPE  
DOOR SHOULD OPEN INTO LOWER TRAFFIC AREA  
GLASS SHOULD HAVE DECALS AT FACE HEIGHT  
0.5 (13mm) MAX THRESHOLD

**STORAGE CABINETS**

DRAWERS WITH ROLLERS FOR EASY OPERATION  
U-SHAPE HANDLES 4" x 1.5" (102mm x 38mm)  
DRAWERS SHOULD BE OPERABLE WITH ONE HAND

**WORKSITE 1**

**FLOORS**

NON-ABSORBENT MATERIALS IN WARM, DARK COLORS  
AVOID COLOR CONTRAST EXCEPT TO DENOTE LEVEL CHANGE  
AVOID SCULPTURED TEXTURES OR CHANGES IN DIRECTION OF GRAIN  
THIN, HEAVY-DUTY UNPADDED LOOP PILE CARPETING PREFERRED  
CARPETING SHOULD BE FIRMLY FIXED TO FLOOR

Specifications on the reverse side are based on body measurements of the average adult. Extremes of size and weight may require adjustment of some specifications. Further explanations of these guidelines may be found in the following resources, from which all specifications have been compiled.

#### CABINETS, DRAWERS, FILES

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3a, 3b.  
Goldsmith, Designing for the Disabled, 245-251, 315.  
Mace, An Illustrated Handbook of the North Carolina Building Code, 117.  
Steinfeld, Barrier-Free Design for the Elderly and Disabled, 111.

#### CLOTHES HOOKS

- Goldsmith, signing for the Disabled, 314.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 115.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 43.

#### DOORS AND HARDWARE

- Cary, How to Create Interiors for the Disabled 24-31.  
Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 26,30.  
Duncan, Gish, Mulholland, Townsend, Environmental Modifications for the Visually Impaired A Handbook, 444.  
Goldsmith, Designing for the Disabled, 185-190.  
Harkness, Groom, Building Without Barriers for the Disabled, 31-33.  
Mace, An Illustrated Handbook of the North Carolina State Building Code, 34, 35, 39, 40.  
Mace, Accessibility Modifications, 21-25.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 117, 77-80.  
Steinfeld, Barrier-Free Design for the Elderly and Disabled, 100-103, 76.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 34-37.

#### ELECTRICAL OUTLETS

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3b.  
Goldsmith, Designing for the Disabled, 212-213.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 110,118.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 41.

#### EQUIPMENT CONTROLS

- Bazar, Ergonomics in Rehabilitation Engineering, 55-71.  
Steinfeld, Barrier-Free Design for the Elderly and the Disabled, 111.

#### FIRE ALARMS/EXTINGUISHERS

- Harkness, Groom, Building Without Barriers for the Disabled, 16, 18.  
Mace, An Illustrated Handbook of the North Carolina State Building Code, 85.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 112, 125.  
Steinfeld, Barrier-Free Design for the Elderly and the Disabled, 72.

#### FLOORS

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 26.  
Duncan, Gish, Mulholland, Townsend, Environmental Modifications for the Visually Impaired A Handbook, 444-445.  
Goldsmith, Designing for the Disabled, 196-197.  
Harkness, Groom, Building Without Barriers for the Disabled, 16, 34.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 75.

#### INTERIOR SIGNS

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 28, 29, 3b.  
Duncan, Gish, Mulholland, Townsend, Environmental Modifications for the Visually Impaired A Handbook, 444-447.  
Harkness, Groom, Building Without Barriers for the Disabled, 16-18.  
Mace, An Illustrated Handbook of the North Carolina State Building Code, 84-85.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 112-113.

#### SHELVES

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3a, 3b.  
Goldsmith, Designing for the Disabled, 123-126.  
Mace, An Illustrated Handbook of the North Carolina State Building Code, 117.  
National Academic of Science, Accessibility An Approach to the Development of Design Criteria, C12-C15.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 43.

#### TABLES, DESKS, WORK STATIONS

- Austin, Resources Handbook for Barrier-Free Design, 79.

Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3a, 3b.

Grandjean, Fitting the Task to the Man.  
Harkness, Groom, Building Without Barriers for the Disabled, 36.

Mace, An Illustrated Handbook of the North Carolina State Building Code, 92-93.

Ohio Governor's Committee on Employment of the Handicapped, Access for All, 115.

Trombly, Scott, Occupational Therapy for Physical Dysfunction, 391-392.

#### TELEPHONES

Cary, How to Create Interiors for the Disabled, 110.

Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 26, 3a.

Goldsmith, Designing for the Disabled, 214.

Mace, An Illustrated Handbook of the North Carolina State Building Code, 114-115.

Ohio Governor's Committee on Employment of the Handicapped, Access for All, 109-125.

Veterans Administration, Handbook for Design Specially Adapted Housing, 41.

#### THERMOSTATS

Mace, An Illustrated Handbook of the North Carolina State Building Code, 84-85.

Ohio Governor's Committee on Employment of the Handicapped, Access for All, 111.

#### WALLS

Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 26.  
Harkness, Groom, Building Without Barriers for the Disabled, 16.

#### WALL SWITCHES

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3b.  
Goldsmith, Designing for the Disabled, 211.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 111.  
US Department of Housing and Urban Development, Barrier-Free Site Design, 17.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 40.

#### WINDOWS AND CONTROLS

- Diffrient, Tilley, Bardaggy, Humanscale 1/2/3, 3a.  
Goldsmith, Designing for the Disabled, 178-180.  
Ohio Governor's Committee on Employment of the Handicapped, Access for All, 111, 124.  
Steinfeld, Barrier-Free Design for the Elderly and the Disabled, 106.  
Veterans Administration, Handbook for Design Specially Adapted Housing, 38.

EASIER DOCUMENT ACCESS  
USING BOOKSTAND,  
MICROFILM VIEWER,  
OR READING MACHINE  
(SEE "CONTROLS" AT RIGHT)



TELEPHONE AIDS:  
SPEAKERPHONE  
HEADSET RECEIVER  
ADJUSTABLE ARM FOR RECEIVER  
ENLARGED "TOUCHTONE" BUTTONS



PEN/PENCIL  
THROUGH RUBBER BALL OR  
HARD FOAM FOR EASIER GRASP

ELECTRIC SELF-CORRECTING,  
AUTO-RETURN TYPEWRITER  
WITH KEYGUARD FOR GREATER  
HAND SUPPORT AND ACCURACY  
AND PAPER ROLL

CASSETTE TAPE RECORDER FOR  
MESSAGES, MEMOS, DICTATION, ETC.

CONTROLS:

OPTIMUM OPERATING FORCE: 3/4 LB (3.2 N)  
PROVIDE AUDITORY/VISUAL FEEDBACK  
AVOID SLICK, UNTEXTURED SURFACES  
AVOID NEED FOR TWISTING MOTION  
PUSH-BUTTON OR ROCKER PREF. TO LEVER OR KNOB

AVOID DRAWERS DEEPER THAN 12" (305mm)  
OPEN DESK-TOP STORAGE PREFERABLE

BULKY OBJECTS SHOULD BE SLID RATHER THAN LIFTED  
USE SLICK SURFACES FOR EASIER MOVEMENT OF MATERIALS  
USE BOLTS, CLAMPS, OR NON-SLIP MATS WHERE STABILITY IS NEEDED

## DIFFICULTY IN HANDLING AND FINGERING

(AFFECTS APPROX. 1% OF U. S. POPULATION)

## DIFFICULTY IN HANDLING AND FINGERING

Persons with this limitation experience decreased mobility, range of motion, and/or strength in their hands. Approximately 1% of the US population is affected to some degree (National Academy of Sciences, 1976).

This limitation may be experienced by persons having any of the following disabilities:

- Amputations
- Arthritis
- Bilateral Hemiparetic
- Cardiac Disorders
- Cerebral Palsy
- Cerebrovascular Accidents (stroke)
- Congenital Deformities
- Dupuytren's Contracture
- Multiple Sclerosis
- Muscular Dystrophy
- Myasthenia Gravis
- Parkinson's Disease
- Polymyositis
- Severe Burns
- Spinal Cord Injury
- Syringomyelia

Aids suggested on the illustration below have been used by persons having this limitation. No endorsement of specific products is intended. The reader is encouraged to obtain further information from suppliers of:

- BOOKSTANDS
- CASSETTE TAPE RECORDERS
- MICROFILM VIEWERS
- NON-SLIP MATS
- OPEN DESK-TOP FILES AND STORAGE
- READING MACHINES
- TELEPHONE AIDS
- TYPEWRITERS
- TYPEWRITER KEYGUARDS, PAPER ROLLS

Further modifications to WORKSITE 1 for persons having this limitation are suggested on the illustration. Each one should be selected, amended, or rejected according to the expressed needs of the individual and the job.

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113

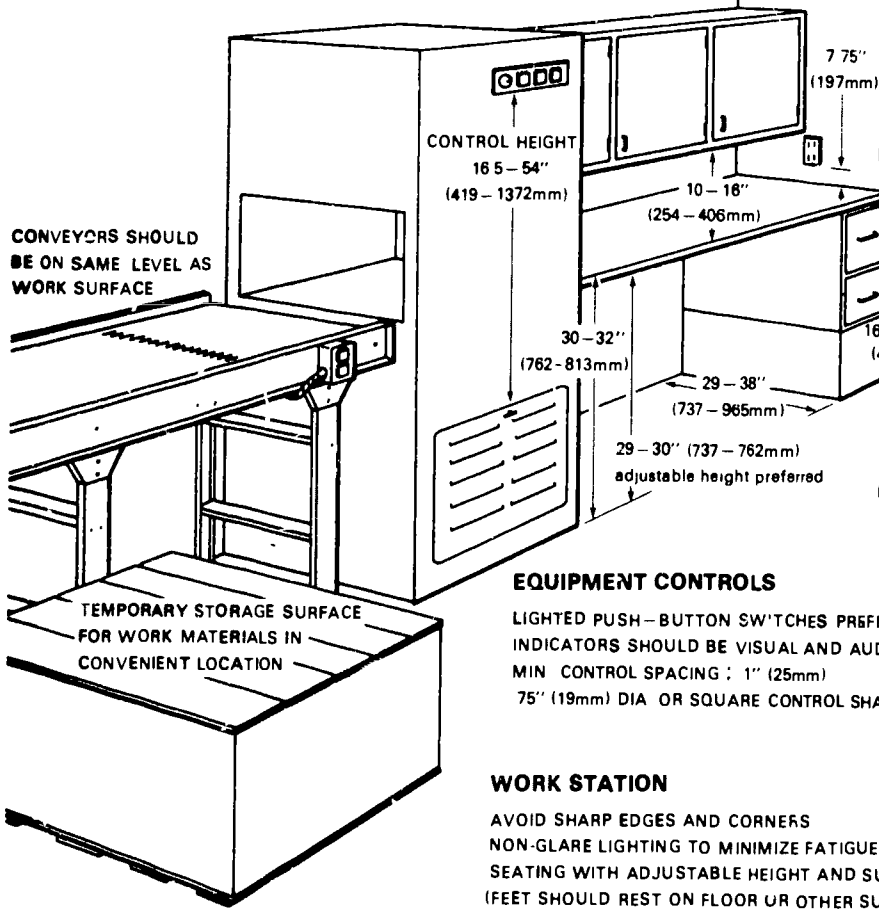
113



USE ONLY RESISTANT, NON-GLARE SURFACES  
 AVOID ROUGH SURFACES AND PROTRUDING OBJECTS  
 AVOID TOTAL SOUND ABSORPTION

**STORAGE CABINETS**

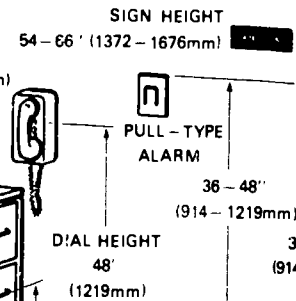
CABINET HEIGHT 63" MAX (1600mm)  
 U-SHAPED HANDLES: 4" x 1 5" (102mm x 38mm)  
 HANDLES SHOULD BE OPERABLE WITH ONE HAND



LOCATE NEAR DOOR FRAME ON LATCH SIDE  
 LABEL USABLE FACILITIES WITH ♿ SYMBOL

**LETTERING**

LIGHT-ON-DARK PREFERRED  
 0.625-1" (16-25mm) HELVETICA TYPE (ALL CAPS)  
 RAISED 0.03" (1mm)  
 MAY BE ACCOMPANIED BY BRAILLE



**TELEPHONES**

RECEIVER WITH VOLUME CONTROL  
 HANDSET CORD 36" (914mm) MIN

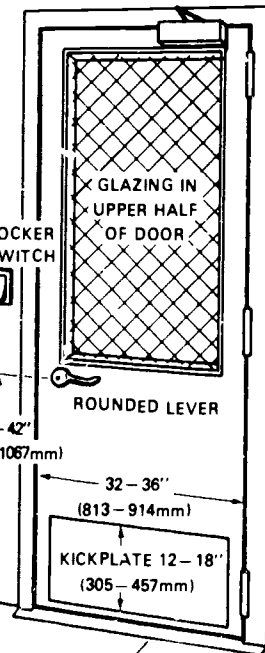
**EQUIPMENT CONTROLS**

LIGHTED PUSH-BUTTON SWITCHES PREFERRED  
 INDICATORS SHOULD BE VISUAL AND AUDITORY  
 MIN CONTROL SPACING: 1" (25mm)  
 75" (19mm) DIA OR SQUARE CONTROL SHAPE

**WORK STATION**

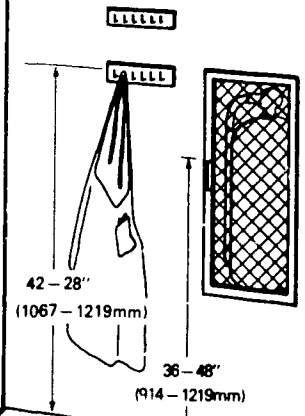
AVOID SHARP EDGES AND CORNERS  
 NON-GLARE LIGHTING TO MINIMIZE FATIGUE  
 SEATING WITH ADJUSTABLE HEIGHT AND SUPPORT FOR LOWER BACK  
 (FEET SHOULD REST ON FLOOR OR OTHER SUPPORT)

**EMERGENCY**



DOOR CLOSER RESISTANCE  
 7-15 LB (22.2-66.7N)  
 pref adjustable or automatic

IF EXTINGUISHERS MUST BE RECESSED,  
 DOOR HANDLES SHOULD BE  
 U-SHAPED: 4" x 1 5" (102mm x 38mm)



**DOORS**

SIDE-HUNG PREFERRED TO SLIDING TYPE  
 60" (1524mm) CLEAR SPACE ON BOTH SIDES OF DOOR  
 DOOR SHOULD OPEN INTO LOWER TRAFFIC AREA  
 GLASS SHOULD HAVE DECALS AT FACE HEIGHT  
 0.5" (13mm) MAX THRESHOLD

**FLOORS**

NON-ABSORBENT MATERIALS IN WARM, DARK COLORS  
 AVOID COLOR CONTRAST EXCEPT TO DENOTE LEVEL CHANGE  
 AVOID PATTERNS OR EXCESSIVE TEXTURES  
 FLOOR COVERING FIRMLY FIXED TO FLOOR

**SPECIFICATIONS ON THIS ILLUSTRATION SUGGEST IMPROVEMENTS TO WORKSITES WHICH WILL AID ABLE-BODIED AS WELL AS PERSONS WITH SENSORY OR LOWER EXTREMITY LIMITATIONS. CONSIDERATIONS FOR MORE SPECIFIC FUNCTIONAL LIMITATIONS ARE DESCRIBED ON TRANSPARENT OVERLAYS.**

**WORKSITE 2**

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Environmental modification guidelines illustrated in Designing for Functional Limitations have been compiled from resources on architectural accessibility, human factors, occupational therapy, and rehabilitation medicine, as well as from disabled persons' experiences at the worksite

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American Mutual Liability Insurance Company Physical Abilities to Fit the Job, Boston American Mutual Liability Insurance Company, 1956

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Chasin, Joseph and Jules Saltman The Wheelchair in the Kitchen, Washington, D C Paralyzed Veterans of America, 1978.

Decker, Roger W Mobile Homes Alternative Housing for the Handicapped, Laurinburg St Andrews Presbyterian College (funded by U S Department of Housing and Urban Development), 1977

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National Research Council Accessibility An Approach to the Development of Design Solutions, Washington, D C National Academy of Sciences, 1976

National Spinal Cord Injury Foundation National Resource Directory, Newton Upper Falls, Massachusetts National Spinal Cord Injury Foundation, 1979

The Ohio Governor's Committee on Employment of the Handicapped Access for All An Illustrated Handbook of Barrier-Free Design for Ohio, Columbus, Ohio The Ohio Governor's Committee on Employment of the Handicapped, 1977

Peterson, Carol Ann and Peg Connolly Characteristics of Special Populations Implications for Recreation Participation and Planning, Washington, D C Hawkins Associates, 1978

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Veterans Administration Handbook for Design Specially Adapted Housing, Washington, D C Veterans Administration, 1978

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## SELECTED PUBLICATIONS - TECHNOLOGY FOR EMPLOYMENT

An Annotated Bibliography of Literature Related To The Employment of Deaf Persons National Center on Employment of the Deaf, Rochester, NY Available from National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, NY 14623 1981 \$100

The Assertive Job Seeker Lilly Bruck A 3-cassette series "Technology in the Workplace," "Employer Attitudes," "The Civil Rights of Disabled Employees" Available from In Touch Networks, Inc., 322 W 48th Street, New York, NY 10036 1981 \$900

Assisting the Physically Handicapped An Identification and Development of Apparatus for Laboratory Shop Phase I K L Bruwelheide Montana State University, Department of Agricultural and Industrial Education, Bozeman, Montana 1979

A Comparison of Commercial Vocational Evaluation Systems (Second Edition) Karl F Botterbusch Materials Development Center, Stout Vocational Rehabilitation Institute, School of Education and Human Services, University of Wisconsin-Stout, Menomonie, WI 54751 1981 133 pages \$10.50 Provides professionals in many human service fields with accurate and detailed information on wide available commercial vocational evaluation systems

Designing for Functional Limitations J Mueller The George Washington University, Rehabilitation Research and Training Center, Job Development Laboratory, 2300 Eye Street, Washington, DC 20037 1979 Excerpts from this document appear at the beginning of this section

Employability Restorations Engineering Program for Severely Handicapped J W McLauring, PhD and C J Laenger, Sr Southwest Research Institute, P O Box Drawer 28510, 6220 Culebra Road, San Antonio, TX 78284 74 pages 1977 The report describes how adaptations, many quite simple and inexpensive, have allowed participants in the program to hold jobs

Employing the Disabled What Are Self-Help Groups and What Assistance Can They Offer the Employer? Rami Rabbv, 136 E 55th Street, Suite 8E, New York, NY 10022, (212) 371-7766 \$5.00 plus \$50 postage and handling 1981

Employment of the Handicapped Resource Guide US Department of Education, Office of Special Education and Rehabilitative Services, Publication No 82-22010, October, 1982 Information on programs to assist disabled persons in obtaining employment, programs creating job opportunities for disabled persons, programs regulating policies concerning employment of disabled persons, information for employers, and information resources and technical assistance

Employment of the Handicapped--The Goal of Integration and Safety in the Workplace Proceedings of the Rehabilitation International Vocational Seminar, Toronto, Canada Available from Secretariat, Vocational Commission, 1323 Forbes

Avenue, Pittsburgh, PA 15219 1980 \$900

A Guide to Job Site Evaluation K F Botterbusch Materials Development Center, Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout, Menomonie, Wisconsin How to use different types of job site evaluations, how to set up a job site and evaluate the client Sample evaluation forms included

Home Operated Business Opportunities for the Disabled Accent Special Publications, Cheever Publishing Inc., P O Box 700, Bloomington, IL 61701 109 pp 1977

Human Scale 1/2/3, 4/5/6, 7/8/9 The MIT Press, Institute of Technology, Cambridge, MA 12142 Anthropometric charts for men, women, and children Guideline requirements for physically disabled and elderly people

The Industrial Engineering Handbook for Sheltered Workshops David A Hietala and Paul M McCray RPM Press, P O Box 627, Menomonie, WI 54751 309 pages, figures, tabs Inquire for price 1982 A reference for streamlining productivity in work centers to result in maximum realistic performance

The International Directory of Job-Oriented Assistive Devices Lifeboat, Fox Hill Garden Offices, 5855 Green Valley Circle, Culver City, California 90230 \$29.95 A 200-page guide on assistive devices for over 25 disability groups The directory includes descriptions of individual disabilities, problems encountered, solutions, how the devices work, and the manufacturer to contact

Job Redesign Antonio Suazo Goodwill Industries of America, Washington, DC 1974

Job Related Physical Capacities Project Final Report Florida International University, Miami, Florida Refers to an aids and accommodations catalogue compiled as part of the project

Managing and Employing the Handicapped The Untapped Potential G C Pat, J I Adkins, and G Morrison Brace-Park Press, P O Box 526, Lake Forest, IL 1581 \$19.95 hardcover, \$14.95 softcover

Materials Development Center 1983 Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout, Menomonie, WI 54751 1983 17 pages A catalogue of print and audiovisual material about vocational evaluation and related services, rehabilitation facility operations, and independent living

Modifying the Work Environment for the Physically Disabled An Accessibility Checklist for Employers Margaret Desmond Human Resources Center, Albertson, New York 11507 107 pp 1982

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October 1981

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American Telephone & Telegraph Company Available  
from National Center for a Barrier Free Environ-  
ment, Information Service, 1615 Fifteenth Street  
NW, Washington, DC 20005 202/466-6896 323  
pages \$37.50, 1983 Although produced for  
AT&T, this document would also be useful to other  
employers and vocational counselors It contains  
an introductory section discussing the concept of  
reasonable accommodation and reviewing the legal  
and regulatory requirements The book provides  
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issues, San Antonio, Texas, June 5-9, 1979  
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Stout, Menominee, Wisconsin 141 pp 1979

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Foundation for the Blind, 15 West 16th Street, New  
York, NY 210 pp. 1978 Lists devices and  
equipment which provide on-the-job assistance to  
visually impaired people Each entry describes  
the function of the device, employment applica-  
tion, vendor, availability, and, in some cases,  
price Listings include hard copy and paperless  
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voice output calculators, computer terminals or  
accessories, labeling aids, measuring aids, commu-  
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People in the Workplace Mainstream, Inc., 1200  
15th Street NW, Washington, DC 20005 1981  
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Tools, Equipment and Machinery Adapted for the  
Vocational Education and Employment of Handicapped  
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Equipment & Machinery A New Catalog Supplement  
671 pages \$32.00 1983 Wisconsin Vocational  
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University of Wisconsin-Madison, Madison, WI  
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Vocational and Educational Aids Smith Kettlewell  
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well Institute, San Francisco, CA 31 pp 1982  
A catalog of sensory aids for blind persons, with  
an emphasis on low-cost electronic vocational  
aids. Includes information on acquiring devices  
or plans and circuit diagrams for devices which  
are not commercially available Pictures and a  
discussion of applications are given Devices  
include items to enable blind persons to read  
meters, scales and other measuring tools Also

available in braille

Work Independence and the Severely Disabled A  
Bibliography G Bilotto, and V Washam  
Research and Utilization Institute, National Cen-  
ter on Employment of the Handicapped, Human  
Resources Center, 10 Willetts Road, Albertson,  
NY 11507 1980 \$7.95 A review of literature  
covering areas related to independence at work  
architectural barriers, mobility, transportation  
job modification, specialized equipment, and  
general and vocational rehabilitation

Working with Cerebral Palsy EM Shaver and K  
Mallik George Washington University, Rehabilita-  
tion Research and Training Center, 2300 Eye  
Street, Washington, DC 20037 1981 \$6.00  
Vocational training of people with cerebral palsy  
includes a list of alternative techniques and  
devices to help overcome barriers at the work-  
place

Two European books on Technology Assisted Employ-  
ment have been translated into English recently

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Lucas Foundation for Rehabilitation, Hoensbroek  
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Between July 1979 and February 1982, the Founda-  
tion studied and developed technical provisions  
for their occupational training and occupational  
practice of individuals with physical disabili-  
ties A new team of mechanical engineers, docu-  
mentation specialist, and administrative assistant  
was recruited and trained to work with other  
Foundation members in gathering knowledge and  
providing experience about the applicability of  
technical aids to employment opportunities The  
project designed, produced, and tested technical  
aids in the work environment in cooperation with  
industry The project's successful production of  
usable items and procurement of jobs is discussed  
in the conclusion section accompanied by recommen-  
dations

Adapting Work Sites for People With Disabilities  
Ideas from Sweden Gerd Elmfeldt, Caroline Wise,  
Hans Bergsten, Ake Olsson The Swedish Institute  
for the Handicapped, Box 303, S-161 26 Bromma,  
Sweden Available in the USA from NARIC or from  
World Rehabilitation Fund, 400 East 34th Street,  
New York, NY 10016 Free The sources for sup-  
pliers are all Swedish, but many of the devices  
are available in the US Many of the adapta-  
tions, and the philosophy behind them, are readily  
applicable to the US

## PERIODICALS

\* specific focus on applications for disability

**\*Aids and Appliances Review** The Carroll Center for the Blind, 770 Centre Street, Newton, MA 02158, 617/969-6200 Each issue of this quarterly newsletter evaluates in depth one type of aid for people with visual impairments. Some are applicable to employment. Given the usual paucity of equipment evaluation data available, this publication is a real goldmine of timely and useful information.

**American Industrial Hygiene Association Journal** American Industrial Hygiene Association, 475 Wolf Ledges Pkwy, Akron, OH 44311 Subscription \$30 00/yr or Free to Controlled Circulation

**American Printer and Lithographer** MacClean - Hunter Publishing Corp., 300 W Adams Street, Chicago, IL 60606

**Biomedical Technology and Human Factors Engineering** US Dept of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 Subscription \$55 00/yr

**Biomedical Electronics** Girard Associates Inc., Box 455, Mt Arlington, NJ 07856 Subscription \$72 00/yr

**\*Bulletins on Science and Technology for the Handicapped** American Association for the Advancement of Science, Office of Opportunities in Science, 1776 Massachusetts Ave NW, Washington, DC 20036

**Computers and Education** Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, NY 10523 Subscription \$95 00/yr

**Computers and People** Berkeley Enterprises, Inc., 815 Washington Street, Newtonville, MA 02160 Subscription \$14 50/yr

**Computerworld** Computerworld, Inc., 797 Washington Street, Newton, MA 02160

**Construction Equipment** Cahners Publishing Co., Inc., 270 St Paul Street, Denver, CO 80206

**Design News** Cahners Publishing Co., Inc., 221 Columbus Avenue, Boston, MA 02116 Subscription \$30 00/yr

**Engineer's Digest** Walker - Davis Publications, Inc., 2500 Office Center, Willow Grove, PA 19090 Subscription Free to Controlled Circulation

**\*Homecare/Rehab Product News** Miramar Publishing Company, 2048 Cotner Avenue, Los Angeles, CA 90025 Subscription \$40 00/yr or Free to Controlled Circulation.

**Housing** McGraw-Hill Publications Co., 1221 Avenue of Americas, New York, NY 10020 Subscription \$16 00/yr

**Industrial Equipment News** Thomas Publishing Company, 1 Penn Plaza, 250 W 34th Street, New

York, NY 10001 Subscription \$12 00/yr or Free to Controlled Circulation

**Industrial Maintenance and Plant Operation** Arnes Publishing Company, 1 West Olney Avenue, Philadelphia, PA 19120 Subscription \$35 00/yr or Free to Controlled Circulation

**\*In the Mainstream** Mainstream, Inc. 1200 15th Street, NW, Washington, DC 20005 Subscription Bimonthly newsletter \$40 00/yr

**Machine Design** Penton/IP, Penton Plaza, Cleveland, OH 44114 Subscription \$50 00/yr or Free to Controlled Circulation

**Manufacturing Engineering** Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, MI 48128 Subscription \$18 00/yr

**Materials Handling Engineering** Penton/IPC, Penton Plaza, 1111 Chester Avenue, Cleveland, OH 44114 Subscription \$24 00/yr

**Materials News** Dow Corning Corp., P.O. Box 1767, Midland, MI 48640 Subscription No Charge to Controlled Circulation

**Measurement and Control News** Measurements and Data Corporation, 2994 West Liberty Ave., Pittsburgh, PA 15216 Subscription No Charge to Controlled Circulation

**Medical Electronics and Equipment News** Reilly Publishing Company, 532 Busse Highway, Park Ridge, IL 60068 Subscription \$20 00/yr or No Charge to Controlled Circulation

**Metal Progress** American Society for Metals, Metals Park, OH 44073 Subscription \$20 00/yr

**Modern Application News** A Verner Nelson Associates, 1282 Old Skokie Road, Highland Park, IL 60035 Subscription \$15 00/yr or No Charge to Controlled Circulation

**Package Engineering** Cahners Publishing Co. 270 St Paul Street, Denver, CO 80206 Subscription \$25 00/yr

**Personal Computing** Hayden Publishing Company, Inc., 50 Essex Street, Rochelle Park, NJ 07662 Subscription \$18 00/yr

**Plant Engineering** Technical Publishing Co., 1301 S Grove Ave, Barrington, IL 60010 Subscription \$30 00/yr

**Plastics Technology** Bill Communications, Inc., 633 3rd Avenue, New York, NY 10017 Subscription \$15 00/yr

**Popular Science** Times Mirror Magazines, Inc., 380 Madison Avenue, New York, NY 10017 Subscription \$15 00/yr

**Power** McGraw Hill, Inc., 1221 Avenue of Americas, New York, NY 10020 Subscription \$11 00/yr

## EDUCATIONAL AND VOCATIONAL TECHNOLOGY

**\*Report.** National Center for a Barrier Free Environment, Suite 1006, 1140 Connecticut Avenue, NW, Washington, DC 20036.

**\*Rx Home Care.** Barrington Publications, Inc, 825 S. Barrington Avenue, Los Angeles, CA 90049. Subscription: \$40.00/yr or Free to Controlled Circulation.

**\*Sensory Aids Technology Update** Sensory Aids Foundation, 399 Sherman Avenue, Suite 12, Palo Alto, CA 94306. Editor: Sharon Connor. Subscription: \$30/year. Available in either print or on cassette. Information about new products, special employment, education and training programs, unusual applications of technology, and what's happening in research and development. Computer hardware, software and interface problems are discussed; product comparisons are profiled. Articles have included: Comparison of paperless braille devices: The MB-2400 and the Versabril; Users review IBM's new talking terminal for mainframe computers; Compuserve: new data base for handicapped users; Telebraille: prototype TDD for deaf-blind; A look at large FM systems for hearing impaired people; Financing adaptive equipment; Vocational guidance tools; Customizing software programs for speech output.

**\*Technical Aid to the Disabled Journal.** c/o Royal Ryde Rehabilitation Hospital, 227 Morrison Road, P.O. Box 108, Ryde, N.S.W 2112, Australia. Subscription: \$10.

**\*TechBrief.** Rehabilitation Engineering Center, Cerebral Palsy Research Foundation of Kansas, Wichita, Kansas. Quarterly publication.

**Today's Office** Hearst Business Communications, Inc., 645 Stewart Avenue, Garden City, NY 11530. Subscription: \$30.00/yr or Free to Controlled Circulation.

**Welding Design and Fabrication** Penton/IPC, 314 Superior Avenue W Cleveland, OH 44113. Subscription: \$24.00/yr

## PRODUCT/EQUIPMENT DIRECTORIES

Contact ABLEDATA for specific product information

**Best's Safety Directory**  
A.M. Best Company, Inc  
Ambest Road  
Oldwick, NJ 08858

**Electronic Engineers Master Catalog**  
United Technical Publications, Inc  
645 Stewart Avenue  
Garden City, NY 11530

**\*Product Inventory of Hardware, Equipment, and Appliances for Barrier-Free Design**  
Second Edition, 1981  
National Handicap Housing Institute, Inc  
12 So. 6th Street, Suite 1216  
Minneapolis, MN 55402

**ThomCat**  
Thomas Register  
1 Penn Plaza  
New York, NY 10117

**\*Tools, Equipment and Machinery Adapted for the Vocational Education and Employment of Handicapped People**  
Wisconsin Vocational Studies Center  
University of Wisconsin-Madison  
Madison, WI 53706  
787 pages, 283 products  
\$33.00  
1981

**\*A New Catalog Supplement: Tools, Equipment, & Machinery**  
Wisconsin Vocational Studies Center  
University of Wisconsin-Madison  
Madison, WI 53706  
671 pages, 231 products  
\$32.00  
1983  
The supplement contains descriptions and illustrations of 231 products modified for use in educating and employing handicapped people. There are no duplications from the original Tools catalog.

**Yellow Pages of Industrial Equipment and Supplies**  
Industrial Research/Development  
1301 S Grove Avenue  
Barrington, Illinois 60010

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## Recreational and Leisure Technology

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## RECREATIONAL AND LEISURE TECHNOLOGY

### INTRODUCTION

This panel discussion on the role of recreation and leisure in the lives of disabled people explores ways in which technology can assist disabled and able-bodied people in removing barriers to participation. The discussion was presented at the La Jolla Workshop on Science and Technology for the Handicapped: Issues in Technology for Daily Living, on May 11-12, 1981. The workshop was sponsored by the American Association for the Advancement of Science (AAAS).

The panel members are involved in work related to recreation and technology.

Chester Land, Director, Therapeutic Recreation Program, Rancho Los Amigos Hospital, Downey, California

Peter Axelson, Veterans Administration Medical Center, Research and Development Center, Palo Alto, California

Marti Hacker, Supervisor of Recreation, Community Service Center for the Disabled, San Diego, California

Roy Gash, Wheelchair Repair Department Manager, Community Service Center for the Disabled, San Diego, California

Mari Taylor, Community Service Center for the Disabled, San Diego, California

**QUESTION** "What are some of the psychological benefits derived from participating in wheelchair sports and recreation?"

**ROY GASH** "I feel more confident about my physical abilities. Racing has improved my eye/hand coordination. After finishing a race I feel great."

**MARRI TAYLOR** "I think it's great for people to compete, physically. It's a rewarding experience whether it's playing cards or playing football. Competition is important to everyone, and sports competition is especially important."

**MARTI HACKER** "Recreation counteracts the isolating effects of being disabled, it provides a way to meet others and a chance to participate in activities with able-bodied friends. Recreation can eliminate the depression that commonly comes with boredom. Health and a good body image are essential ingredients of self-image. Above all, though, recreation can provide fun, something that disabled people often fear will forever be missing in their lives."

**CHESTER LAND** "Everyone owns the right to play, to enjoy playful moments and not feel guilty."

**QUESTION** "How can technology benefit recreation for disabled people?"

**MARTI HACKER** "One of the most important differ-

ences between recreation for able-bodied people and for disabled people is the need for additional manpower to help with setting things up for disabled people's use. Technology can be very useful here, since proper design and mechanical assists can eliminate the need for much extra manpower. From a disabled person's point of view, this is usually a plus, since most of us do not like having to depend on another person any more than necessary. Mechanical adaptations increase feelings of, and indeed our level of, independence.

**QUESTION** "How did wheelchair sports and the development of special equipment for these sports develop?"

**ROY GASH** "Wheelchair sports have promoted the development of better, lighter and more durable wheelchairs. All of the changes in wheelchair design have come about because of disabled people using available equipment and not being satisfied with it. The men and women who participate in sports and other recreational activities have developed modified wheelchairs to make them lighter, to fit the sport, and to personalize the chair to make it fit the individual."

"The use of wheelchairs in basketball, track, tennis and off-road activities has promoted the growth of a new generation of wheelchairs for the active wheelchair user. Wheelchair design has remained basically the same since the 1930s when Everest and Jennings started selling their chair. Until the early to middle seventies, all wheelchairs were copies of this basic design. In the past five years, however, many improvements in wheelchair design have been introduced. These innovations can be traced directly to wheelchair sports, the changes have been made by disabled people thinking about the equipment they use."

"All of the chairs which were designed for sports are useful for people with arm and hand weakness. The newer, lighter wheelchairs on the market today can make the difference between a person being dependent and independent -- someone with impaired arm strength can push his or her own lightweight chair, whereas it would have been impossible with the older models. This increased independence is directly related to the many hours spent developing a better wheelchair."

"Quality wheelchair hubs for everyday use are another result of sports. There are several different hubs being manufactured today. These are a great improvement over the standard wheelchair hub. Many wheelchair users find they greatly improve the way a chair rolls. They, too, are especially helpful for people with weak hands or arms."

"Most of the newer equipment on the market today which enables disabled individuals to compete in track, basketball, snow skiing and many other activities is the direct result of a disabled person or group of disabled individuals designing quality equipment for their specific needs."

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QUESTION: "What are some of the technological adaptations made to wheelchairs for recreation or competitive use?"

ROY GASH: "The wheelchairs used in basketball were the first to be modified to make the chair more manageable. This was done by adding axle plates to enable the user to change the center of gravity. Negative camber was created by using a camber bracket to spread the frame wider at the bottom than at the top. Excess metal was also cut from the frame. These changes were standard if a person wanted to be competitive while playing the game.

"Today the majority of people playing wheelchair basketball use lightweight alloy wheelchairs. These range from Quadra, Quickie or Stainless basketball chairs to locally-made lightweight non-foldable wheelchairs. All of these newer chairs have adjustable rear axle positions, quick release rear wheels, adjustable front casters and adjustable back heights. They also come in any width desired by the user. These new chairs have improved bearings all around, as well as stronger, improved hubs and front casters. They are also stronger than the old models.

"The wheelchairs used in track were originally the same basic wheelchair design. The same modifications made to the basketball chair were made to the track chair, except the track chair had more weight cut from it. Some people used sagged or sagging upholstery to lower their center of gravity. Smaller push rims were used to increase speed.

"Today race chairs are specifically made for racing. Race equipment is designed for the individual and his or her disability, using the design of the chair to increase speed and muscle groups to their utmost capacity.

"My racing chair is long and low. I use 700 centimeter wheels and high-pressure clincher tires. I also use Phil Wood hubs. I use inch-and-a-quarter pneumatics on the front so that I sit about 13 inches off the ground. I have steering handles on the chair because on downhill and curves steering is difficult. These are some of the adaptations that can be made.

QUESTION: "What are the benefits of cambered wheels and Phil Wood hubs?"

ROY GASH: "Cambered wheels help for stability and turns. You can turn quicker and not have the likelihood of tipping over. There are chairs now with variable cambers. You can adjust the cambers with a setting, but they're low production chairs. In addition, there are wheels that pop off, just push the button and the wheel comes right off. That helps as far as putting the chairs in cars or other places.

"I think it would be hard to improve the Phil Wood hubs. If I took my wheel and spun it, it would spin twice as long as any other wheel in here without a Phil Wood hub. I think they're probably roller bearings, but I don't know for sure what it is. They're waterproof and dirt proof and guaran-

teed for a lifetime. Even on a very slight incline you just roll right down it, you don't push. Also you don't have one wheel rolling better than the other, they both roll a true straight line.

QUESTION: "Where can you get Phil Wood hubs?"

ROY GASH: "Go to a bike shop. If they carry Phil Wood hubs, they'll string your wheels for \$10 or \$15.

QUESTION: "We see many changes in the manual chairs, but what about the power chairs?"

MARRI TAYLOR: "I would like to see more technology put into the design of power chairs. I would like to see a chair that can be used in sand, mud, dirt, and any kind of situation. I would like to see wider tires on both the front and back. I would also like to see chairs that were not all chrome, so that they don't have the 'hospital look.' If wheelchairs could be manufactured so that they could get across any kind of terrain, that would be wonderful. I'd like to help anyone who wants to design that.

QUESTION: "What modifications to the terrain are necessary to make recreation accessible to disabled people?"

CHESTER LAND: "In Los Angeles, there's an accessible path to the Marina. We constructed a concrete path under the sand and put rails along it that you could move in and out of. If a person wants to go down to the water, there is a chair available so you won't get your chair all sandy and wet. You can transfer to the available chair and move on the concrete path down to the water. If you want to walk and use canes, you can do that.

MARRI TAYLOR: "Also I've been working with the state Department of Parks and Recreation and they are really willing to make all of the state parks accessible. I'm also working with the county Parks and Recreation Department. The more we can push to have our county parks and state parks accessible, the more disabled people will get out into the public. I've always run into an attitude with people who say, 'I've never seen a disabled person here,' and I look at the flight of steps or the rocks or whatever and I say, 'Well, gee whiz, I wonder why?' It's hopefully up and coming. It's going to take a bit of doing, and unfortunately it's going to take a bit of money, but there is a need.

"We're not asking them to pave all their trails. We're asking them to make bathroom facilities accessible, to make drinking fountains accessible, a couple camp sites interspersed throughout the campground that could be made with a little harder-packed dirt or something like that. There's a new combination of asphalt and dirt and a couple of other weird things they put into it that can make a hard-pack trail. There is a trail in Northern California -- I'm not sure how long it is -- but it's a special project and a wheelchair can go the whole distance, but that's unusual.

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As a disabled person, I'm not asking for total accessibility, that's impossible. If I can't get from here to there, well, that's too bad but if there's something that can be done easily, I'm all for it. I don't expect the whole world to be ramped; it's just not possible.

**QUESTION:** "How can transportation barriers to recreation be eliminated?"

**MARTI HACKER:** "Transportation is truly the first barrier to recreation for disabled people. Because of the expense of specially-adapted vehicles, many disabled people do not drive. There is a tremendous need for inexpensive transportation for disabled people, preferably our own vehicles. Unfortunately, few solutions have been found, although some seem obvious. For example, severely disabled wheelchair users who want to drive have no choice except to use a modified van. Vans cost considerably more than cars, not to mention the cost of gas and upkeep. One possible solution would be a small car with seats removed, allowing the wheelchair user to enter from the back of the car, in the wheelchair, from which he or she would also drive. Such a set-up would also eliminate the need for an expensive lift. In addition to getting to recreational events, driving itself can be a form of recreation. Motorcycles driven from a wheelchair in a sidecar have implemented this idea. Other vehicles, such as street-legal golf carts, double as recreation and transportation for some disabled people. Of course, modified bicycles, either three wheelers or bicycle attachments for wheelchairs, serve the same purpose for short distances.

**QUESTION:** "What barrier does cost play in prohibiting the availability of chairs and other sports equipment to average consumers?"

**ROY GASH:** "Wheelchair sports have helped the development of the wheelchair tremendously. Many individuals are now designing their own chairs, and this is bringing about some excellent technology. Price is still a major barrier. For example, if a wheelchair basketball team purchases ten basketball chairs commercially, the cost can exceed \$10,000. However, if they have a welder or a mechanic on the team, they can make all their chairs for \$1,000, less the wheels.

**QUESTION:** "What types of ski equipment have been developed for physically disabled individuals?"

**ROY GASH:** "There are currently several types of snow skiing equipment on the market. These include snow sleds which are compatible with ski lifts. There are several large ski areas which have equipment to loan as well as instruction for disabled skiers. Peter, why don't you describe the ARROYA?"

**PETER AXELSON:** "The ARROYA is a sled-like device constructed of reinforced fiberglass. Stainless steel edges on the bottom surface allow for turning and stopping on varying terrain and in varying ski conditions. The ARROYA addresses the neglected recreational needs of disabled persons who

would benefit from integration into the whole of society. The responsible application of technology toward ski-sled design development and the establishment of downhill ski-sledding protocol will allow ski programs for the disabled to offer integrative downhill skiing to just about every one.

**QUESTION:** "How has the ARROYA been received by disabled and non-disabled skiers?"

**PETER AXELSON:** "Demonstrations of the ARROYA ski-sled at various instructor clinics throughout the United States and in Norway generated very positive publicity. Each clinic received local newspaper coverage and some received television coverage. The objective of this publicity was to make individuals aware of the opportunity for paraplegics to use the ARROYA ski-sled and to increase general public awareness of the disabled community.

"Unlike many other sports and recreational activities available to the disabled person, the ARROYA allows a ski-sled user to interact naturally with skiers using other types of adaptive equipment (i.e., skis, boots, poles, etc.) This type of interaction between ambulatory and non-ambulatory individuals is not found in "wheelchair sports" (many recreational activities for paraplegics and quadriplegics tend to segregate them from their ambulatory friends). In fact, able-bodied individuals also enjoy skiing in the ski-sled. It is therefore possible that this ski-sled will be used by both ambulatory and non-ambulatory individuals.

"One of the things we have had difficulty with is getting outside funding for this kind of work. We have submitted proposals but funding sources don't always recognize that recreation actually needs research. We are going to continue to monitor the evaluation process of the last prototype sled so that we can find a manufacturer that will continue with the next prototype.

**QUESTION:** "Are disabled people who cannot or do not wish to be involved in competitive sports relegated to physical inactivity?"

**MARTI HACKER:** "There are other recreational activities which provide excellent ways of improving muscle tone, coordination, circulation, and cardio-vascular endurance. Most recreational sports are adaptable for many disabled people, the type and degree of disability determine the modifications necessary. Swimming is a sport that can be enjoyed by almost everyone. Adaptations for pools include lifts and sloping access for wheelchairs.

"Bowling is another sport that has been adapted for disabled people. A special chute can be used for those who are unable to roll the ball themselves.

"Sailing requires help setting up the boat and getting in and out of it -- a possibility for technology.

"Waterskiing is another sport that has recently

been adapted for disabled enthusiasts. In San Diego a ski chair called the Aquabat is used. This device consists of a seat attached to two short skis and handlebars. Some type of easily or automatically released hand gripper needs to be designed for those with insufficient hand strength.

"These are but a few of the activities which are alternatives to competitive sports. One final word -- for wheelchair users, each improvement made in everyday chairs makes participation in recreation easier and more fun.

CHESTER LAND "The disabled community is now beginning to move into the mainstream. How many men as children wanted to be football players but were not big enough, or wanted to be basketball players but were not tall enough? Those were handicapping conditions. The same situation is now beginning to occur among individuals who use wheelchairs. Everyone is not going to be able to play wheelchair sports, but the same leisure feeling can be derived from other recreational sports.

MARRI TAYLOR "For me, fishing is something very individual that makes me feel great. I look upon fishing as a competitive sport as well as basketball or anything else. Whether I am going to get that little fish or not is competition enough for me.

QUESTION "How do individuals who have not been involved in wheelchair sports gain access to communication networks that exist among technology experts?

MARRI TAYLOR "Valuable information exchanges exist among local communities of disabled athletes, sports enthusiasts, and small businesspeople. A major challenge for the future will be to involve small businesspeople in manufacturing innovations as they come out of the wheelchair competitions. Sports and Spokes is a valuable publication which contains useful information about wheelchair sports and equipment.

QUESTION. "Are there any national centers where individuals with disabilities can receive specific training in sports and recreation?"

MARRI TAYLOR "The Vinland National Center in Loretto, Minnesota is a national healthsports center which offers training to disabled and non-disabled individuals. This center provides workshops which focus on skill building in a wide range of physical activities, as well as in the area of health promotion, stress management, disability education, and medical self-care skills. Canoeing, running/jogging, swimming, weight and circuit training, cross country skiing, pulk skiing and ice sledding; archery, wheeling, and poing are some of the skill areas that are addressed by the center. Vinland also published Vin-Lines, a quarterly newsletter.

Summary

"The right to enjoy leisure time through a variety of sports and recreational opportunities is the right of all individuals, including individuals with disabilities. The benefits involved from participation in recreation and leisure pursuits are far-reaching, and include physical, emotional, and psychological benefits.

"Wheelchair sports have opened up sports participation to wheelchair users. As the popularity of these sports increases, new developments in wheelchair design are introduced. The popular use of chairs in basketball, track, tennis and other sports has promoted the growth of a new generation of wheelchairs for the active user.

"Other forms of sports equipment are being developed by the rehabilitation engineering community. Bicycles and ski equipment are two areas undergoing current research and development. Camping and wilderness activities are also becoming more accessible as national parks and local camping areas begin to make provisions to include persons with disabilities.

"As persons with disabilities continue to make their recreation and leisure needs known, advances in technology will continue in this important area. As disabled and non-disabled people continue to play together, technology for recreation will expand and increase access to this life area."

Addresses of Organizations Referred to in This Excerpt

Mission Bay Aquatic Center  
1001 Santa Clara Point  
San Diego, CA 92109

Phil Wood & Company  
153 West Julian  
San Jose, CA 95110  
408/798-1540

Sports 'n' Spokes Magazine  
5201 North 19th Avenue, Suite 111  
Phoenix, AZ 85015  
602/246-9426

Vinland National Center  
3675 Ihdupri Road  
P.O. Box 308  
Loretto, MN 55357

## SPORTS

"There is hardly any sport in which persons with disabilities do not take part, nor any disability for which there are no special organized games or olympiads. The opportunities range from local sports (school, community center, etc.) up to state, regional, national, and international competitions.

"During and immediately following World War I, interest developed in sports for those persons with amputations and visual impairments. Then, in 1944, the Spinal Injuries Centre at Stoke-Mandeville Hospital in Aylesbury, England, initiated wheelchair sports. In 1962, the British Commonwealth Paraplegic Games were founded and held in Perth, Western Australia. The Pan-American Wheelchair Games were held for the first time in 1967 in Winnipeg, Canada, and have continued successfully in various countries every fourth year. In the 1970's the World Zone Games were initiated, and in 1975, the first Far Eastern and South Pacific Games for disabled persons were held in Oita, Japan. In 1976, the United States Association of Blind Athletes was founded. Also in 1976, the Olympiad for Disabled People was initiated and almost 1,700 athletes with varied disabilities competed. The Annual International Cerebral Palsy Games were started in 1979. And the list of sporting events goes on.

"Sports programs enable disabled persons to develop physical skills and fitness, experience the challenges of competition and the thrills of victory, and be provided with opportunities to help organize and operate sophisticated national and international programs.

"For disabled persons to participate fully in a sport, however, equipment, performance technique, and game rules may need to be modified."

Sports for Disabled Individuals, Rehab Brief,  
Vol IV No 3, Jan 26, 1981

## DISABILITY-RELATED SPORTS ASSOCIATIONS

These groups may be able to provide information on useful applications of technical aids.

American Athletic Association of the Deaf  
3916 Lantern Drive  
Silver Spring, MD 20902

Amputee Sports Association  
George C Beckmann, Jr., President  
11705 Mercy Blvd  
Savannah, GA 31406  
919/927-5408

Blind Outdoor Leisure Development (BOLD)  
533 E Main Street  
Aspen, CO 81611

Canadian Wheelchair Sports Association  
333 River Road  
Ottawa, Ontario  
CANADA K1L 8B9

Disabled Sportsmen of America  
P O Box 26  
Vinton, VA 24179

International Committee of Silent Sports  
Gallaudet College  
800 Florida Avenue, NE  
Washington, DC 20002  
202/651-5114 (voice or TDD)

International Games for the Disabled  
Eisenhower Park  
East Meadow, NY 11554  
516/542-4493

International Sports Organization for the Disabled  
International Stoke Mandeville Games Federation  
Stoke-Mandeville Spinal Injury Center  
Aylesbury, England

Mobility International USA  
P O Box 3551  
Eugene, OR 97403  
503/343-1284

National Association of Sports for Cerebral Palsy  
United Cerebral Palsy Associations  
66 E 34th Street  
New York, NY 10016  
212/481-6359

National Handicapped Sports & Recreation  
Association  
Capital Hill Station  
P O Box 18664  
Denver, CO 80218  
303/978-0564

National Inconvenienced Sportsman's Association  
3738 Walnut Avenue  
Carmichael, CA 95608  
916/484-2153

National Inconvenienced Sportsman Association  
2215 Allegheny Road  
El Dorado Hills, CA 95630

National Wheelchair Athletic Association  
2107 Templeton Gap Road, Suite C  
Colorado Springs, CO 80907  
303/632-0698

Outdoor Experimental Education for the Hearing  
Impaired  
National Technical Institute for the Deaf  
Rochester Institute of Technology  
1 Lomb Memorial Drive  
Rochester, NY 14623

Paralyzed Veterans of America  
801 18th Street NW  
Washington, DC 20006  
202/872-1300

Special Olympics  
Joseph P Kennedy Foundation  
1701 K Street NW, Suite 203  
Washington, DC 20006  
202/331-1346



## RECREATIONAL AND LEISURE TECHNOLOGY

Sports for the Physically Disabled  
333 River Road  
Ottawa K1L 8B9  
CANADA

United States Amputee Athletic Association  
Route 2, County Line  
Fairview, TN 37062  
615/670-5453

U.S. Association of Blind Athletes  
55 West California Avenue  
Beach Haven, NJ 08008  
609/492-1017

United States Wheelchair Sports Fund  
c/o Nassau Community College  
Garden City, NY 11530  
516/222-1246

Vinland National Center  
3674 Ihduapi Road  
Loretto, MN 55357

These national organizations and agencies have shown an active interest in the development of recreation programs for people with disabilities

American Alliance for Health, Physical Education,  
Recreation and Dance  
1900 Association Drive  
Reston, VA 22091

American Camping Association  
Bradford Woods  
Martinsville, IN 46151

American Corrective Therapy Association  
4910 Bayou Vista  
Houston, TX 77091

Boy Scouts of America  
P.O. Box 61030  
Dallas/Ft. Worth Airport, TX 75261

Camp Fire, Inc.  
4601 Madison Avenue  
Kansas City, MO 64112

Girl Scouts of the USA  
830 Third Avenue  
New York, NY 10022

Information and Research Utilization Center (IRUC)  
American Alliance for Health, Physical Education  
and Recreation (AAHPER)  
1701 16th Street, NW  
Washington, D.C. 20036  
(202) 833-5541

National Park Service  
Division of Special Programs and Populations  
U.S. Department of the Interior  
Washington, DC 20240

National Recreation and Park Association  
1601 N. Kent Street  
Arlington, VA 22209  
703/525-0606

National Therapeutic Recreation Society  
1601 N. Kent Street  
Arlington VA 22209  
703/525-0606

Outdoor Recreation Technical Assistance  
Clearinghouse  
Heritage Conservation and Recreation Service  
Department of the Interior  
Washington, DC 20240  
(202) 343-7962

Also see organizations listed under each activity

Vinland National Center  
3675 Ihduapi Road  
P.O. Box 308  
Loretto, MN 55357

The Vinland National Center is a health education/sports center for persons with disabilities. It is located twenty-three miles west of Minneapolis. The Vinland National Center was started in 1976 with a Bicentennial gift of one million kroner from Norway to the American people. Modeled after the Norwegian healthsports center, Beltostolen, Vinland promotes healthy lifestyle changes, as well as a high quality of life and better health through healthsports training. The "Vinland Concept" represents a holistic approach to rehabilitation. Vinland provides a national outreach follow-up and support programs for its graduates when they leave the center and return to their home communities. In addition, training manuals and curriculum guides are available for sale to disabled persons, family members, and health care, rehabilitation and education professionals on physical fitness training, sports and recreation skills, personal development and health promotion topics. For further information on courses, applications and financial aid, contact The Vinland National Center directly, the phone is 612/479-3555, voice or TTY.

## WHEELCHAIR SPORTS

## SPORTS WHEELCHAIRS

The first edition of this guide reprinted part of an article "Scoring in the Sports Wheelchair Market" from *Rx HomeCare*, May 1982, by Richard Salzberg. The directory was felt to be a representative guide to major manufacturers of wheelchairs and other recreational transport. Because of the many exciting developments in this area within the past two years, this article is now out of date; a more recent survey is:

"Survey of 1983 Sport Wheelchair Manufacturers," written by the editors of *Sports 'n' Spokes* magazine, in *Paraplegia News*, September 1983. This article is the first in what is planned to be an annual feature comparing manufacturers and their products.

The field is changing so fast that the Guide is already somewhat out of date. For the most current information, contact the manufacturers listed, or your local sales representative. Many of the companies have wheelchair athletes on staff. For comparative information, get in touch with wheelchair athletes in your area.

For a different point of view, see "Tackling the Sports Wheelchair" by Debra Zauzmer, in *RxHomeCare*, November, 1983. This article provides the dealer's perspective on the sports wheelchair market. It includes a section, "Getting in on the Action," which suggests ways dealer support can be shown.

The new developments in sports wheelchairs are profoundly influencing wheelchair developments. Expect to see a lot of advertising about new products, and many articles written in both trade journals and consumer-oriented publications.

## SOME MANUFACTURERS OF SPORTS WHEELCHAIRS

Bair Chair  
#6 Seco Court  
Sacramento, CA 95823  
916/427-1035

Canadian Wheelchair Manufacturing  
1312 Blundell Road  
Mississauga, Ontario CANADA L4Y 1M5  
416/275-3960

Equalizer  
274 Buchon St  
P.O. Box 1296  
San Luis Obispo, CA 93401

Everest & Jennings, Inc  
3233 East Mission Oaks Blvd  
Camarillo, CA 93010  
805/987-6911

Hall's Wheels  
15 Marlboro Street  
Belmont, MA 02178  
617/489-3246

Invacare Corporation  
1200 Taylor Street  
Elyria, OH 44035  
800/321-5715

Mastercraft Metal Products  
P.O. Box 591  
Santa Cruz, CA 95061  
408/426-6313

Motron Designs, Inc  
1075 Cole  
Clovis, CA 93612  
209/298-1718

Orthopedia GMBH (Germany)  
U.S. Distributor  
International Medical Equipment  
11000 Rush Street #20  
South El Monte, CA 91733

Ortop Technical Medical Aids (Israel)  
U.S. Distributor  
Meditech  
544 10th Street  
Palisades Park, NJ 07650  
201/974-0500

Poirier Wheelchair (France)  
U.S. Distributor  
Magnum International  
2930 West Central  
Santa Ana, CA 92704  
714/641-9696

Production Research Corporation  
10217 Southard Drive  
Beltsville, MD 20705  
301/937-9633

Quadra Wheelchairs, Inc  
31117 Via Colinas  
Westlake Village, CA 91362  
213/991-6302  
800/324-1068

Spinner International  
Box 69, S-197 00 BRO Sweden  
Telephone +46 758 42200  
Telex 11370 SPIN S

Sports Chairs  
3673 Procyon Avenue  
Las Vegas, NE 89103  
702/873-6493

Stainless Medical Products  
9386 Dowdy Drive  
San Diego, CA 92126  
619/578-6820

Theradyne Corporation  
21730 Hanover Street  
Lakeville, MN 55044  
612/469-4404  
800/323-4014



## RECREATIONAL AND LEISURE TECHNOLOGY

**Wheeler Dealers**  
P.O. Box 656  
Avondale, AZ 95323

**X-L Enterprises**  
2003 Palm Avenue  
Chico, CA 95926  
916/891-3535

### PUBLICATIONS

"Competitive and Recreational Wheelchair Sports"  
Paralyzed Veterans of America Washington, DC  
1978, 8 pp. (Brochure)

Constitution and Rules, Training Techniques and  
Records. National Wheelchair Athletic Association  
Woodside, NY, 1977, 131 pp

"A Look at Wheelchair Sports and What's Happening  
in the Northwest" Stotts, Kathleen and Warren, G  
Model Systems, Science Digest, Spring 1982

**National Wheelchair Athletic Association**  
2107 Templeton Gap Road, Suite C  
Colorado Springs, CO 80907  
303/632-0698

Paraplegia News, 5201 N. 19th Avenue, Suite 111,  
Phoenix, AZ 85015, (502) 246-9426 Monthly maga-  
zine published by Paralyzed Veterans, August 1981,  
Vol 35, No 8 "The Sporting Life," (special  
issue on wheelchair sports)

"The Psychology of Wheelchair Sports" Labanowicz,  
Stan, Ph.D. Therapeutic Recreation Journal, Vol  
11, No 1, pp 11-17, 1978

Sports'n Spokes, 5201 N 19th Ave, Suite 111,  
Phoenix, AZ 85015, (602) 246-9426, Magazine pub-  
lished bi-monthly on wheelchair competitive sports  
& recreation

Wheelchair III -- Report of a Workshop on Special-  
ly Adapted Wheelchairs and Sports Wheelchairs  
The report was developed out of the third in a  
series of workshops sponsored by RESNA and the  
Veterans Administration Rehabilitation Research  
and Development Service Available from RESNA,  
Suite 402, 4405 East-West Highway, Bethesda, MD  
20814 \$10.00

### FOR MORE INFORMATION ON WHEELCHAIR SPORTS

**National Wheelchair Athletic Association**  
2107 Templeton Gap Road, Suite C  
Colorado Springs, CO 80907  
303/632-0698

### Baseball

**National Wheelchair Softball Association**  
P.O. Box 737  
Sioux Falls, SD 57101

### Basketball

**National Wheelchair Basketball Association**  
110 Seaton Bldg  
University of Kentucky  
Louisville, KY 40506  
606/257-1673

Playing and Coaching Wheelchair Basketball E  
Owen University of Illinois Press, Champaign,  
IL 400 pages 1979

### Football

**Rehabilitation-Education Center**  
University of Illinois  
Oak Street at Stadium Drive  
Champaign, IL 61820

**The Silver Wheels Wheelchair Football**  
109 Florence Avenue  
Buffalo, NY 14114

### Marathon Racing

**International Wheelchair Road Racers Club**  
12710 N 30th Street  
Tampa, FL 33612  
8 3/977-8824

**National Spinal Cord Injury Foundation**  
369 Elliot Street  
Upper Newton Falls, MA 02164

**National Wheelchair Marathon**  
Paul DePace  
380 Diamond Hill Road  
Warwick, RI 02886

### Motorcycling

**Wheelchair Motorcycle Association**  
Dr. Eli Factor  
101 Torrey Street  
Brockton, MA 02401  
617/583-8614

### Softball

**National Wheelchair Softball Association**  
P.O. Box 737  
Sioux Falls, SD 57101

### Tennis

**National Foundation for Wheelchair Tennis**  
3857 Birch Street  
Box 411  
Newport Beach, CA 92660

**International Foundation for Wheelchair Tennis**  
2203 Timberloch Place, Suite 126  
The Woodlands, TX 77380  
713/363-4707

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## WATER SPORTS

## Boating

"Although boat modifications and adaptations cover a wide range, handholds and handrails are the most common additions. However many disabled people do not need to make any significant modifications to their craft

"There is a risk involved in boating (as in all sports), but safety regulations and procedures are designed to minimize this risk, even if all of it cannot be eliminated. However, since part of the challenge of boating is its risk, many of the benefits for the disabled persons would be lost if all the challenges of the sport were removed. Even so, every boater should wear, or have immediate access to, a properly fitted Personal Flotation Device. Aboard a small craft, the device should be worn at all times."

"Sports for Disabled Individuals," Rehab Brief, Vol 14, No 3, January 26, 1981

Disabled boaters have formed their own organization, the Handicapped Boaters Association, which seeks to further the safe participation of disabled people in recreational boating and related activities throughout the country. The association publishes a bimonthly magazine, Boating World Unlimited

These programs have information on equipment selection and adapting equipment for boating

Handicapped Boaters Association  
PO Box 1134  
Ansonia Station  
New York, NY 10023

Wilderness Inquiry  
2929 4th Avenue South  
Minneapolis, MN 55408  
612/827-4001

Mission Bay Aquatic Center  
1001 Santa Clara Point  
San Diego, CA 92109

Adapted Boating Program  
Office of Parks and Recreation  
Sailboat House  
1520 Lakeside Drive  
Oakland, CA 94612  
415/444-3807

## Publications

RC Adams, A Daniel, A & L Rullman "Para-Canoeing." Games, Sports and Exercises for the Physically Handicapped, 3rd Edition. Lea and Febiger, 600 Washington Square, Philadelphia, PA 19106 \$28.50 1982

Advisory Panel on Water Sports for the Disabled, The Sports Council. Water Sports for the Disabled. The Hillingdon Press, Uxbridge, England

American Red Cross. Adapted Aquatics Swimming for Persons with Physical or Mental Impairments

Doubleday & Co., Inc., Garden City, NY 1977

American Red Cross Methods in Adapted Aquatics A Manual for the Instructor. American Red Cross, Washington, DC 1977

Camp Confidence Waterfront Program-Summer. The Camp, Box 349, Brainerd, Minnesota 56401 1973

John Chartres & Douglass Hurndall "They Said We Couldn't Do It" RYA Seamanship Foundation, Victoria Way, Working, Surrey, GU12 1EQ England 1981

Nancy Crase "Wheelchair Boating" Sports 'n Spokes, 1 (4), 11-14, November-December 1975. Describes various types of boats suitable for people in wheelchairs

Diare Duryea "Another Kind of Handicap" Yachting, October 1976, 86-87

Matthew Guidry "The Challenge -- Expanding Horizons of Aquatic Programs for the Handicapped" Presentation at Project Aquatics Workshop, Seattle, WA, and Columbia, MO November, 1975

Handicapped Boaters Association "Boating World, Unlimited" January-February 1981, Vol 1, No 1 New York, NY

Bob Hawkes "Sailing If One Paraplegic Sails - Others Surely Can Too!" Sports 'n Spokes, Nov-Dec, 1977, 3 (4), 8-9

Harold Hayes "Sailing Blind" The New Beacon, December, 1970 Royal National Institute for the Blind, London, England

Eugene Hedley, PhD Boating for the Handicapped Guideline for the Physically Disabled Human Resources Center, Albertson, NY 1978

Carol Hogan "She Took Her Wheels to Sea" Sail United Marine Publishing, Inc., Boston, MA Dec 1977, pp 88-90

Human Resources Center National Recreational Boating for the Physically Handicapped Strategy Paper and Annotated Bibliography. Human Resources Center Albertson, NY 1978

Syd Jacobs Information on Whitewater Kayaking for the Handicapped. 209 Columbus, Port Angeles, WA 98362, 206/452-4253

Wallace J Lynch "Canoeing for Recreation and Rehabilitation" Parks and Recreation 1972, 20-21, 46

Tim Marshall "Solo Sail Racing The Challenger - a Tri-maran That's Fast, Safe and Accessible" Sports 'n Spokes, March-April 1980 5(6), 5-6

Lee Anna Mielzarek & Rolf H Mielzarek "Reaching Out + Reasonable Risk = Growth Adventure" Challenge, November 1975, 11 (1), 1, 3

Oral O Miller Four Years at the Oars 3701

## RECREATIONAL AND LEISURE TECHNOLOGY

Connecticut Avenue, NW, Washington, DC.

National Easter Seal Society for Crippled Children and Adults. Year-Round Recreation Programs for the Handicapped. National Easter Seal Society, Chicago, IL. 1973

Oakland Office of Parks and Recreation Open Boating. Oakland Office of Parks and Recreation, Water Safety and Boating Program for the Disabled, 1520 Lakeside Drive, Oakland CA 94612 1982 A handbook about Lake Merritt's Adapted Boating Program for the Disabled. Chapter 4 has a description of facilities, equipment considerations and categories, building and stocking a work space Chapter 5 describes a team approach to teaching, designing and making adaptive equipment and devices An award-winning documentary, "Open Boating," is also available in either 16 mm film or videotape formats

David C Park "Recreation" The White House Conference On Handicapped Individuals, Vol. I Awareness Papers, pages 119-131 Washington, DC May 1977

Joan Reed "Sightless Sailing, a Reality in Seattle" Nor' Westing, Dec 1977, 13(2), 7-13

### Scuba

Articles on divers' nutrition, physical fitness and beach accessibility are the fare in a new publication for physically handicapped people who scuba dive or who would like to learn how to scuba dive Scuba Quarterly Undersea International Digest (SQUID), published by the Handicapped Scuba Association, offers diving advice and information from experts in underwater education SQUID also sponsors a national forum where diving instructors discuss scuba teaching tips, results, and suggestions Subscriptions cost \$18.00 per year, and are available from:

Handicapped Scuba Association, 1104 El Prado, San Clemente, CA 92672 714/498-6128

Another organization with information on this area is

Professional Association of Diving Instructors, 2064 N Bush Street, Santa Ana, CA 92706

Some publications are

Scuba Diving for the Handicapped Project Michael Beaman. Handicapped Scuba Association, 1104 El Prado, San Clemente, CA 92672 21 pages June 1978

Scuba Diving for Physically Handicapped Program James Cesario Institute of Rehabilitative Medicine, 400 E. 39th Street, New York, NY 100016, 212/679-3200, ext 217.

### Water Skiing

Water skiing can be a new and exciting recreational experience for many disabled people The American Water Ski Association has indicated its interest in working with groups to help introduce the sport to people with disabilities

American Water Ski Association, Attention Bruce Kister, P O Box 191, Winter Haven, FL 33880

Waterskiing for the Physically Disabled Mission Bay Aquatic Center, 1001 Santa Clara Point, San Diego, CA 92109 This manual is a guide for the summer camp, school, recreation department or any other group that wishes to institute a disabled waterski program It includes instructions for adapting a monoski and one skiseat

### Water Sports

Water Sports for the Disabled Sterling Publishing Co., 2 Park Avenue, New York, NY \$16.95 1983

## WINTER SPORTS

"Many disabled people can now enjoy skiing and skating. In 1971, the Winter Park Handicap Recreational Program in Winter Park, Colorado, began to teach people with amputations how to ski. Now, people with 29 different types of disabilities are also taught to how to ski. At some winter resorts, a blind skier may take to the slopes in tandem with a sighted companion who provides directions by verbal command or by means of a light harness. One-legged skiers are equipped with two arm-braced outrigger skis to give them a three-pronged balance.

"Beginning ice skaters who lack muscle strength, coordination, or who are overanxious may use a skate aid for support until they gain confidence. The collapsible aid is used much as a chair is used for support, but the aid is more stable and evenly balanced. Although blind and deaf people need no special equipment for skating, blind skaters would probably feel more secure with sighted partners, and a source of music centrally located may be helpful for orientation."

From "Sports for Disabled Individuals,"  
Rehab Brief  
Vol IV, No 3, Jan 26, 1981

**Skiing**

Arroya: a downhill skiing system specially designed for persons with physical disabilities  
Arroya User/Instructor Manual available from:  
Peter W Axelson, Rehabilitative Engineering Research & Development/153, 3801 Miranda Avenue, Palo Alto, CA 94304, (415) 493-5000 x4473.

Colorado Outdoor Education Center, P O Box 697, Breckenridge, CO 80424, (303) 453-6422.

Kick the Handicap, Learn to Ski: A Handbook of Information for the Physically Handicapped  
Stieler, William E. Marlette, Michigan Adapted Sports Association, 1977, 123 pp.

National Amputee Ski Technique National Amputee Skiers Association. Carmichael, CA 1970, 91 pp

Pulk Skiing: Sled skiing and ice sledding for persons with mobility impairments 131 Larry Orr, Vinland National Center, P O Box 308, Loretto, Minnesota 55357

The Winter Park Amputee Ski Teaching System, O'Leary, H Available from Winter Park Ski School, P.O. Box 313, Winter Park, CO 80482, (303) 726-5514 x179

**INTEGRATED SKIING** In an effort to facilitate integrative recreational sporting activities, a downhill skiing system called the ARROYA was introduced in 1979 at the National Handicapped Skiing Championships. Development of the ARROYA downhill skiing concept was funded by the Rehabilitative Research and Development Center at the Palo Alto Veterans Administration Medical Center

The ARROYA is a simple sled-like device with no moving parts. The skier learns to control the direction and speed of the ARROYA by developing various downhill skiing skills. The ARROYA consists of four stainless steel edges that face inward beneath a composite shell. The skier sits in a molded seating system that links the user to the sled, much like the traditional downhill skier's foot is secured within a ski boot. The ARROYA is currently being manufactured by Beneficial Designs, 5858 Empire Grade, Santa Cruz, CA 95060. A list of skiing programs that use Arroya can be obtained from Beneficial designs. A cross-country sled is available from Mountain Smith, Inc, 12790 W 6th Place, Golden, CO 80401, (303) 238-5823

For more information on training programs and events related to pulk skiing, sled skiing, ice sledding and dog sledding

Alaska

Alpine Alternatives  
1634 W 13th  
Anchorage, Alaska 99501  
(907) 276-7526  
Marty Decker, Director

Arizona

Handicapped Unbound, Inc  
P O Box 1044  
Prescott, AZ 86302

California

Environmental Traveling Companions  
Fort Mason, Bldg C  
Room 3B  
San Francisco, CA 94123

NHYSRA Lake Tahoe Chapter  
Larry Young  
Box 1636  
Truckee, CA 95734  
(Incline Village, Lake Tahoe)  
(916) 587-3911  
(Alpine)

Tahoe Handicapped Ski School  
P O Box 2633  
Olympic Valley, CA 95730  
(916) 583-7584  
Katherine Hayes, Director

Colorado

Colorado Outdoor Education Center  
P O Box 697  
Breckenridge, CO 80424  
(303) 453-6422  
Bruce Werber, Director

Ed Luchs  
P O Box 5429  
Snowmass Village, CO 81675  
(303) 923-3294  
(Alpine)

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## RECREATIONAL AND LEISURE TECHNOLOGY

Horizons for the Handicapped  
P.O. Box 2143  
Steamboat Springs, CO 80477  
(303) 879-4466

Horizons for the Handicapped  
Laura Canfield  
P.O. Box 2143  
Steamboat Springs, CO 80477  
(303) 879-4466  
(Alpine)

Winter Park Recreational Assoc  
Box 36  
Winter Park, CO 80482  
(303) 726-5514, ext 179  
(Alpine)  
Hal O'Leary, Director

### Connecticut

United Deaf Skiers Association  
Attention Mr Gutfran  
Two Sunset Hill Road  
Simsbury, CT 06070  
(203) 244-3070

### Minnesota

Courage Alpine Skiers  
c/o Courage Center - Duluth  
Duluth, MN 55802  
(218) 727-6817  
(Alpine skiing)

Lynx Track - Will Steger  
P.O. Box 785  
Ely, MN 55731  
(Interdisciplinary programs in dog-sledding  
and winter travel)

Minnesota Outward Bound School  
308 Walker Avenue South  
Wayzata, MN 55391

Ski for Light - HEALTHsports, Inc  
1455 W Lake Street  
Minneapolis, MN 55408  
(612) 927-3611  
(Annual February week-long X-C Ski event  
with blind/sighted/mobility impaired  
also regional events)

Vinland National Center  
3675 Iduapi Road  
Loretto, Minnesota 55357  
(612) 479-3555  
Larry Orr/Director

Wilderness Inquiry II  
2929 4<sup>th</sup> Avenue South  
Minneapolis, MN 55408  
612/827-4001  
(Summer and winter travel programs)

### New Hampshire

Outdoor Wilderness Program  
Crotched Mountain Center  
Greenfield, NH 03047

### New York

Outdoor Experimental Ed for the Hearing Impaired  
National Technical Institute for the Deaf  
Rochester Institute of Technology  
1 Lomb Memorial Drive  
Rochester, NY 14623

### Utah

Adaptive Outdoor Recreation  
Ken Sleight Expeditions  
349 S 600 East  
Salt Lake City, UT 84103

Peter Mandler  
2273 Aubur Lane, Apt 6  
Salt Lake City, UT 84117  
(Snowbird, Alpine)  
(801) 272-7420

### Washington

Ski for All Foundation  
521 Wall Street, Suite 326A  
Seattle, WA 98121 (Snoqualmie Ski Summit)  
(206) 623-2714  
(Alpine)  
Chris Colb, Executive Director

### International

Track Three Ski  
Box 1260  
Station O  
Toronto, Ontario  
CANADA M4T 2P4

Karsten Inde  
Maraton Produkter  
Ekbacka 19700BRO  
Sweden 0758140522  
Postgata 878391-2  
Barkgata 289-8500

New Zealand Assoc for Disabled Skiers  
P.O. Box 2417  
Christchurch New Zealand  
Gillian Hall/Director

### SKATING

International Council on Therapeutic Ice Skating  
P.O. Box 13  
State College, PA 16801

**OTHER SPORTS****Bowling**

American Blind Bowling Association  
15 N Bellaire Avenue  
Louisville, KY 40206

American Wheelchair Bow Association  
Robert Moran, Executive Secretary  
6718 Pinehurst Drive  
Evansville, IN 47711  
812/862-6503

**Wheelchair Bowling.** Jim Lane and Dick Schaaf (eds.) Available from: Wheelchair Bowlers of Southern California, 6512 Cadiz Circle, Huntington Beach, CA 92647 Softcover 96 pages \$7.95 plus \$1.00 shipping

**Golf**

The Amputee Golfers Association  
Lakeview Terrace Watchung, NJ 07060

Dennis Walters, Jr  
8952 NW 10th Street  
Pembroke Pines, FL 33024

John Klein  
1016 Cliff Drive  
Santa Barbara, CA 93109

National Amputee Golf Foundation  
George C Beckman, Trustee  
Warm Springs, GA 31830

Peter Longo Golf Show  
PO Box 27283  
Tempe, AZ 85282

Western Amputee Golf Association  
Ed Bryant, Sec Treasurer  
118 W Swain Road  
Stockton, CA 95207

**Flying**

Flying has attracted increasing numbers of disabled people with the availability of FAA-approved portable hand controls. Boarding seats and/or door modifications are helpful in improving accessibility for some types of aircraft. There are several wheelchair pilot groups around the country that encourage and support private flying and help steer disabled participants through the licensing bureaucracy.

American Wheelchair Pilots Association  
Dave Graham  
PO Box 1181  
Mesa, AZ 85201  
(602) 831-4262

**California Wheelchair Aviators**

Bill Blackwood  
1117 Rising Hill Way  
Escondido, CA 92025  
(Paraplegia flight instructor. Information on planes, instruction, hand controls cockpit accessible wheelchairs)

Soaring Society of America Inc  
Box 66071  
Los Angeles, CA 90066  
(213) 390-4448

Ed Stadleman  
PO Box 207  
Sturgis, Kentucky 42459  
(Aircraft hand controls)

Union Aviation Inc  
Sturgis Airport - G  
Sturgis, KY 42459  
(In residence pilot training for disabled people, portable aircraft hand controls)

Wheelchair Pilots Assoc  
11018 102nd Avenue, N  
Largo, FL 33540  
(813) 393-3131

Some publications on flying are

"Flying Beyond the Handicap" Kenneth W Smith  
AOPA Pilot, October 1982, pages 68-73

"A Multi-Purpose Recreational Vehicle for the Disabled", Nigel Shapcott, RE, and Michael Heinrich, RE Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from: RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

"Powered Ultralights and the Disabled Pilot", Michael J Heinrich, RE, and Nigel Shapcott, RE Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from: RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

**Horseback Riding**

North American Riding for the Handicapped Association (NARHA)  
Box 100  
Ashburn, VA 22011

National Foundation for Handicapped Horsemanship for the Handicapped  
Box 462  
Malvern, PA 19355

**Hunting & Fishing**

Disabled Sportsman of America  
PO Box 26  
Vinton, VA 24179



## ADDITIONAL PUBLICATIONS: SPORTS AND RECREATION

Access to Recreation Architectural and Transportation Barriers Compliance Board Washington, D.C., 1977, 70 pp

Bibliography on Recreation, Play and Sports Rehabilitation International Postfach 101 409, 6900 Heidelberg, Federal Republic of Germany, 1975

Competitive Athletic Programs for Impaired, Disabled and Handicapped Persons American Alliance for Health, Physical Education and Recreation Washington, D.C., 1973 18 pp

Directory of Recreation & Leisure Services - For the physically handicapped in the Los Angeles area. 132 page directory \$7.95 + tax & mailing Christianson, Mickey A., 11066 Gonsalves Place, Cerritos, CA 90701, (213) 924-2159 Available from author

Equipment for the Disabled, Vol 6, Leisure and Games National Fund for Research into Crippling Disease 2 Foredey Drive Postlade, Brighton, BN4 2BB, E-

"Familiar Sports and Activities Adapted for Multiply Impaired Persons" PAM Repeater, No 22, February, 1984 Published by the PAM Assistance Centre, 601 Maple, Lansing, MI

Games, Sports and Exercises for the Physically Handicapped, 34d edition Adams, R.C., Daniel, A & Rullin L Lea and Febiger, Philadelphia, PA, 1982 \$20.50, 400 pages

Outdoor Pursuits for Disabled People, Croucher, Norman 1981, 170 p Woodhead-Faulkner Ltd, 8 Market Passage, Cambridge CB2 3PF, England, 4 75 Ls

Physical Activities for the Handicapped Vannier, Mary Helen Prentice Hall, Inc., Englewood Cliffs, NJ 07632, 1977, 338 pp

Physical Activities for Individuals with Handicapped Conditions Delores Geddes 2nd edition, 1978 C.V. Mosby Company, St. Louis, MO

Recreation A Bibliography National Easter Seal Society, 2023 West Ogden Avenue, Chicago IL 60612 Revised annually

Recreation and Leisure for Handicapped Individuals Resource Guide US Department of Education, Office of Human Development Services, Office for Handicapped Individuals, DHEW Publication No (OHDS) 79-22004

"Recreation for the Disabled", Jo Lockhart, MS A chapter in Disability and Rehabilitation Handbook, Goldenson, et al., McGraw-Hill, 1978

Recreation for Physically Handicapped Pomeroy, Janet, Macmillan Publishing Company, 866 3rd Avenue, New York, NY 10022 (Out of print)

Sports and Games for the Handicapped, Reference Circular No 79-1 National Library Service for

the Blind and Physically Handicapped, The Library of Congress, Washington, DC 1979

Sports and Recreational Programs for the Child and Young Adult with Physical Disability Proceedings of the Winter Park Seminar, Winter Park, CO, April 11-13, 1983, \$10 prepaid from the American Academy of Orthopaedic Surgeons, PO Box 7195, Chicago, IL 60680 How to assess the orthopaedically disabled child's activity, possible adaptations for various sports and recreational activities available program resources, competition classifications, and bibliography

Sports Centers and Swimming Pools Walter, Felix Disabled Living Foundation, 346 Kensington High Street, London W14, England, 39 pp, 2 00 pounds Recommends design standards for sports facilities and swimming pools, and ancillary equipment for use by disabled persons

"Teacher-made Adaptive Devices for Archery, Badminton, and Table Tennis" J Cowart Practical Pointers, May 1978, (13), 1-16 Contains guidelines for making adaptations of physical education equipment for students with disabilities Adaptations are suggested for archery, badminton, and table tennis equipment Each idea is designed to compensate for a specific functional limitation Construction steps are described and drawings are provided

Textbook of Sport for the Disabled Guttman, Sir Ludwig Alden Prass, London, England, 1976, 184 pp

Therapeutic Recreation and Adapted Physical Education within Rehabilitation Collingwood, Thomas R Hot Springs, Ark., Arkansas Rehabilitation Research and Training Center, 1971, 44 pp

Vin-Lines Quarterly newsletter from Vinland National Center, 3675 Ihdupai Road, P O Box 308, Loretto, MN 55357

## AUDIVISUALS

Annotated Listings of Films Physical Education and Recreation for Impaired, Disabled, and Handicapped Persons American Alliance for Health, Physical Education, and Recreation 3rd edition, 128 pp, annotated, price \$7.95

A Closer Look Barbara J Maresca Available from Film Arts, P O Box 468, Graton, CA 95444 16mm, color, 15 mins 1981 Explores wheelchair experiences, focusing on wheelchair basketball, hiking, other activities, and design and maintenance of the chair Phillip Morgan shows his design and construction of a lightweight wheelchair Stresses mobility and independence

Crystal Productions Catalog, Box 12317, Aspen, CO 81612, (303) 925-8160 List of sports & rehabilitation films about amputee, CP & blind skiing, spinal cord injuries

It's Ability That Counts Rehabilim/RFRL, 20 West



40th Street, New York, NY 10018 16 mm, color, 32 minutes. Sale \$365.00, rental \$25.00. Sir Ludwig Guttman introduces this film which so effectively illustrates the results of his life work, interspersing competition at the Stoke-Mandeville Games with leisure activities.

Not Just A Spectator Rehabfilm/RFRL, 2J West 40th Street, New York, NY 10018 16 mm, color, 35 minutes. Sale \$350.00, rental \$25.00. A colorful and exciting film that covers a wide variety of leisure activities for the disabled, including spelunking, rock-climbing, sailing and water-skiing.

Riding Towards Freedom Rehabfilm/RFRL, 20 West 40th Street, New York, NY 10018 16 mm, color, 32 minutes. Sale \$365.00, rental \$25.00. Horseback riding for the disabled has come into its own, and Riding Towards Freedom shows all aspects of the activity from the organization of riding classes to mounting methods and games. The great value of the sport to all those involved is clearly demonstrated.

Water Free Rehabfilm/RFRL 20 West 40th Street New York, NY 10018 16 mm, color, 35 minutes. Sale \$350.00, rental \$25.00. The first in a series of specialized offshoots from Not Just A Spectator, Water Free explores swim-training for all ages and levels of skill in detail. It includes survival training and a swim in the English Channel.

**SOME LOCAL RECREATION PROGRAMS**

Arizona

Handicapped Unbound, Inc  
P O 1044  
Prescott, AZ 86302  
602/445-5076

California

Adaptive Physical Education  
College of Marin  
Sir Francis Drake Highway  
Kentfield, CA 94904  
Laurie Lanham, RPT  
415/4 -9654  
Disabled Student's Office  
415/485-9406

Adaptive Recreation Program  
Andy Fleming, Coordinator  
City of Santa Barbara  
620 Laguna Street  
Santa Barbara, CA 93102  
Scuba diving for paraplegics

Adaptive Rehabilitation Physical Education  
De Anza Junior College  
21250 Stevens Creek Blvd  
Cupertino, CA 95014  
408/996-4873

All Seasons Riding Academy  
Therapeutic Riding Program  
43510 Osgood Road  
Fremont, CA 94538  
415/651-7330

Amputees in Motion (AIM)  
1539 W 11th Avenue  
Escondido, CA 92025  
Pam Stahl, President, San Diego  
717/747-6054  
Jerry Bahlquist, Coordinator  
714/729-9403

Local chapters in San Diego and Los Angeles, social & sports get-togethers, hospital visitation program

Berkeley Outreach Recreation Program  
605 Eshleman Hall  
University of California  
Berkeley, CA 94720

California Wheelchair Athletic Association  
P O Box 26482  
San Jose, CA 95159-6483

Environmental Traveling Companions  
Fort Mason, Building C  
Room 3B  
San Francisco, CA 94123

Indoor Sports, Inc  
3445 Trumbull  
San Diego, CA 92106

Orange County Riding Center, Inc  
Therapeutic Riding Program  
Stables  
Lake Forest Riding Club  
25201 Trabuco Road  
El Toro, CA  
Office  
23011 Moulton Parkway, Suite C-6  
Laguna Hills, CA 92653  
714/837-8225 (office)  
714/728-3669

Recreation Center for the Handicapped  
207 Skyline Blvd  
San Francisco, CA  
415/665-4100  
Programs for children and adults

Santa Barbara Community Golf Course  
John Klein  
3500 McCaw Avenue  
Santa Barbara, CA 93105

Colorado

Colorado Outdoor Education Center for the Handicapped  
P O Box 697  
Breckenridge, CO 80424

Michigan

Adapted Sports Association, Inc  
Communications Center  
6832 Marlette Road  
Marlette, MI 48453

## RECREATIONAL AND LEISURE TECHNOLOGY

### Minnesota

Courage Center  
3915 Golden Valley Road  
Golden Valley, MN 55422  
612/588-0811

HEALTHsports, Inc  
Leslee Lane  
1455 W. Lake Street  
Minneapolis, MN 55408  
612/827-3611

Wilderness Inquiry II  
2929 4th Avenue South, Suite O  
Minneapolis, MN 55408  
612/827-4001

### New Hampshire

Outdoor Wilderness Program  
Crotched Mountain Center  
Greenfield, NH 03047

### Ohio

Adaptive Sports Program  
Kinesiotherapy Clinic  
University of Toledo  
2801 West Bancroft Street  
Toledo, OH 43606

Indoor Sports Club  
1145 Highland Street  
Napoleon, OH 43545  
419/792-5756

### Canada

Toronto Bulldogs Wheelchair Sports Club  
c/o Lyndhurst Hospital  
520 Sutherland Drive  
Toronto, Ontario M4G 3V9 CANADA

## LEISURE ACTIVITIES

For information, see also National Organizations listed under SPORTS.

## GARDENING

One of my favorite equipment catalogs is Smith & Hawken Catalog for Gardeners (25 Corte Madera, Mill Valley, California 94941, (415)383-4415)

It's always a joy to read -- beautiful photos and/or drawings, lively text, and a strong emphasis on quality products. Until the Spring '84 issue, my catalog always stayed at home. It now joins my "Technology for Independent Living" files, because Smith & Hawken has begun a section called "Enabling Tools."

"We are proud to offer a selection of tools we call 'Enabling Tools.' This covers a broad area, and includes implements for older and younger people, for those whose limbs and muscles are not as strong as they once were, for the handicapped, or simply for people who want lighter and handier tools.... they include carts, kneelers, special grips and a wonderful selection of modular tools from Gardena in Germany. Although Dave and I are still reasonably young and hearty, these tools will certainly find a place in our toolshed as they offer superior value and flexibility."

This integrated marketing approach is especially obvious in two of the entries

## "CHILDREN'S TOOLS

"These are scaled down versions of our regular tools for those with less muscle, less space or fewer years. They are built to the same quality specifications as all Smith & Hawken tools. One of the frustrations for children in beginning gardening is that no one has taken seriously the making of children's tools. These down-scale tools give the child an immediate sense of the purpose and effect of a normal tool, and are perfect teaching aids for classroom use. The T-handles permit small hands a good two-handed grip. Their durability allows years of use and wear. All of these tools are suitable for senior citizens or the handicapped, as well as for those who garden on balconies, rooftops, or patios."

## "SUPERLIGHT TOOLS

"I discovered these on a recent trip to England, and almost overlooked them as they were being produced and sold by a company known solely for its excellent boat fittings. At first glance, I thought them to be aesthetically beautiful, but could not see their utility -- that is, until I picked one up. They are extremely light, and despite that, they are very strong. It would take a company making yacht fittings to realize the need for both strength and lightness. Each tool is made of aluminum alloy that is anodized so that it will not oxidize and turn black as cast aluminum tools do. The Hoes and Edger weight just 24

oz., the Rake only 32 oz. They are perfect tools for everyone, but are ideal for those who cannot lift a heavier tool. Whether young or old, or simply disposed to the ease and convenience of a light tool, these will please all."

With this approach in mind, it becomes easier to evaluate other products in regular gardening catalogs to determine if they will meet your special needs (editor)

Equipment for the Disabled Leisure and Gardening (Fifth Edition) Edited by ER Wilshere and GM Cochrane 1983 109 pp Oxford Regional Health Authority, 2 Foradown Drive Postslade, Brighton, BN4 2BB, ENGLAND

Leisure and Gardening has recently been updated. It is one in a series of volumes dedicated to presenting equipment related information to "those professionally concerned with the care of physically handicapped people of all ages. [These books] provide guidelines to help in the selection of equipment and suggest ways of overcoming different problems." They can also be used directly by disabled people. The materials are useful and detailed, unfortunately, the fact that the volumes are compiled in England can be a limiting factor in using some of the material presented.

The section on gardening, however, is quite universal. Most of the equipment is available for export, or can be closely approximated in the US.

There are tips on setting up an accessible greenhouse, pruning one's trees with ease, and laying out an accessible and easy upkeep patio garden that can be used by persons anywhere.

One reviewer's comment was "Where else in the world can one go to locate comparative information on garden hoes for persons with disabilities?"

Greenhouse Design for the Handicapped University of Nebraska, Lincoln, NE 18 pp 1967 Available from NARIC NARIC Accession #EI 7701-002977

## MUSIC

Settlement Music School's Programs for the Handicapped, S Archibald Leacock, Director

These programs began in 1976 as a pilot program with 30 students. Today these programs provide a creative and stimulating musical experience to almost 500 physical and visually disabled children and adults throughout the Delaware Valley, and have attracted both local and international attention. Distinguished violinist Itzhak Perlman is honorary chairman of The Therapeutic Music Program, jazz great George Shearing is honorary chairman of the Visually Handicapped Program.

The Settlement Music School plans to expand these programs to include a National Music Information

## center for the Handicapped

All disabled individuals are invited to share in these innovative and unique programs. For further information, contact Settlement Music School, Post Office Box 25120, Philadelphia, Pennsylvania, 19147; telephone (215)336-0400

The National Technical Institute for the Deaf has adapted musical equipment for more than 500 deaf musicians by using amplification and equalization techniques. NTID uses the latest technical equipment to teach deaf students to check their pitch visually. Light emitting diodes indicate to deaf musicians the accuracy of their pitch. If the line of dots moves up, the pitch is sharp, if it moves down, the pitch is flat, and if the line of lights is stable, the musicians have the correct pitch. For more information, contact Bruce Halverson at 716/475-6253

NOTE-ABLE

A newsletter on music for persons with physical limitations. The emphasis is on adapted musical instruments and methods which can be used by disabled people

The newsletter is written by Paige Finnerty, a musician and vocational rehab counselor. To receive the next issue, send a self-addressed stamped envelope to NOTE-ABLE, c/o Rancho Los Amigos Hospital, 7601 E Imperial Highway, 500 Hut, Downey, CA 90242

Clinically Adapted Instruments for the Multiply Handicapped Cynthia Clark and Donna Chadwick. Magnamusic-Baton, 10370 Page Industrial Blvd., St Louis, Missouri 63132 Phone 314/427-5660 192 pages. 1980. This book describes adaptations which can be made to a variety of melody and rhythm instruments (some of original design) used in music therapy. Photographs or drawings are included with each description

Guide to the Selection of Musical Instruments with Respect to Physical Ability and Disability

Magnamusic-Baton, 10370 Page Industrial Blvd, St Louis, Missouri 63132 197 pages 1982 This book describes in detail the physical mobility necessary to play most band and orchestral instruments. Each instrument is discussed in terms of range of motion, strength, dexterity, etc

Make Your Own Musical Instruments Muriel Mandell and Robert E Wood Sterling Publishing Co., Inc, 419 Park Avenue South, New York, NY 10016 126 pages. 1977

Treatment with Music A Manual for Allied Health Professionals. Karen J Miller, RMT, MOT, OTR/L Techniques manual containing basic music activities, techniques, and equipment appropriate for use in the treatment of physical dysfunction Barbara A. Rider, Chairperson, Occupational Therapy Department, Western Michigan University, Kalamazoo, Michigan 49008

## NEEDLEWORK

Creative Crochet L Calder \$7.95 plus \$1.00 postage Penguin Books, 625 Madison Avenue, New York, New York 10022 For those with the use of only one hand, the detailed design instructions and special basic technique make crocheting surprisingly simple Illustrated in full color throughout Paperback also available

The Not-So-Nimble Needlework Book Iris Rosenthal Grosset & Dunlap, 51 Madison Avenue, New York, NY 10010 160 pages. illustrations Paper \$5.95. 1977

Aids to Make You Able Wendy Davis Fred Sammons, Inc., Brookfield, IL 114 pages \$6.95 1979

The Source Book for the Disabled Glorya Hale, editor Paddington Press, Ltd Distributed by Grosset & Dunlap, New York 1979

"Sewing Machines." The English journal of the Consumers' Association, Which, joined with consumer organizations in nine other countries in a report on "electronic" sewing machines. As part of this international test, three sewing machines emerged which can be specially adapted for use by disabled people. These are Bernina 830H (Handicap), Switzerland; Husqvarna Viking 6270, Sweden, and the Husqvarna Viking 6690, Sweden. The Bernina comes fitted with aids to make it more suitable for people with physical and sight disabilities. The Husqvarna machines can be supplied with kits, one for the physically handicapped and a second for the blind and partially sighted. In the report, the point was made that no sewing machine -- not even one specially adapted -- will suit everybody. The advice is, try out a variety of sewing machines before buying

See also CLOTHING, page 62

**FITNESS**

Adams, Ronald, Alfred Daniel and Lee Rullman Games, Sports, and Exercises for the Physically Handicapped. 3rd ed. Lea and Febiger, Philadelphia, PA, 1975

American Alliance for Health, Physical Education and Recreation Testing for Impaired, Disabled and Handicapped Individuals Washington, D C

Collingwood, Tom and Robert Carkhuff Get Fit for Living. Human Resource: Development Press, 22 Amherst Road, Amherst, MA 01002 1976

Dance Slimnastics Ltd. "Armchair Aerobics" Armchair Aerobics is a special exercise program developed by Dance Slimnastics. Designed for the physically limited person, all of its exercises can be done while seated. Dane Slimnastics Ltd., P.O. Box 367, Port Washington, WI 53074 414/375-2502

Iron Athlete Training Center, Mark Lescoa, Manager, 1940 E. University Avenue, Tempe, AZ 85281 Write for information about a personalized weight lifting program

Milligan, G Timothy Fitness is Free, But You Have To Work For It: A physical fitness program for spinal cord injured persons June 1978 Arkansas Rehabilitation Research and Training Center. University of Arkansas, Little Rock.

Milligen, Tim. Physical Fitness Training for Rehabilitation Clients University of Arkansas, Little Rock, 1975.

Pollock, Dr. Michael L. "Arni Pedaling as an Endurance Training Regime for the Disabled" Archives of Physical Medicine and Rehabilitation, Volume 55, #9, September 1974, pp 418-424

Wheelchair Workout is \$13.50 plus \$1.00 postage Write 12275 Greenleaf Avenue, Potomac, MD 20854

**TRAILS**

There is a national network of special recreational facilities and "barrier-free" trails designed especially for people with disabilities. For more information on barrier-free trails and facilities in your area, contact the Forest Service Field Office nearest you. A complete list can be obtained free of charge by writing to Recreational Staff, USDA Forest Service, PO Box 2417, Washington, DC 20013. Request Forest Service Publication No. 13

## TOYS AND GAMES

## THE VALUE OF TOYS

Howard C. Shane  
The Children's Hospital Medical Center  
Boston, Massachusetts

"There seems to be a growing realization that toys should be an intricate part of childhood regardless of the presence of a handicapping condition. This becomes apparent if one talks with distributors of communication aids, visits evaluation centers for nonspeaking children, reads Communication Outlook or talks with persons interested in biomedical technology. There are countless numbers of children's toys marketed. Some require activation by another person through winding, cranking, blowing or puppeting which creates a relatively passive participation on the part of the child. Yet children generally attain skill levels requisite for independent interaction with these same activation mechanisms. In contrast, handicapped children have extremely limited opportunities to engage in independent toy manipulation. Irrespective of cost, the modified toys are simply fewer in number. On a more promising note, toy modification is experiencing a tremendous boom. Often a simple modification can be performed on any battery operated toy. (For specifics refer to C. Wethered in Communication Outlook, Vol 2, No 2) One possible explanation for the growing popularity of adapted toys is the growing number of children fitted with switches for the purpose of controlling an automated communication aid. These control switches can in fact provide a secondary function when interfaced with a toy. For some children additional skill training is required before they can actually control a communication aid effectively. Highly reinforcing and motivating toys allow for enjoyable experiences while training for reliable switch control. In the Communication Enhancement Clinic at the Children's Hospital Medical Center, Boston, for example, switch fitting is initially accomplished by interfacing a child with a toy.

"We recognize the importance of toys for children in that they provide endless hours of entertainment. In addition to enjoyment, toys foster the development of pre-linguistic and cognitive skills, such as attending, motor coordination, sorting, matching and categorization, schemas for causality, object permanence, etc. I emphasize that accessible toys have been particularly unavailable until recently. Toy adaptation has gained popularity for children with cognitive and/or physical limitations. Since federal legislation mandates equal educational opportunities for all children, educational facilities are required to design programs to promote development in all the prelinguistic and cognitive areas just mentioned for which toys are so important. Thus, more widespread availability and utilization of modified toys should ensure more stimulating and challenging learning environments for all children."

Reprinted from: "Communication Outlook", Vol 3, #1, April 1981

## TOY SELECTION

## Exceptional Equipment for Exceptional Children

"Good playthings should have these characteristics

- o free of detail as possible
- o versatile in use
- o easily comprehended
- o large, easily manipulated parts
- o involve child in play, including large muscles
- o encourage cooperative play
- o material that is warm and pleasant to touch
- o durable
- o work as intended
- o safe
- o generous in proportions and quantity
- o price based on durability and design

"The special child needs special equipment, but that is not all. It is the purpose of therapeutic equipment to enable the child as far as possible to participate in normal life and in normal play. This calls for an integrated approach to equipment, providing special equipment to allow the child to play and standard equipment to play with.

"The integration of special and standard equipment is especially important when mainstreaming requires that every child be educated in the least restrictive environment. A swing with interchangeable standard and special seats can be a real asset, or a rocking boat which accepts a special vestibular board which any child would enjoy.

"The possibilities are endless. With a little imagination you can find the perfect combination of special and standard equipment."

from Criteria for Selecting Play Equipment for Early Childhood Education, Rifton Equipment, Rifton, New York

## Choosing the Right Toy

"It is quite an art to choose the right toy at the right level for a handicapped child. Normal children are more accommodating and active in searching out a suitable toy and finding an appropriate way of playing with it.

"Our problem with the handicapped child is not that there are too many toys for them but that there are too few toys of the right sort. The main purpose of this book is to help you choose the right toy for your child. "It is very difficult to achieve a careful match between commercially available toys and your child's present abilities. At this point you will begin to appreciate the need for special toys. One of the features of the toys that we will be describing is that you can adjust their level to suit your child. A simple idea, but as yet, a novel one in the world of toys."

"Making Toys for Handicapped Children"

**The Concept of Control**

"Toys modified for the handicapped may represent a child's first understanding of cause and effect. The operation of a control interface connected to a toy is an excellent way of introducing control of an object in the environment as well as providing an early, simplistic association with a technical device which may be a forerunner for future, more complex aids. Many electronic and electrical toys can be modified for control by an interface using a battery interface. This device serves as an interface between the batteries of the toy and the control interface."

A listing of appropriate battery-operated toys is available from the Prentke Romich Company, Shreve, Ohio.

Battery interfaces are available commercially from companies such as Prentke Romich and ZYGO, or you can make them yourself (see D-I-Y, below).

**A Note on Safety**

Though disabled children may have some special needs to consider when selecting toys, the need for safety is the same as for any other child.

Easter Seals (2023 W Ogden Avenue, Chicago IL 60612) distributes Playing It Safe: A Safety Checklist for Children's Toys, reprinted from the Journal of American Insurance, Fall, 1977.

**DO-IT-YOURSELF (D-I-Y)**

You can make adapted toys, there are instructions in several of the books and pamphlets listed in the publication section. Also see the section on **CONTROL**, page 201.

Toy Adaptation Chris Wethered Canadian Association of Toy Libraries, 50 Quebec Avenue, Suite 1207, Toronto, Ontario M6P 4B4 CANADA 14 pages June 1979. Basic information needed to adapt battery-operated toys for activation by disabled children.

Guidelines for Adapting Battery Operated Toys Revised 1982 Jayne Higgins. The 25 page booklet includes procedures and materials for making a pillow switch, touch panel switch, and on-off switch. Toy to in-line jack procedures are also given which permits easy and immediate interchange of different switches to the toy. Step-by-step illustrated instructions are included as well as information on common pitfalls and problems. Information on where to obtain materials and toys through nation wide stores is included (ie Sears catalog; Radio Shack catalog). All switches are relatively inexpensive to make (\$2.00-\$5.00). Available from California Avenue School, Jayne Higgins, Speech Pathologist, 215 W California Avenue, Vista, CA 92083 \$3.00.

Toy Modification Note: Build It Yourself: Battery Interrupter Gregg Vanderheiden Trace Center, Madison, Wisconsin.

**PEOPLE AND ORGANIZATIONS WITH A SPECIAL INTEREST IN TOYS AND GAMES**

Linda Barr, Technical Resource Centre  
Alberta Children's Hospital  
Child Health Centre  
1820 Richmond Road, S W  
Calgary, Alberta T2T 5C7

Linda J Burkhardt  
8315 Potomac Avenue  
College Park, MK 20740

Rehabilitation Engineering Center  
University of Tennessee  
682 Court Avenue  
Memphis, TN

Trace Center  
University of Wisconsin--Madison  
314 Waisman Center  
1500 Highland Avenue  
Madison, WI 53706

Margrit Beesley  
Augmentative Communication Service  
Ontario Crippled Children's Centre  
350 Rumsey Road  
Toronto, Ontario M4G 1R8

Arselia Ensign, Director  
PAM Assistance Centre  
110 Marshall Street  
Lansing, MI 48912

Howard C. Shane, PhD, Director  
Communication Enhancement Clinic  
Children's Hospital Medical Center  
300 Longwood Avenue  
Boston, MA 02115

Peggy Tyler  
528 1/2 N Buckeye  
Wooster, OH 44691

Peggy Barker  
Rehabilitation Engineering Center  
Children's Hospital at Stanford  
520 Willow Road  
Palo Alto, CA 94304  
415/327-4800

Deborah Gilden, Ph D  
Smith-Kettlewell REC  
2232 Webster  
San Francisco, CA  
Toys for blind children

Steven Kanor, Ph D  
10 Lefurgy Avenue  
Hastings-on-Hudson, NY 10706



## SOME MANUFACTURERS AND DISTRIBUTORS OF SPECIAL TOYS

You can obtain toys from

**Abbey Medical**  
3216 El Segundo Blvd  
Hawthorne, CA 90250

**AbleChild**  
154 Chambers Street  
New York, NY 10007  
212/255-0068

**The Aidis Trust to Aid Disabled & Elderly People**  
4 Stour Close  
Shillingstone, Blandford  
Dorset, England

**Behavioraids**  
1210 West Alameda Drive  
Tempe, Arizona 85282

**Brad's Toys**  
P.O. Box 12  
Prospect Height, IL 60070

**Discovery Toys**  
Paula Fogleman, OTR  
3900 Sharp Road  
Glenwood, MD 21738  
301/442-1833

**Education Technology Center**  
Box 64  
Foster, Rhode Island 02825  
401/822-4622

**Electronic Handicapped Equipment, Ltd**  
1165 Portland Avenue  
Rochester, NY 14621  
716/544-9060

**Equipment Shop**  
P.O. Box 33  
Bedford, MA 01730

**Exceptional Play, Inc**  
P.O. Box 1015  
Lawrence, Kansas 66044

**G E Miller, Inc**  
484 S Broadway  
Yonkers, NY 10705

**H & H Hagland & Hanses HB**  
Borgnasagen 20  
2-781 31  
Borlange, Sweden

**Handicapped Children's Tech Services**  
RFD 2, Box 60B  
Foster, Rhode Island 02825

**The Handlers**  
P.O. Box 13178  
Tucson, Arizona 85732

**Huntercraft**  
Special Toys for Special Children  
Sherborne, Dorset  
England  
Phone (093581-2288)

**Steven Kanor, PhD**  
101 Lefurgy Avenue  
Hastings-on-Hudson, NY 10706

**Mid-Canada Medical**  
1230 Crestlawn Drive  
Mississauga, Ontario  
Canada

**Kurt Naef**  
CH-4314  
Zeiningen, Switzerland

**P. Luntke-Romich Co**  
8769 Township Road 513  
Shreve, Ohio 44676

**J.A Preston Corporation**  
60 Page Road  
Clifton, NJ 07012

**Rifton Equipment**  
Rifton, NY 12471

**Special Friends**  
P.O. Box 1262  
Lowell, MA 01853

**Telegraphics**  
P.O. Box 1061  
Carrollton, Texas 75006

**Touch Toys, Inc**  
303 Ritchie Highway  
Rockville, MD 20852

**Toys for Special Children**  
101 Lefurgy Avenue  
Hastings-on-Hudson, NY 10706  
914/478-0960

**Zygo Industries**  
P.O. Box 1008  
Portland, Oregon 97207

Toys and games for blind children are available from these sources

**American Foundation for the Blind (AFB)**  
Customer Service Division  
15 W 16th Street  
New York, NY 10011

**American Printing House for the Blind Incorporated (AMPHBI)**  
1839 Frankfort Avenue  
P.O. Box 6085  
Louisville, KY 40206

**Science Products (for the Blind) (SFB)**  
Wayne Box A  
Southeastern, PA 19087

## TOY LIBRARIES

Children with special needs often do not have the same access to toys as other children. One solution to this problem is to start a Toy Library which makes toys available to children in the same way that regular libraries make books available to people. A toy library provides access to a wide variety of high quality playthings for children, and especially for infants and pre-school children.

Children respond best to novelty and frequent change in their playthings. The variety of various toys required to supply this diversity of play experiences are, unfortunately, beyond the means of most households. What better solution than to have a whole range of developmental toys to borrow?

Some toy libraries, such as The Daisy Toy Lending Library exists as a support service and resource for the handicapped child's parents, his prime teachers. When parents can play with a child in a relaxed fashion, yet still promote the sequence of learning through informed choice and use of toys, the child may progress faster and farther, building up confidence in his own abilities, and have fun in the process. The library is designed to strengthen parental competence in stimulating the developmentally delayed child.

Some toy libraries also have TOYMOBILES, mobile vans that bring the collection to the community.

For more information on toy libraries

## TOY LIBRARIES ASSOCIATION

ARK, a publication of the Toy Libraries Association, is concerned with the establishment and upkeep of toy libraries. The journal lists new toy libraries and contains information on building and buying toys. ARK also contains a section entitled "Activity" which reviews various programs sponsored by local ACTIVE groups throughout the United Kingdom. ACTIVE members develop communication aids, education aids and play aids for both children and adults who experience handicaps.

"Activity" also includes news about groups with subscriptions to ARK, a review of reference books and news of radio and television shows concerning persons who experience handicaps.

For further information, write ARK, The Journal of The Toy Libraries Association, Seabrook House, Wyllyotts Manor, Darkes Lane, Potters Bar, Herts EN6 2HL, ENGLAND

## ACTIVE

The stated aim of ACTIVE, with groups located in Britain, Australia, New Zealand, Canada and throughout Europe, is to help children and adults who experience handicaps to lead more independent lives. ACTIVE is affiliated with the Toy Libraries Association. Membership of TLA/ACTIVE totals 800 persons. These individuals come from a variety of backgrounds, including those who experience handicaps, their friends and relatives,

and professionals.

One project pursued by ACTIVE is the publication of worksheets which contain designs for a range of play, leisure and communication aids not available commercially. The designs are submitted by ACTIVE members.

For further information, contact ACTIVE, Seabrook House, Darkes Lane, Potters Bar, Herts EN6 2HL, ENGLAND

CANADIAN TOY LIBRARIES ASSOCIATION  
50 Quebec Ave., Suite 1207  
Toronto, Ontario M6P 4B4, Canada

USA members of Canadian Toy Libraries Association include

California

Daisy Toy Lending Library  
890 Morse Avenue  
Sacramento, CA 95608

The Toy Chest  
2371 Stanwell Drive  
Concord, CA 94520

Connecticut

Click Industries Ltd  
66b Rolling Ridge Road  
Stamford, CT 06903

Florida

Tallahassee Toy Library  
410 1/2 N Bronough Street  
Tallahassee, Florida

Illinois

Chicago Public Library  
Children's Services Spec  
425 N Michigan  
Chicago, Illinois 60611

Children's Services  
Champaign PL & Info Ctr  
505 So Randolph  
Champaign, Illinois 61820

Glenview Public Library  
1930 Glenview Road  
Glenview, Illinois 60025  
Attn: M Kraut

Indiana

Indiana State Library  
Serials Section  
140 N Senate Avenue  
Indianapolis, Indiana 46204

Maryland

Harford County Library  
100 Pennsylvania Avenue  
Bel Air, Maryland 21214  
Attn: M Jaugstetter

Worcester County Library  
307 N Washington Street  
Snow Hill, MD 21863

Michigan

PAM Assistance Centre  
601 Maple  
Lansing, Michigan 48909

Minnesota

Ms Janet Cahill  
3611 37th Ave NE #209  
Minneapolis, MN 55421

Moorhead Public Library  
Lake Agassiz Regional Library  
PO Box 699  
Moorhead, MN 56560

Toys 'n Things  
906 North Dale  
St Paul, Minnesota 55103

Nebraska

Bellevue Public Library  
1003 Lincoln Road  
Bellevue, Nebraska 68005

New Jersey

Mrs Geri Schumann  
5 Amherst Place  
Upper Montclair, NJ 07043

New York

The Adriel and Evelyn Harris Toy Library  
for Handicapped Children  
United Cerebral Palsy of Westchester  
David G Osterer Cerebral Palsy Center  
King Street & Lincoln Avenue  
Town of Rye, NY  
(914) 937-3300

Ohio

Mentor Public Library  
8215 Mentor Avenue  
Mentor, OH 44060

Ms Helen L Orringer  
2151 Evansdale Avenue  
Toledo, OH 43607

Toy Library for Special Children  
Cincinnati Center for Developmental  
Disabilities  
Children's Hospital Medical Center  
Cincinnati, OH 45229  
513/559-4626

Toys of Love  
201 Wick Avenue  
Youngstown, Ohio 44503

Oregon

Dr Caroline Bauer  
6535 SW Chelsea  
Portland, Oregon 97223

Pennsylvania

Pittsburgh Toy Lending Library  
5410 Baum Boulevard  
Pittsburgh, PA 15232

Wisconsin

Door County Toy Library  
c/o Kathy White  
833 Michigan  
Sturgeon Bay, Wisconsin 54235

Ms Nancy Elsmc  
75 7th Street  
Racine, Wisconsin 53403

Mead Public Library  
710 Plaza 8  
Sheboygan, WI 53081

A directory of toy libraries (not specific to, but including libraries with toys for disabled children) has been published by Toys N Things Press, 906 N Dale Street, St Paul, MN 55103, 612/488-7284 Contact Jean Nicol for more information

Hidden in Play Lekotek is a documentary film that shows children in Scandinavia and the United States using Lekoteks -- toy libraries for children who experience handicaps. The libraries' trained staff members choose toys for the child's particular developmental needs and help parents guide their child's development through play.

The film follows the real experiences of eight children discovering their local Lekotek. Two centers are featured, one in Baerum, Norway, and the other, the first American Lekotek, in Evanston, Illinois.

The 28-minute film won the Blue Ribbon in Child Development Films at the 1982 American Film Festival, a Golden Eagle from CINE, and second place in the Programs and Facilities category at the Sixth International Rehabilitation Film Festival. Distributed by Filmedia Limited, the color film is available in 16mm or videocassette for sale or rental. For further information, contact Filmedia Limited, 1201 W Chase Avenue, Chicago, IL 60626.

The address for the Lekotek in Evanston is Lekotek, 613 Dempster Street, Evanston, IL 60201, 312/328-0007.

Although it is not a lending library, The Able Child (154 Chambers Street, New York NY 10007) has a wheelchair-accessible play area and professional advisors to select toys and play equipment. TAC is a resource center with aids for all ages. Free catalog.

## SELECTED PUBLICATIONS TOYS AND GAMES

"Adapted Games and Developmental Motor Activities for Children" Michael Marsallo, MA, and Dennis Vacante, MA, 4608 Exeter Street, Annandale, VA 22003. \$8.50

"Adapting Audio/Video Games for Handicapped Learners" Teaching Exceptional Children Part I Vol. 14, #2, November 1981. Part II Vol. 14, #3, December 1981. Single copy available from Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091 \$3.50. The material for these articles is excerpted from Audio/Visual Games for Severely Handicapped Learners Possibilities and Simple Adaptations by Karen Hughes, produced by the National Media Materials Center for Severely Handicapped Persons. Part II features special adaptive equipment checklists for adaptations that need to be made, suggestions for do-it-yourself projects, and more profiles of toys and games.

"Adapting Toys for Children with Disabilities" The Exceptional Parent Celia Schoeffler with Sandra Brooks August, 1982

"Adaptive Controllers for Video Games and Computers." Ken S Yankelevitz Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

Choosing Toys and Activities for Handicapped Children Jill Norris Toy Libraries Association, Seabrook House, Wyllyotts Manor, Darkes Lane, Potters Bar, Herts, England EN6 2AB 1974

"Communication Outlook" Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, Michigan 48824. Communication Outlook is a quarterly newsletter addressed to the community of individuals interested in the application of technology to the needs of persons who experience communication handicaps due to neurological or neuromuscular conditions. Communication Outlook is edited and published jointly by the Artificial Language Laboratory, Michigan State University and the TRACE Center for the Severely Communicatively Handicapped, University of Wisconsin. It is the principal publication of ISAAC. Subscriptions are \$10 (\$12 outside North America). Subscriptions are for whole volumes (4 issues). Single copies are available for \$3.00.

"Instructions for Constructing a Large Area Flap Switch (LAFS) to Allow Disabled Children to Control Battery Operated Toys" G Fraser Shein Biofeedback Research Project, Rehabilitation Engineering Department, Ontario Crippled Children's Centre, 350 Rumsey Road, Toronto, Ontario M4G 1R8 Canada. November 1980

Educational Games for Physically Handicapped Children Crary and Breen Available from Fred Sammons, Inc., Box 32, Brookfield, IL 60513 Love Publishing Company, 1777 South Bellaire Street, Denver, CO 80222, \$4.95. A 90-page booklet of recreational games which involve the

larger muscle groups. Games can be played with a minimum of equipment. Activities are grouped in order of difficulty and include learning games. Excellent drawings supplement the text. Extensive bibliography.

The Good Toy Guide The Toy Library Association, Potter's Bar, Herts, England EN6 2AB 1980

Guidelines for Adapting Battery Operated Toys Revised 1982 Jayne Higgins. The 25 page booklet includes procedures and materials for making a pillow switch, touch panel switch, and on-off switch. Toy to in-line jack procedures are also given which permits easy and immediate interchange of different switches to the toy. Step-by-step illustrated instructions are included as well as information on common pitfalls and problems. Information on where to obtain materials and toys through nation wide stores is included (i.e. Sears catalog, Radio Shack catalog). All switches are relatively inexpensive to make (\$2.00-\$5.00). Available from California Avenue School, Jayne Higgins, Speech Pathologist, 215 W California Avenue, Vista, CA 92083 \$3.00

Homemade Innovative Play Equipment for Activities in Physical Education and Recreation for Impaired, Disabled and Handicapped Participants 1973 Available from Council on Exceptional Children, 1920 Association Drive, Reston, Virginia

Guide to Mattel Toys for Parents of the Visually Handicapped Child Write to Toys for Special Children, Mattel Toys Division of Mattel, 5150 Rosecrans Avenue MS504, Hawthorn, CA 92550

Hear and Say Toys for Children with Hearing, Speech and Language Difficulties Susan Knowles Noah's Ark Publication Available from Toy Libraries Association, Herts, England 1978

Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children, Second edition Linda Burkhart, 8315 Potomac Avenue, College Park, MD 20740 50 pages \$5.00 plus \$1.00 postage and handling 1982. This book gives simple directions for constructing toys and switches that can be easily operated by severely and profoundly handicapped children. No special skills are needed to make them. All supplies can be found around the house or purchased inexpensively at local stores. One example is a head control switch. The materials cost about \$2.50 and takes about half an hour to construct. The switch is attached to the child's head with a barrette and plugged into a toy or tape recorder. When the child lifts his or her head, the music or toy turns on, thus giving the child a reason to lift their head. This book has a wide range of applications and should be useful to parents, teachers, specialists of vision, hearing, speech, physical and occupational therapists and other friends of the handicapped.

Making Toys for Handicapped Children Roy McCorkey and Dorothy Jeffree Human Horizons Series, Souvenir Press Ltd, 43 Great Russell Street, London, England 1981. Provides parent

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and teachers with simple instruction on how to make toys especially designed to stimulate the development of mentally and physically handicapped children. Photographs and drawings illustrate the construction of each toy, and accompanying suggestions show how to use each toy for maximum benefit to the child. This is an excellent book on making and using low-cost toys.

Let Me Play Dorothy Jeffree, Roy McCokey and Simon Hewson. Souvenir Press, London, England 1977

Let's Play Games! National Easter Seal Society for Crippled Children and Adults, 2023 W Ogden Avenue, Chicago, Illinois 60612

"Making Toys Accessible" Communication Outlook, Vol 2, No. 1, September, 1979. Barry Romich, Prentke Romich Company, 8769 Township Road 513, Shreve, Ohio 44676

Meeting the Needs of the Handicapped: A Resource for Teachers and Librarians C.H. Thomas and J.L. Thomas, editors. Oryx Press, Phoenix, AZ 440 pages. 1981

More Homemade Battery Devices for Severely Handicapped Children with Suggested Activities Linda Burkhart, 8315 Potomac Avenue, College Park, MD 20740 \$12.50 1982. A continuation of the first book. Includes a section on suggested activities for incorporating these devices into the child's program.

No Cost, Low Cost Playthings: Toys for Fun and Learning Demonstration and Research Center for Early Education, John F. Kennedy Center for Research on Human Development, George Peabody College, Nashville, TN 37203

PAM Repeater "Toys-Toys-Toys and Learning" Maurine Otos, State Coordinator of Deaf-Blind Services, Oregon School for the Blind. PAM Repeater is published by the PAM Assistance Centre, 601 Maple, Lansing, Michigan

Title unknown, "A publication with directions for making simple toys from scrap and recycled items." Touch Toys, Inc., 303 Ritchie Highway, Rockville, MD 20862 \$3.00

Toy Adaptation Chris Wethered. Available from Canadian Association of Toy Libraries, 50 Quebec Avenue, Suite 1207, Toronto, Ontario M6P 4B4 Canada. 14 pages. June 1979. Basic information needed to adapt battery-operated toys for activation by disabled children.

Play Helps--Toys and Activities for Handicapped Children Roma Lear. William Heinemann Medical Books, London, England 1977

Prattle and Play: Equipment Recipes for Nonspeech Communication Faith Carlson. Media Resource Center, Meyer Children's Rehabilitation Institute, 444 South 44th Street, Omaha, NE 68131 \$5.00. The book is aimed toward both professionals and parents who are interested in building toys or communication devices for nonverbal children. The book is arranged in "recipe format," like a cookbook, making it suitable for the novice.

The book is divided into two sections. The equipment section includes materials and instructions needed for making equipment. The adaptations section tells how to make special measurements and changes in design for a particular child's needs. The materials used to construct the equipment are principally wood, cloth and plastic.

Toys for the Physically Handicapped Child Margrit Beesley. Augmentative Communication Service, Ontario, Canada 1982. Available from Toys for the Physically Handicapped Child, 53 Fairmeadow Avenue, Willowdale, Ontario M2P 1W8, CANADA

Toys Help: A Guide To Choosing Toys For Handicapped Children Canadian Association Toy Libraries, 1207-50 Quebec Avenue, Toronto, Ontario Canada M6P 4B4 \$7.00 1981. Toys Help is a five-part information kit which introduces the therapeutic and educational uses of toys and also offers the basic information needed to set up a toy/play based therapeutic project. The kit contains a rationale and model for conceptually understanding toy-based therapy (unit 1), criteria for selecting potentially beneficial toys (unit 2), a chart listing 100 toys and their uses (unit 3), administrative and practical suggestions for the storage and cataloging of toys, including basic information for starting a toy library (unit 4), and a number of suggestions for modifying commercially available toys (unit 5). Also included are the titles of several books and articles, names and addresses of toy suppliers and agencies or organizations involved with and interested in helping children through the use of toys.

The Use of Current Technology in the Design and Construction of Simple Inexpensive Teacher Made Response-Contingent Educational Materials for the Severely and Profoundly Handicapped Population Chris E. Wethered 1978. Master's Thesis, University of Miami. Available from Chris Wethered, c/o University of Tennessee, Rehabilitation Engineering Center, 1248 La Paloma, Memphis, TN

"The Value of Toys" Communication Outlook, April 1981, Vol 3 Number 1. Howard C. Shane, Ph.D., The Children's Hospital Medical Center, Boston, MA

Wobble Switch Toy Control Switch: A Do It Yourself Guide Ben Brown 1980. 3 pages. Available from TRACE Center, University of Wisconsin, Madison, WI 53705

## PLAYGROUNDS

Access to Play - A Design Criteria for Adaptation of Existing Playground Equipment for Use by Handicapped Children. Contact Pittsburgh Architects Workshop, Inc., 237 Oakland Avenue, Pittsburgh, PA 15213 102 pages. 1979. The ideas presented emphasize adaptation of existing equipment to make public playgrounds safer and more accessible for both normal and handicapped children. Dimensions, diagrams, and detailed descriptions are provided, as well as a fine bibliography.

The Design of a Pre-School Therapeutic Playground An Outdoor Learning Laboratory Ronnie Goroon Institute of Rehabilitation Medicine, 400 East 34th Street, New York, NY 10016 52 pages 1972. Describes the design and development of an outdoor therapeutic playground area for disabled children in which space, equipment and activity areas are consistent with the education goals of the IRM. The equipment shown has been custom built, but could be adapted using less expensive materials.

An Instructional Playground for the Handicapped Using Tires as Inexpensive Playground Equipment Activity and Construction Manual The University of the State of New York, The State Education Department, Division for Handicapped Children, Special Education Instructional Materials Center, 55 Elk Street, Albany, NY 12234 50 pages 1975

Playground for all Children Book I, User Groups and Site Selection, 52 pp., (\$3.30) Book II, Design Competition Program, 49 pp., (\$1.60) Book III, Resource Volume, 153 pp., (\$3.50) U.S. Department of Housing and Urban Development, Government Printing Office 245 pp. These three books pertain to the construction of public playgrounds designed for integrated play between handicapped and able-bodied children. Booklet I describes the children who are expected to use it and the background research studies for the project. Booklet II deals with the design competition devised for the city of New York to encourage the widest variety of approaches and solutions. Volume III documents the development of the playgrounds and deals with process and product.

Playgrounds For Free The Utilization of Used and Surplus Materials in Playground Construction Paul Hogan MIT Press, Massachusetts Institute of Technology, Cambridge, MA 02142. 252 pages 1974. Shows how to obtain discarded materials, such as tires, telephone poles, and cables, and how to construct playgrounds out of them. The emphasis is on involving community residents in building their own playgrounds.

## **Technology for Personal Mobility**



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## MOBILITY DEVICES

### MOBILITY DEVICE EVALUATION GUIDE

#### General

This guide is designed to provide a way to systematically compare different mobility aids or evaluate the appropriateness of a device for a specific mobility device rider. The form does not discuss how to fit a wheelchair but is more concerned with what the device is designed to do and how well it works. The items included have been compiled from criteria used by designers, therapists, and consumers to evaluate assistive equipment.

#### Rating System

The rating system allows for comparing performance in certain areas such as posture and mobility in a single product or comparing one area in many products in a quantitative manner. The novice may have difficulty rating certain items, such as maintenance or durability, but the form may be used as a guide to obtaining systematic information from experienced users.

The rating system is a sliding scale from 0 to 5. Give a 0 if the item does not function, is most unsatisfactory, or is unacceptable. A score of 5 indicates the item performs very well, is most satisfactory, or is the best. Gradations between the extremes are scored 1, 2, 3, or 4. A category NA is provided for inapplicable functions, e.g. a manual wheelchair has no electrical system to critique.

In general, the comments section should explain why the rating was given, what equipment features or modifications affect the function, or conditions required for the device to work.

The instructions for the rating sheets explain each item and provide suggestions for comments. The user may choose to use or ignore these recommendations. However, the usefulness of the form depends on the quality of the comments made on the form by the evaluator.

This guide was developed by Helen Tsuda, MA Candidate, Division of Physical Therapy, Stanford University Medical School, April 1981, with the guidance of Sandi Enders, OTR and Kelly Flanagan, at Children's Hospital at Stanford, Rehabilitation Engineering Center. Special thanks to Sam McFarland, Southwest Research Institute, San Antonio, Texas, for editing assistance and to the Bay Area Pediatric Interest Group for identifying the need for such an evaluation guide.

## MOBILITY DEVICE EVALUATION GUIDE REFERENCES

Clearfield, D Medical Devices and Equipment for the Disabled. An Examination Disability Rights Center, Washington, DC 1976 This paper discussed the safety, cost and consumer satisfaction of medical equipment. A case study of the wheelchair industry mentioned problems seen by users which includes durability, cost, fit, weight, and repairs.

Clinical, Engineering and Work Related Evaluation of Stationary Stand-up Frames and Stand-Up Frames and Stand-Up Wheelchair for the Disabled Research Project #R-115 New York University Research and Training Center Annual Report, pp 57-69, 1979-1980 This project examined the La Berne Gearlift Stand-In Table and LIVO Stand-Up Wheelchair in terms of the assistance needed to use, pressure exerted by straps or structures, tolerance, and user reaction. Balance, stability, mobility, and adjustability were also considered.

Enders, S "Draft Proposal for Wheelchair Evaluation for the Veterans Administration Prosthetic Center, New York" Center for Independent Living, Equipment Evaluation Program, Berkeley This draft provided a list of characteristics of equipment to be examined. Points often overlooked in other critiques included restraints, transfer access, disengagement of the power source and drive, instructions provided, prescriptive indications, comparison to previous equipment, and how it is secured for transport.

Fenwick, D Wheelchairs and Their Users Her Majesty's Stationary Office, London, 1977 The National Health Service interviewed wheelchair users in England and Wales to determine user demographics, disabilities, equipment use, and satisfaction with the equipment and service. The interview questionnaire was included.

Grall, T B A Feasibility Study of Product Testing and Reporting for Handicapped Consumers Consumers Union of the United States Inc., Mount Vernon, NY March 1979 The study was designed to show the need and marketability of product evaluations for handicapped consumers. Some consumer concerns often overlooked by designers included durability, utility, ease of use, and repairs--cost, part availability, and service agent competence. Rehabilitation professionals also wanted safety information.

Hotchkiss, R "Left To Your Own Devices: The State of the Art of Wheelchair Design" In Mobility for Spinal Cord Impaired People Report for a Workshop Held at the Rancho Los Amigos Hospital, Downey, CA, on February 22-24, 1974, pp 45-59 National Research Council, Washington, DC, 1975 Available from the National Rehabilitation Information Center (NARIC), Catholic University, Washington DC. This presentation referred to current characteristics of wheelchair designs then discussed advantages and disadvantages of some designs proposed to solve frame, wheel, width, and stair-climbing problems.

Sheredos, S.J., Darlington, J.W., Lyles, M Evaluation of Stand-Up Wheelchairs Veterans Adminis-

tration Prosthetics Center, Clinical Evaluation Service, Castle Point, New York. Undated copy. This article reviewed the design of six wheelchairs with respect to weight, controls, transfers, and user reactions. Pictures of all six chair in use are included.

Stout, G "Some Aspects of High Performance Indoor/Outdoor Wheelchairs" Bull Prost Res BPR-10-32 pp 135-175, Fall, 1979 This article studied the performance of electric wheelchairs in terms of stability, speed, wheel size, brakes, controls, height, and folding and reclining features.

Team Assessment of Device Effectiveness: A Retrospective Study Children's Hospital at Stanford, Rehabilitation Engineering Center, Palo Alto, CA, October 1980 This evaluation considered changes in life style, daily use, life span, effectiveness, and cost of devices. Functional, psychosocial and environmental need of the user are stressed. Fifteen aspects of good equipment are also included.

VAPC Evaluations of Mobility Aids Past, Present and Future Veterans Administration Prosthetics Center, New York, July 1978 Pictures, short descriptions, and findings concerning safety and merits of further examination of some mobility aids are included. No explanations of "standards of acceptability" were given.

Vash, C.L. "Psychosocial and Learning Consideration in using Mobility Systems" Mobility for Spinal Cord Impaired People, pp 136-145 (See Hotchkiss) National Research Council, Washington, DC 1975 This speaker addressed mobility about the home, neighborhood, and beyond. Issues of cost, versatility, cosmetics, safety, and private and public transportation were considered.

DESCRIPTION

DEVICE \_\_\_\_\_

Frame \_\_\_\_\_

Seat and Back \_\_\_\_\_

Wheels, Front \_\_\_\_\_

Back \_\_\_\_\_

Rims \_\_\_\_\_

Brakes \_\_\_\_\_

Arm rests \_\_\_\_\_

Foot rests \_\_\_\_\_

Power system Motor \_\_\_\_\_

Battery \_\_\_\_\_

Charger \_\_\_\_\_

Controls \_\_\_\_\_

Other equipment \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Dimension In use \_\_\_\_\_

For transport or storage \_\_\_\_\_

Weight Total \_\_\_\_\_

Heaviest piece \_\_\_\_\_

Cost \_\_\_\_\_

Special functions \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## MOBILITY DEVICES

### DESCRIPTION

#### Introduction

Fill in this form first.

The following suggestions are examples of the variety of styles and helpful information that may be considered in the description of a wheelchair

This section will contain short phrases to describe important features such as materials used, actions, and whether it is standard or optional. The addition of a photograph is very helpful and highly recommended

Frame steel, chrome, plastic, aluminum, wood, paint, folding, non-folding, lightweight, heavyweight, narrow

Seat and Back solid seat, sling seat, zippered back, detachable back, vinyl, cloth, contoured, modular, one piece, include type of cushion used

Arm Rests part of frame, detachable, adjustable, flared, desk style, full length, padded, skirt guards

Foot Rests part of frame, detachable, swing away, elevating, telescoping, wood, metal, plastic, calf pads, heel loops

Wheels front or back wheel drive, dimensions (width and diameter), solid pneumatic, semipneumatic tires, type of tread free wheeling casters, spokes

Rims chrome, plastic, wrapped, textured, with extensions, type of bracing

Brakes Foot or hand control, powered, location, extensions, front or rear

Motor, Battery, Charger Battery voltage, number of batteries, variable speeds, covers, plugs and connections, line voltage for charging, charging frequency

Controls joy stick, pneumatic, proportional, switches, location

Other Equipment list may include straps, pads, head rest, trays, crutch holders, other options

Dimensions Height, length, width, or other useful measurements. If the item folds or dismantles for transport, include those measurements

Weight Heaviest piece when dismantled should be considered. Even when dismantled, one piece may be too heavy for easy transport or mobility

Cost Average cost and a range of costs may be useful or attach catalog and price list. Dating is important since changes occur over time

Special functions This space is for listing any special functions or purposes the item may have. Examples: sport model, stand-up, stair climbing

FUNCTION

DEVICE \_\_\_\_\_

	Performance Rating		Comments
	low	high	
<b>MOBILITY</b>			
Indoors	NA 0 1 2 3 4 5		
Outdoors	NA 0 1 2 3 4 5		
Uneven terrain	NA 0 1 2 3 4 5		
Ramps	NA 0 1 2 3 4 5		
Curbs	NA 0 1 2 3 4 5		
Distance	NA 0 1 2 3 4 5		
Maneuverability	NA 0 1 2 3 4 5		
<b>POSTURAL SUPPORT</b>			
Supports body and its parts	NA 0 1 2 3 4 5		
Maintains posture	NA 0 1 2 3 4 5		
Controls abnormal tone	NA 0 1 2 3 4 5		
Prevents deformities	NA 0 1 2 3 4 5		
Prevents tissue trauma	NA 0 1 2 3 4 5		
Changes position	NA 0 1 2 3 4 5		
<b>DAILY USE</b>			
Comfort	NA 0 1 2 3 4 5		
Ease of use	NA 0 1 2 3 4 5		
Ease of transfers	NA 0 1 2 3 4 5		
Access to tables	NA 0 1 2 3 4 5		
Access to other equipment	NA 0 1 2 3 4 5		
Access to public places	NA 0 1 2 3 4 5		
<b>ADAPTABILITY</b>			
Adjustable parts	NA 0 1 2 3 4 5		
Changing phys status	NA 0 1 2 3 4 5		
Different disabilities	NA 0 1 2 3 4 5		

## MOBILITY DEVICES

### MOBILITY

Indoors The device should be able to negotiate carpets, linoleum, and thresholds. Doorway width may need consideration with special width requirements getting lower scores.

Outdoors Concrete sidewalks, asphalt road, dirt, and grass are common surfaces that need to be accessible.

Uneven Terrain Consider uneven sidewalks, thick rugs, sand, gravel, hills, and small obstacles.

Ramps Limitations to the grade and length of incline should be noted. Energy requirements and the speed of ascent and descent may need attention.

Curbs Consider the height and assistance necessary to negotiate.

Distance Any limits and the limiting factor (user, battery, or terrain) should be noted. Example: goes from room to room, works on linoleum only.

### POSTURAL SUPPORT

Support Body and Its Parts Support should be neither inadequate nor too restraining. Indicate whether special pads, straps, or shaping is necessary to achieve sufficient support.

Maintains Posture The device should not give way under pressure or need constant readjustments.

Control Abnormal Tone/Prevent Deformities/Prevent Tissue Breakdown Consider whether the equipment inhibits or facilitates abnormal patterns of movement or tone, scoliosis, changes of body position to relieve pressure. Any high pressure areas should have adequate padding to avoid tissue breakdown. (Some aids are designed specifically for these functions while others give postural support secondary importance.)

Changes Position If a device can change position (e.g., back reclines) consider if support or pressure is altered and describe changes if significant. The amount of assistance required to change should be examined.

### DAILY USE

Comfort This function implies a good fit is possible. The device should not cause pain or discomfort.

Ease of Use This item must be qualified as to whether the user or an assistant finds the aid simple and smoothly operable.

Ease of Transfer Again, consider whether the user and/or any assistants find the device easy to get in and out of.

Access to Tables Tables should be within reach as the chair faces it. Special table height requirements should be noted.

Access to Other Equipment Other equipment may include kitchen appliances, bathroom fixtures, working area, or assistive devices (e.g., respirator).

Access to Public Places School, business and recreational facilities should be accessible. Any special needs, e.g., wide electric doors, ramps or assistance should be listed in the comments.

### ADAPTABILITY

Adjustable Parts Parts that can be altered or change position should maintain positions set and change quickly and easily when desired.

Changing Physical Status The device should accommodate some growth changes or physical and mental deterioration due to disease processes.

Different Disabilities If the device is extremely specialized for a certain type of patient, give a low score. If the aid can be adapted for many people, score higher.



FUNCTION

DEVICE \_\_\_\_\_

	Performance Rating		Comments
	low	high	
<b>TRANSPORT</b>			
Into car unassisted	NA 0 1 2 3 4 5		
Into car w/ assistance	NA 0 1 2 3 4 5		
Into van	NA 0 1 2 3 4 5		
Use public transport	NA 0 1 2 3 4 5		
Can be carried upstairs	NA 0 1 2 3 4 5		
Distance	NA 0 1 2 3 4 5		
<b>SAFETY</b>			
Stationary	NA 0 1 2 3 4 5		
In Motion	NA 0 1 2 3 4 5		
Inclement Weather	NA 0 1 2 3 4 5		
Electrical System	NA 0 1 2 3 4 5		
<b>DURABILITY</b>			
Expected lifetime	NA 0 1 2 3 4 5		
Upholstery	NA 0 1 2 3 4 5		
Frame	NA 0 1 2 3 4 5		
Attachments	NA 0 1 2 3 4 5		
Power system	NA 0 1 2 3 4 5		
<b>MAINTENANCE</b>			
Washable	NA 0 1 2 3 4 5		
Repair frequency	NA 0 1 2 3 4 5		
Repair costs	NA 0 1 2 3 4 5		
Downtime	NA 0 1 2 3 4 5		
<b>APPEARANCE</b>	NA 0 1 2 3 4 5		
<b>SPECIAL FEATURES</b>	NA 0 1 2 3 4 5		

Evaluated by \_\_\_\_\_

150

## MOBILITY DEVICES

### TRANSPORT

Into Car Unassisted Higher score if a user can get the aid in and out with no help quickly and easily. Indicate the smallest car that will accommodate the user and device.

Into Car with Assistance Indicate how much help is required and car size.

Into Van Specify special tie-downs to secure device safely for transport and whether the user remains in or gets out of the chair while traveling. The height of the user in the chair may influence the head room required.

Use Public Transportation Will equipment fit on bus, train, plane, etc? What special equipment (e.g., lifts) will be needed?

Can Be Carried Upstairs This item is included for devices which cannot climb or descend stairs or where no ramps or elevators are available. Consider the number of assistants required and whether the user is in or out of seat. (This characteristic may be important for safety in emergencies.)

### SAFETY

Stationary The device should not tip over, rock, or be easily pushed off balance. The brakes should hold well.

In Motion Progress should be without jerks while going straight or turning. Control must be maintained constantly and easily.

Inclement Weather Consider safety in wind, rain, snow, ice, heat, cold.

Electrical System Connections should be good, shock hazards reduced, and charging instructions clear. Watch out for loose wires and battery leaks.

### DURABILITY

Expected Lifetime A list of what component or factor determines the lifetime may be helpful. Example: child outgrows device in six months.

Upholstery Indicate whether it tears or wears out. Specify if replacements or reinforcements are possible.

Frame Although rating of this item is mainly concerned with it standing up to daily use, any rattling, bending, or scratching should be examined.

Attachments Separate pieces should remain firmly attached throughout the life, be replaceable or last as long as the rest of the device.

Power System Consider which parts last throughout the life, how often batteries need charging and replacement.

### MAINTENANCE

Washable Special cleaning needs should be listed. Rating also includes how often and how easy it is to clean.

Repair Frequency Least often scores highest. Comments could indicate which parts require most care. (Repairs may also include routine maintenance.)

Repair Costs The expense will also be affected by who is performing the repair -- user, friend, vendor, bicycle shop, distant manufacturer. Item which requires most repairs or most expensive repairs may be useful to note. Average annual costs may also be informative.

Downtime This concept includes how long repairs take in which the aid is unavailable, and how often this occurs.

APPEARANCE This category is one of the most subjective. Consider both the user's and the public's reaction to the device. One guide suggested is to ask "Would I want to be seen using this equipment?"

SPECIAL FEATURES Space is allowed for listing any significant feature not previously mentioned. Remember to specify what is being rated.

SUMMARY

Device \_\_\_\_\_ Date \_\_\_\_\_

Put Picture of Aid/Device Here

Brief description \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Overall impression \_\_\_\_\_  
\_\_\_\_\_

Advantages \_\_\_\_\_  
\_\_\_\_\_

Disadvantages \_\_\_\_\_  
\_\_\_\_\_

Appropriate users \_\_\_\_\_  
\_\_\_\_\_

Availability \_\_\_\_\_

Evaluated by \_\_\_\_\_

Date \_\_\_\_\_ 16 \_\_\_\_\_

## MOBILITY DEVICES

### SUMMARY

This section condenses the information obtained from the rating sheets and can be used for quick referencing of important features. A brief description may cover appearance and function of the device, e.g. "battery powered, contour customized wheelchair can mount most curbs". The overall impression should include whether the device works well or not and under what circumstances. The evaluator may find a listing of the device's performance for each broad function on the rating sheets helpful. Specific pleasures or aggravations can be listed under advantages and disadvantages.

The appropriate users section may list the types of disabilities or the functional abilities of people who may use this device. (Example: For users with good upper extremity and trunk strength and control.)

The section for availability allows space for information concerning the manufacturer, vendor, repair facilities, and the time for delivery.

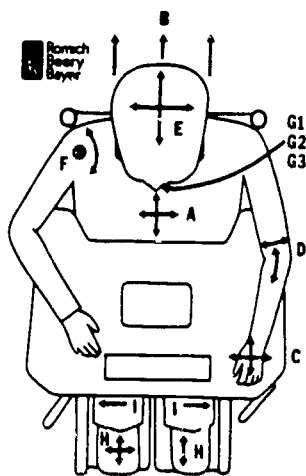
## WHEELCHAIR CONTROL SYSTEMS

## What Controller Is Best?

Selection of a suitable controller is of major importance in achieving an effective wheelchair control system. Generally, efficient control of the wheelchair represents one of the more difficult tasks to accomplish (both from the standpoint of choice of controller and development of operator skills). Operation of communication aids and typing devices also represent difficult tasks. Most other functions are easily managed by whatever approach works for the wheelchair. Usually, coordinated, simultaneous, two-axis, proportional control (immediate-acting, continuously variable control of both speed and turns), when available, will achieve the best maneuverability. Compromising any of these characteristics will result in decreased precision or a slower rate for a given maneuver.

In order to select or devise the best controller for a given individual, one must weight the various trade-offs. The features generally considered are:

- 1) The operator's abilities
- 2) Effectiveness of control
- 3) Ease of learning and training requirements
- 4) Appearance (cosmetic and aesthetic)
- 5) Interference with other desirable functions
- 6) Medical considerations



## What Can Be Used For Control?

By positioning a switch or sensing device at some anatomical location, signals can be derived which might be employed to operate a wheelchair. This listing represents potential control sources, letters refer to the anatomical sites indicated on the drawing.

A Chin Control requires very small travel (1/4" or less) to produce proportional control.

B Head Rest Control By pushing straight back against the headrest a forward signal is produced. By rocking your head to the left or right against the headrest, turn signals are generated. A separate switch needs to be activated to reverse the sense for backward motion.

C Joystick. Operates using standard joystick format.

D Arm/Elbow Control Movement of the elbow outward and/or sliding of the arm forward and backward might be used for activation of switches or proportional signals.

E Head Control Direct use of forward/backward and left/right movement of head is employed.

F Shoulder Position Here elevation and depression (or slump) provide forward/backward signals while protraction/retraction of the shoulder provide the left/right signals.

G1 Pneumatic (puff/sip) Control This system uses hard puffs and sips to control forward and backward velocities, while soft puffs and sips introduce proportional turns.

G2 Spoken Control A computer can analyze the words you speak and use them in the same way as you might speak to a blind-folded driver.

G3 Mouth, Tongue, Lip Control A head mounted chin controller element can make use of small movements to provide proportional control.

H Foot Control A rocker plate could yield all four signals for wheelchair directions, or "gas pedal" type controls might be used.

I Knee Control Thrusting the knee inward or outward can provide control signals.

## BATTERIES FOR WHEELCHAIRS

For reasons of energy output and cost per unit weight, the lead-acid battery remains the battery of choice. According to David Bayer, at least 50% of all problems with powered wheelchairs are battery-related. He gives the following "dos and don'ts" of battery choice and care.

**The Right Battery**

- 1 If possible, use a rechargeable lead-acid battery designed for deepcycling.
2. Avoid those batteries which are advertised as having these design features:
  - "Improved cold-start performance" (e.g., DIE-HARD and similarly advertised units)
  - "Maintenance-free," which generally lack filler caps to permit inspection and replenishing of electrolyte levels
- 3 If you must use a gel-cell battery (because of air travel requirements) avoid continuous use on a regular basis. Use a charger designed specifically for the gel-cell.
- 4 In the instance where deep-cycle batteries are not available, use conventional automobile lead-acid batteries which have filler caps and long warranty periods (2-4 years). Even though it may not be honored, the longer warranty is indicative of larger capacity, i.e., a longer operating period before recharging is necessary, thus avoid deep cycling.
- 5 If possible, avoid frequent or deep cycling of your battery. Deep cycling occurs when you use most of your battery's capacity before recharging it.

**Charging the Battery**

- 1 Do not use automatic (so-called "smart") chargers for conventional auto-style or deep-cycle lead-acid batteries. The "smart" charger approach, though, is recommended in the case of gel-cell batteries.
2. Make a regular habit of recharging your battery nightly.
- 3 A rechargeable duration in proportion to the amount of driving during the day is appropriate. A charger with a timer shut-off is helpful. Since different chargers will charge at various rates and wheelchairs consume power at differing rates, there is not a specific "charge to use" ratio which can be recommended for all wheelchairs.
4. Approximately once every 1-2 weeks, intentionally overcharge your battery for 6-12 hours beyond the normal charging time. The actual overcharging begins when the ammeter on the battery charger reads one-fourth (1/4) to one-tenth (1/10) of its initial charge rate, i.e., typically one ampere or less. During this time many battery cells will bubble vigorously and emit hydrogen and oxygen. Overcharging should take place in a well-venti-

lated area. Once the battery is overcharged, immediately fill the electrolyte level up to a little over the plate tops -- using DISTILLED WATER ONLY.

NOTE: Overcharging in a small, unventilated room may pose an explosion hazard.

**Battery Connections**

- 1 All battery connection should be inspected monthly and maintained in a corrosion-free state.
- 2 Clean up all wet spots or spills around the battery as they occur. Wash liberally with water and dry.
- 3 At least once every 6 months, remove the battery lug clamps and all connections at the battery terminals, thoroughly clean, and reassemble.

NOTE: It is useful to carefully document all connections before disconnecting them.

- 4 If connection hardware is damaged due to corrosion or physical abuse, replace it.

**Batteries -- Handling and Your Health**

1 Lead-acid batteries contain sulfuric acid which has damaging effects on metals, cloth, skin, muscle, and fatty tissue. When in contact with skin, it may cause a burning sensation (if sensory nerves are intact). Thus, it should be washed off skin and clothing immediately with liberal amounts of water.

2 After washing liberally with water, then taste (lick) affected skin or cloth surfaces in order to assure yourself of complete removal of the sulfuric acid. Diluted sulfuric acid will have a vinegar taste and is harmless internally.

NOTE: In the event of more than a minor burn especially in the case of a disabled individual, consult a doctor immediately.

3 Since individuals with spinal cord injuries may not have the benefit of sensation of pain to warn them of acid, take all necessary measures to keep it away from their presence, i.e., skin and clothing.

4 Baking soda is helpful in neutralizing acid in cases where you cannot be assured of washing it away entirely. However, do not use baking soda as a substitute for a thorough initial washing with water.

from "Batteries on Powered Wheelchairs -- The Do's and Don'ts of Battery Care" Reprinted from Current Expressions, Vol 1, No 1, 1981, the newsletter of Prentke Romich Company, 8769 Township Road 513, Shreve OH 44676. Mr Bayer can be contacted at Du-It Controls in Shreve, OH.

## SOURCES OF MORE INFORMATION ON WHEELCHAIRS

The most current information about new wheelchair designs and prototypes is generally not in printed sources. Developmental information is exchanged informally through a "people network." Names and addresses of many of these people can be found in the Wheelchair I, II, and III reports. These publications also have information on such things as the history and development of wheelchairs, and the state-of-the-art information on wheelchair design and wheelchair surveys.

Wheelchair I Report of workshop December 6-8, 1979 Moss Rehabilitation Hospital, 12th Street and Tabor Road, Philadelphia, PA 19141 1978 173 pages Focus on manual wheelchairs

Wheelchair II Report of a workshop December 13-16, 1979 Moss Rehabilitation Hospital 12th Street and Tabor Road, Philadelphia, PA 19141 Focus on powered wheelchairs

Wheelchair III Report of a workshop March 25-27, 1982 La Jolla, California RESNA, 4405 East-West Highway, Bethesda, MD 20814 67 pages \$10.00 Focus on sports chairs and on specialty adapted wheelchairs

This selected list focuses on selecting, operating and maintaining a wheelchair.

The Care and Feeding of a Wheelchair Medical Equipment Distributors, Inc (MED), 1215 So Harlem, Forest Park, IL 60130 1979 15 pages Has a section "Diagnosing Your Wheelchair's Ails"

"The Changing Role of Wheelchair Tires" Robert Howard RxHomeCare, November 1983 Barrington Publications, 825 Barrington Ave., Los Angeles, CA

Choosing and Using a Wheelchair (Pubn A-313) National Easter Seal Society, 2023 W Ogden Ave., Chicago, IL 60612 Single copies free with self-addressed stamped business-sized envelope. Quantity rates also available.

Equipment for the Disabled Wheelchairs (Fifth Edition) Edited by GM Cochrane and ER Wilshire Oxfordshire Health Authority 2 Fore-down Drive, Postslade, Brighton, BN4 2BB, England 1983 103 pages, figures, photos L7 50 The book provides worthwhile guidelines on wheelchair selection for anyone anywhere. In focusing on specific brands and listing wheelchair and accessory sources, the book becomes somewhat less useful to those outside of Britain. Lay-out is well done and the pictures/drawings are often helpful.

Functional Wheels AG Garris Dept of Rehabilitation, 830 K Street, Sacramento, CA 95814 1980 73 pages

The Professional Wheelchair Contact Invacare, Inc Elyria Ohio 1980

A Stitch in Time Wheelchair Maintenance and Repair Jere Gandolf Burns Center for Occupational Curriculum Development, P.O. Box 7218,

University of Texas at Austin, Austin, TX 78712 1982 "No matter how we constructed and how carefully operated the wheelchair is, it still must be maintained or it will break down. This manual tells how to inspect for and recognize problems. It describes routine maintenance procedures, such as inspecting tires. The information can be used to detect problems while they are still small enough for simple repair.

A Stitch in Time is based on the idea that some simple inspection and maintenance tasks can reduce the number of repairs that must be done on a wheelchair. For that reason, certain chapters have two types of material, called sections. The A section of a chapter covers inspection and maintenance. It tells how to recognize problems, and what to do to correct them and prevent them from getting worse. Section B material is on repair, and tells what to do if conditions have become bad enough to require repair work.

"Most chapters are organized in terms of parts or groups of parts. For example, Chapter 5 is on bearings and Chapter 6 is on caster wheels.

"In addition, the book has five special-purpose chapters. The first, Chapter 1, Maintenance References, covers information which is necessary for using the other chapters. There are also chapters on fitting the wheelchair, rust, wheelchair safety, and skin maintenance. Special material on motorized wheelchairs is presented in an Appendix at the end of this manual.

"There is no 'typical' person who uses a wheelchair. Therefore, this manual is aimed at a wide group of potential users. This includes people in wheelchairs and their friends and relatives. It also includes people who might enter the occupation of wheelchair repairer. The manual, and audiovisual material related to it, could be useful in a wheelchair repair course. It can also serve as a reference during maintenance. The material has been simply written, so it can be used by people with many different levels of education. It is well illustrated.

"Audiovisual materials have been developed to cover the inspection and maintenance aspects of wheelchair maintenance. The material includes tape cassettes, slide or videotape visuals, an instructor's guide, and a participant's manual. Although the materials are for group presentation, it could also be helpful to an individual. In particular, the Participant's Manual summarizes information presented by the A/Vs, and is excellent for review. The A/V material is titled Wheelchair Maintenance -- A Stitch in Time. It is also available from the Center for Occupational Curriculum Development, Division of Continuing Education, Post Office Box 7218, The University of Texas at Austin, Austin, TX 78712."

Street Wheeling Manual Metropolitan CIL, 1728 University Avenue, St. Paul, MN 55104

Things to Consider When Buying or Renting a Wheelchair Pocket Catalog No 3 Everest & Jennings,

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## MOBILITY DEVICES

Inc., 3233 East Mission Oaks Blvd., Camarillo, California 93010 805/987-8911 1976

Wheelchair Maintenance and Simple Repair Carol Nordstrom, RPT Physical Therapy Department, Woodrow Wilson Rehabilitation Center, Fishersville, VA

Wheelchair Maintenance for the Non-mechanical Consumer Allied Resources Center for the Handicapped, Inc., Utica, NY 1980 Consumer-oriented publication with diagrams and descriptions of preventive maintenance and repair procedures for wheelchairs

"Wheelchair Management Developing a System for Long Term Care Facilities" The J Long Term Care Administration, Vol VIII, #2, June, 1980

Wheelchair Management Guidelines C Epstein Occupational Therapy Consultants, Inc., 19 South Bridge Street, Somerville, NJ 08876 This 40-page guide provides an overview and methodology for the systematic management of wheelchairs in an institutional setting. The author presents a rationale for developing the system, describes the implementation and presents specific policies and procedures to set the system in place. Forms and coding key are included

Wheelchair Prescriptions Everest & Jennings, Inc., East Mission Oaks Blvd., Camarillo, CA 93010 805/987-8911 1976 Booklet 1 Measuring the Patient, Booklet 2 Wheelchair Selection, Booklet 3 Safety and Handling, Booklet 4 Care and Service

Wheelchair Scheduled Maintenance Program Everest & Jennings, Inc., East Mission Oaks Blvd., Camarillo, CA 93010 805/987-8911 Provides information on establishing a program for scheduled wheelchair maintenance in an institutional setting

Wheelchair Selection More Than Choosing a Chair with Wheels B Fahland, 1976 \$2.95 from the Sister Kenny Institute, 800 E 28th Street at Chicago Avenue, Minneapolis, MN 55404

Wheelchairs and Accessories, An Accent Guide B Garee, Ed Accent Special Publications, Cheever Publishing, Inc., P.O. Box 700, Bloomington, IL 61701. 134 pp \$7.50 (+ \$65 shipping) This guide contains ideas on choosing the best wheelchair, accessories you can add for comfort, safety, convenience, and fun. How to keep your chair in top shape, and where to get the latest product information

"Wheelchairs Aids for Participation and Discovery," "Wheelchair Guidelines for Selection," The Exceptional Parent, February, 1983, Volume 13, #1, pp 17-28 This article covers such areas of concern as the selection process, fitting, appearance, posture, bathrooms, transportation, types of chairs, accessories, cost, and maintenance and service

"Wheelchairs Selection, Uses, and Maintenance" Georgiana B Wilson, LPT, and Virginia I Kerr, OTF., Chapter 8 in Basic Rehabilitation Techniques. A Self-Instructional Guide, second edi-

tion Robert Sine, MD, editor Aspen Systems Corporation, Rockville, MD 1981

A Wheelchair User's Manual for People with Spinal Cord Injury Bruce Blasch, Mobility Training Project, 1981 Available from the author, Waisman Center, University of Wisconsin-Madison, Madison, WI 53705

See also references in Mobility Device Evaluation Guide, and Sports Wheelchairs, SPORTS

## AUDIOVISUALS

I've Got Wheels Brian Line and Nick Dance Available from Dance/Line Films, LeCourt, Liss, Hampshire, England 3/4" videocassette, color, 20 minutes 1979 Illustrates how correct equipment and environment can provide access to a wheelchair-bound person

A New Freedom Amigo Sales, Inc. 6693 Dixie Highway, Bridgeport, MI 48722 color, 10-1/2 minutes 1979 Demonstrates how the ALIGO wheelchair is helping several individuals overcome their physical disabilities

Power Wheelchairs When, How, Why Suzanne Elaine Bennethum, OTR, Dorothy Pezenik, OTR, Charlene Butler, Ed D., and Susan Harris, RPT, PhD Everest & Jennings, 3233 East Mission Oaks Blvd., Camarillo, CA 93010, 805/987-8911 1984 Call your Everest & Jennings representative for a free screening at your facility. Facility screenings include information booklets

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## SOME COMMERCIAL SOURCES OF WHEELCHAIRS

See Toll Free Numbers for phone numbers

## SPECIAL WHEELCHAIRS

- 303 Higgins Court  
 Orange, CA 90501  
 714/421-2269  
 800/262-1331 (in California)
- Accume Corporation  
 32 Race Street  
 San Jose, CA 95126
- Bair Chair  
 #6 Seco Court  
 Sacramento, CA 95823
- Carters Rehabilitation Division  
 Rajowalt Company  
 Atwood, IN 46502
- Colson Equipment  
 Harry S Truman Blvd  
 Caruthersville, MO 63830
- Convoid  
 PO Box 2731  
 Palos Verdes CA 90274
- Electrolurgy, Inc  
 1121 Duryea Avenue  
 Irvine, CA 92714
- Equalizer  
 274 Buchon St  
 San Luis Obispo, CA 93401
- Everest & Jennings, Inc  
 3233 East Mission Oaks Blvd  
 Camarillo, CA 93010
- Gendron, Inc  
 Lugbill Road  
 Archbold, Ohio 43502  
 419/445-6060  
 800/537-2521
- Hall's Wheels  
 15 Marlboro Street  
 Belmont, MA 02178
- Imex Riser Wheelchair  
 5672 Almaden Expressway  
 San Jose, CA 95118  
 408/978-8112
- Invacare Corporation  
 1200 Taylor Street  
 Elyria, OH 44035
- Jung Products  
 5801 Mariemont Avenue  
 Cincinnati, OH 45227
- Mastercraft Metal Products  
 PO Box 591  
 Santa Cruz, CA 95061
- Mobilizer Medical Products Inc  
 500 Nuber Avenue  
 Mount Vernon, NY 10550
- Modern Tubular Production, Inc  
 198 High Street  
 Chatham, Surrey, England
- Motion Designs, Inc  
 1075 Cole  
 Clovis, CA 93612
- Newton Aids (England)  
 U S Distributor  
 Newton, USA  
 469 Ridge Road W  
 Rochester, NY 14615
- Ortho-Kinetics  
 P O Box 436  
 W220 N507 Springdale  
 Waukesha, WI 53187
- Orthopedia GMBH (Germany)  
 U S Distributor  
 Internat'l Med Equip Corp  
 11000 Rush Street, #20  
 South El Monte, CA 91733
- Ortop Tech Medical Aids (Israel)  
 U S Distributor  
 Meditech  
 544 10th Street  
 Palisades Park, NJ 07650  
 201/974-0500
- Pin Dot Products  
 P O Box 642  
 Northbrook, IL 60062
- Poirier Wheelchair (France)  
 U S Distributor  
 Magnum International  
 2930 West Central  
 Santa Ana, CA 92704  
 714/641-9696
- Production Research Corp  
 10217 Southard Drive  
 Beltsville, MD 20705
- Quadra Wheelchair, Inc  
 31125 Via Colinas #903  
 Westlake Village, CA 91361
- Sears and Roebuck Co  
 1633 Broadway  
 New York, NY 10019
- Smith & Davis  
 1180 Central Industrial Lane  
 St Louis, MO 63110  
 314/771-7145  
 800/325-7145, 800/238-6678
- Stainless Medical Products  
 9386 Dowdy Drive  
 San Diego, CA 92126
- Summit Services, Inc  
 535 Division Street  
 Campbell, CA 95008
- Theradyne Corporation  
 21730 Hanover Street  
 Lakeville, MN 55044  
 612/469-4404  
 800/323-4014
- Vessa  
 Paper Mill Lane  
 Alton, Hampshire GU34 2PY  
 ENGLAND
- X-L Enterprises  
 2003 Palm Avenue  
 Chico, CA 95926
- Zimmer Orthopaedic Ltd  
 Bridgend, Mid Glam CF31 3PY  
 Great Britain

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## **MOBILITY DEVICES**

### **POWERED WHEELCHAIRS**

#### **A-BEC**

20460 Gramercy Place  
Torrance, CA 90501  
800/421-2269  
800/262-1331 (in California)

Colson Equipment  
Harry S Truman Blvd  
Caruthersville, MO 63830

Everest & Jennings, Inc  
3233 E Mission Oak Blvd  
Camarillo, CA 93010

Everest & Jennings, Inc  
111 Snidercroft Road  
Concord, Ontario M4T 2W1  
CANADA  
416/661-2000

Fortress Scientific  
2110-C Northwest Parkway  
Marietta, GA 30067  
404/352-2792

Instrument Components  
759 B Lakeshore Blvd  
Painesville, OH 44077

Invacare Corporation  
1200 Taylor Street  
Elyria, OH 44035

Mobility Engineering & Dev  
7131 Hayvenhurst Avenue  
Van Nuys, CA 91406

Mobility Plus (L Mulholland)  
P O Box 391  
215 N 12th Street  
Santa Paula, CA 93060  
805/525-7165  
800/325-7397

National Welded Products  
2900 Spring Street, #6  
Redwood City, CA 94063

Newton Aids (England)  
US Distributor  
Newton USA  
469 Ridge Road  
Rochester, NY 14615

Orthopeda GMBH (Germany)  
US Distributor  
Internat'l Med Equip Corp  
11000 Rush Street, #20  
South El Monte, CA 91733

Poirier Wheelchair (France)  
US Distributor  
Magnum International  
2930 West Central  
Santa Ana, CA 92704  
714/641-9696

Saab-Scania of America, Inc  
Saab Drive, P O Box 697  
Orange CT 06477  
ATTN: Permobil

Sears & Roebuck Co  
1633 Broadway  
New York, NY 10019

Steven Motor Chair Co  
120 N Gunter  
Siloam Springs, AZ 72761

Summit Services, Inc  
535 Division Street  
Campbell, CA 95008

Tunkers Industries Inc  
1832 Star-Batt Drive  
Rochester, MI 48063  
313/852-5331

21st Century Scientific Inc  
7135 Hayvenhurst Avenue  
Van Nuys, CA 91406

Vessa  
Paper Mill Lane  
Alton Hampshire  
GU34 2PY ENGLAND

### **POWER UNITS FOR WHEELCHAIRS**

#### **A-BEC**

29893 Higgins Court  
Torrance, CA 90501

DAMACO  
9612 Lurine Avenue  
Unit A  
Chatsworth, CA 91311

Instrument Components  
959 B Lakeshore Blvd  
Painesville, OH 44077

Oxford Orthopaedic Engineering Ctr  
Nuffield Orthopaedic Center  
Headington, Oxford, England OX3 7L1

Rosenthal Manufacturing  
5033 North Kedzie  
Chicago, IL 60625

Mobility Plus (Solo Products)  
P O Box 391  
215 N 12th Street  
Santa Paula, CA 93060  
805/525-7165  
800/325-7397

Solo Products  
2435 Front Street  
West Sacramento, CA 95691

21st Century Scientific Inc  
6920 Hayvenhurst Avenue #205  
Van Nuys, CA 91406

Zimmer Orthopaedic Ltd  
Bridgend, Mid Glam  
CF31 3PY  
Great Britain

## POWERED WHEELCHAIR ALTERNATIVES

A-BEC  
1815 W 205th Street  
Suite 206  
Torrance, CA 90501

Abbey Medical  
3216 El Segundo Blvd  
Hawthorne, CA 90250

Alpha Unlimited, Inc  
2315 Industrial Blvd  
Sarasota, FL 33580  
813/351-3488  
800/237-6836

American Stair Glide  
4001 E 13th Street  
Grandview, MO 64030

Amigo Sales, Inc  
6693 Dixie Highway  
Bridgeport, MI 48722

Braun Corporation  
1014 S Monticello  
Winamac, IN 46696  
219/946-6157  
or  
5751 Engineer Drive  
Huntington Beach, CA 92649

EF Brewer Company  
P O Box 159  
Menominee Falls, WI 53051

Chair Lift of California  
31220 La Baya Drive, Suite #113  
Westlake Village, CA 91362

Electric Mobility Corporation  
591 Mantua Blvd  
Sewell, NJ 08080  
800/257-7955  
800/232-6550 (in New Jersey)

Everest & Jennings, Inc  
3233 E Mission Oak Blvd  
Camarillo, CA 93010

Independence Chair Company  
W220 N507 Springdale Road  
P O Box 436  
Waukesha, WI 53187  
414/542-6060

Instrument Components Co  
7239 Industrial Park  
Mentor, OH 44060

Invacare Corporation  
1200 Taylor Street  
Elyria, OH 44035

Kimed Industries  
11 Broadway  
New York, NY 10004

Leisure Lift Chairs  
P O Box 6176  
Kansas City, KS 66106

Midon Engineered Products  
P O Box 1031  
Kitchener, Ontario N2G 4E3

Motovator  
1722 Border Avenue  
Torrance, CA 90501

Ontario Crippled Children's Centre  
350 Rumsey Road  
Toronto, Ontario M4G 1R8  
CANADA

Ortho-Kinetics  
P O Box 436  
W220 N507 Springdale  
Waukesha, WI 53187

Palmer Industries  
P O Box 707, Union Station  
Endicott, NY 13760

Sherry Products, Inc  
1501 Pacific Coast Highway  
Hermosa Beach, CA 90254

Small Electric Vehicles, Inc  
56 E Walnut Street  
Westerville, OH 43081

CF Struck Corp  
W51 N545 Struck Lane, Box 307  
Cedarburg, WI 53012

Voyager Ltd  
P O Box 1577  
S Bend, IN 46634

Zimmer Orthopaedic Ltd  
Bridgend, Mid Glam  
CF31 3PY  
Great Britain

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See also SEATING Commercial Sources for Postural  
Seating Systems

## MOBILITY DEVICES

### RESEARCH & DEVELOPMENT ORGANIZATIONS

#### NIHR-supported research

University of Virginia Medical Center  
Department of Orthopedics and Rehabilitation  
P O Box 109/UVA  
Charlottesville, CA 22908  
804/977-6730  
Colin McLaurin, Ph D, Warren Stamp, MD, project directors

#### Veteran's Administration-supported research

Rehabilitation R&D  
Mail Stop 153  
Veterans Administration Medical Center  
3801 Miranda  
Palo Alto, CA  
415/493-5000, x 5465  
Larry Leifer, Ph D, project director

### THE DEVELOPMENT OF WHEELCHAIR STANDARDS

A recent development in the rehabilitation engineering field has been a concerted effort to develop voluntary standards for manual and powered wheelchairs. This development has occurred in response to several factors, including international cooperation on the development of wheelchair standards, US government interest in the development of domestic standards, and consumer advocacy for the development of such standards.

RESNA currently serves as the official US representative to the International Standards Organization's (ISO) Wheelchair Standards Subcommittee. The RESNA Subcommittee is also developing voluntary US standards for wheelchairs in cooperation with the Veterans Administration and the Food and Drug Administration.

The RESNA Subcommittee has established an ambitious work schedule for itself and is anticipating the completion of voluntary domestic standards for both manual and powered chairs by the close of 1986.

For more information see 'The Development of Wheelchair Standards' by L.R. Phillips, P.W. Axelson, D.A. Hobson and S.R. McFarland, in Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego, California, June 1983. Published by RESNA, Suite 402, 4405 East West Highway, Bethesda, Maryland 20814.

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## MOBILITY BEYOND SEATED WHEELED SYSTEMS

CHOOSING & USING OTHER TYPES OF  
MOBILITY EQUIPMENT

There are many publications that include information on walking aids. These are included because they are so clear visually and I like pictures. If you have favorites, please send information to the Sourcebook editor for inclusion in the next edition (editor)

Basic Rehabilitation Techniques: A Self-Instructional Guide Robert D. Sine et al., editors  
Aspen Systems Corporation, 1600 Research Blvd., Rockville, MD 20850 1981 263 pages \$20.95  
This book was written for nurses who work with disabled persons. Its goal is to provide the nurse with the basic rehabilitation techniques to enable him/her to train disabled people in ordinary functional activities. This includes self-care activities, mobility, pressure relief, pain, etc. The techniques described are simple and utilize equipment that is readily available. The text is written in clear language. Excellent drawings and pictures add to comprehension of details of the technique. Because the techniques include training in the use of assistive devices, this book is also useful to more than just nurses as an introductory guide to the equipment most commonly used by the disabled. It discusses selection, use and training with the devices.

Physical Management for the Quadriplegic Patient  
J. Ford and B. Duckworth FA Davis Company, Philadelphia, PA (Out of print, look for it in an OT or PT dept. or a rehab dept.) 1974  
\$16.95 This textbook on the physical management of quadriplegic patients includes an appendix which describes do-it-yourself aids for these individuals.

Providing Early Mobility Intermed Communications, Inc., 132 Welsh Road, Horsham, PA 19044 1980  
This book is part of a series of training manuals for nurses. This one is written to assist the nurse in taking a positive approach to the emotional and physical considerations in early mobility. It is included in this technology guide because it includes the detailed instruction needed to use the following pieces of transfer and positioning equipment: cradle boots, hand rolls, footboards, hand splints, transfer boards and mechanical lifters. In other sections of the book, concise captions and how-to-do-it photos show you how to safely transfer a patient with halo traction, how to select the proper crutches, cane, walker or wheelchair for your patient, and how to teach him to use the equipment correctly. It also includes step-by-step procedures and photos for turning and positioning, range-of-motion and isometric exercises, and transfer techniques. This is an excellent training manual for anyone, for instance, a disabled person could use it to train a personal care attendant. The photos are so explanatory, the text is almost unnecessary.

## PROTECTIVE AIDS

Assistive and Protective Devices for the Handicapped M.J. Marin (editor) Georgia Retardation Center, 4770 North Peachtree Road, NE, Atlanta GA 30338 July 1981  
This manual provides practical information on a selection of adaptive and protective devices such as helmets, eye protectors, mitts, protective gloves, elbow restraints, pelvic supports, etc.

A Resource Guide to Protective Aids J. Frank K. Mallik, W. Chiu, and L. Job Development Laboratory, The George Washington University, 2300 Eye Street NW, Suite 420, Washington, DC 20037  
Protective aids are listed according to the part of the body to be protected and the type of protection required. Includes helmets, restraints and supports, slings and splints, pressure relief and skin protection. Lists manufacturers and suppliers.

## MOBILITY AIDS FOR THE BLIND

John A. Brahm, Ph.D.  
Smith-Kettlewell Institute of Visual Sciences  
San Francisco, California

"In the application of technology to aid the blind, one of the problems receiving a great deal of attention is mobility -- the ability to move safely and independently through the environment. The technology to assist blind individuals with solving mobility difficulties has been applied only recently, and efforts in this application of technology are still in their infancy.

## Historical Overview

"Although sticks of various shapes and sizes probably have been used by blind people for a long time, specific mobility aids for the blind are relatively new. The large number of blind veterans in the United States after World War II prompted Dr. Richard Hoover to begin his classic studies within the Veterans Administration in the systematic use of a long, white cane to aid mobility. The techniques which he developed and refined have been adopted widely in mobility training programs around the world, and can, in the hands of a competent user, transform a simple, white stick into a remarkably effective tool. Indeed, the white cane is currently the most popular mobility aid.

"Another traditional mobility aid is the guide dog. However, guide dogs are used by only a small fraction of the blind community. This situation is unlikely to change for many reasons, primarily because of the substantial cost of training the dog and the limited number of individuals suited to co-existence with a guide dog.

"World War II also prompted the development of radar and sonar technologies for remote sensing. In the 1950s and 60s, transistor technology made electronic devices more portable. Inventors began to see the potential for various obstacle-detection devices to aid blind people. Many devices have been developed, although only a fraction have found their way into practical use. The principal behind most of these obstacle-detection devices is simply the transmission of an energy wave (usually ultrasonic, but sometimes optical) and the reception of echoes from objects in or near the traveler's path. Once received, the signals must be decoded and displayed in some intelligible form, usually aurally or tactilely. Range usually is estimated by measuring the time taken for the wave to reach the target and return to the receiver.

"The maximum range of interest for sensing devices is usually no more than 20 feet, making the use of radar or light waves highly inconvenient and expensive since it involves measurement of extremely short time delays. Optical transmission has been used, however, where range measurement was not a design goal.

"The question of how much information should be

presented to the user of a mobility aid and how that information should be displayed is probably the principal issue in mobility aid design. Development has followed two schools of thought. One class of aids, known as obstacle detectors or clear-path indicators, warn only of the presence of and sometimes the approximate range of obstacles directly in the travel path, while generally not being concerned with identification of the obstacles detected. Such devices are relatively inexpensive and technically simple.

"A second category of aids, known as environmental sensors, attempts more than mere detection of obstacles.

"The dispute between proponents of obstacle detectors and environmental sensors -- between rich and sparse displays -- is still unresolved. More complex displays require more learning, and too much information can be confusing. There is no doubt that experienced users, however, benefit greatly from the extra input.

## Current Status Problems

"Most of the aids described [in the full text of the paper cited] are commercially available, but have not achieved broad penetration of the market. All are relatively expensive, costing anywhere from \$300 to \$3,000. Most are designed to supplement, rather than replace, the long cane, and there is disagreement over whether the additional information they provide is worth the very considerable extra cost and the effort of training. A skilled user of the long cane can use the sounds emitted by the cane tip for natural echolocation, providing him with a surprising amount of information about the immediate environment. This category of user, although not typical of the general population, would require substantial additional input from an electronic aid before its use became worthwhile. The sophisticated auditory display of such an aid may tend, however, to mask the subtle echolocation cues mentioned above. For those individuals who do not possess refined echolocation skills, however, this argument cannot be valid. Other reasons must be sought for the apparent lack of general acceptance of the existing electronic mobility aids.

"Mobility and navigation is so commonplace to sighted people that it has warranted very little study. As a result, researchers have little basic knowledge to use as a starting point when designing and evaluating mobility aids for the blind. What are the essential components of information needed for mobility? What spatial cues does a sighted person rely on for maintaining a safe course through the environment? Once these cues are identified, how can they best be coded and displayed to the user? If we do not really understand mobility, how can we measure it to ascertain whether an artificial aid is actually improving a blind individual's performance? Until now, the production of hardware has tended to precede and outstrip any progress in the basic knowledge of human goal-oriented locomotion. This



lack of knowledge has begun to be addressed, and more basic research now underway into the problems of orientation and mobility should yield a more satisfactory theoretical basis for engineering design decisions

#### Discussion

"None of the electronic travel aids developed so far has seriously challenged the supremacy of the long cane. There is little doubt, however, that such aids can be a valuable addition to a blind traveler's available tools, especially for travel in unfamiliar areas. If the true goals of mobility include traveling with "grace and independence," then clearly the long cane is insufficient. Whether using a long cane is graceful or not of course is debatable, but in practice it acts as a path clearer, causing other pedestrians to step out of the way. This is not independent travel, nor can independence be achieved while it is still necessary for the blind individual to ask questions of passersby on virtually every aspect of way-finding in unfamiliar areas.

"The need for aids which can give advance warning of obstacles and/or additional information about the immediate environment, not to mention assistance in global navigation, appears self-evident. The upcoming generation of mobility aids offers the possibility of achieving some of these goals at lower cost and greater convenience than possible before. Serious efforts are being made to improve upon past designs, while advances in knowledge of the mobility process are strengthening the framework within which these new devices can be evaluated and refined. There are good reasons for expecting steady improvements in technologically assisted travel for the blind."

Excerpted from "New Developments in Mobility and Orientation Aids for the Blind," IEEE Transactions on Biomedical Engineering, vol BME-29, no 4, April 1982. Reprinted with permission of the author.

#### SOME SOURCES OF INFORMATION

Foundations of Orientation and Mobility Richard L. Welch and Bruce B. Blasch, Editors. American Foundation for the Blind, 15 West 16th Street, New York, NY 10011. 1980. Chapter 11, "Mobility Devices," by Lee Farmer, is of particular interest.

Orientation Mobility Techniques: A Guide for the Practitioner Everett Hill and Purvis Ponder. American Foundation for the Blind, 15 West 16th Street, New York, NY 10011.

## SEATING AND POSITIONING TECHNOLOGY

## INTRODUCTION

Clinical application and research on seating technology is generally divided into two major areas: postural control and pressure relief. The bulk of the information on postural control relates to children with cerebral palsy, while the pressure relief field tends to focus on adults who have sustained a spinal cord injury. Much of what is written in both areas is much more broadly applicable, to wider age ranges and to other disability categories. If you are looking for information on seating, you may want to look beyond the "intended audience" label of the publication or product.

Many conferences and workshops held in recent years have demonstrated that seating, whether for pressure relief or for postural control, is not only an area of major concern but one of tremendous controversy. Everyone seems to have their own opinions about what works and what doesn't. Although there is a considerable body of research literature, very little exists in writing on useful clinical approaches and applications.

Paul Brand writes in the *Journal of Rehabilitation R&D*, July 1983, that

"A major defect in the whole system whereby research projects are funded and articles are accepted for publication is that too many scientists are looking at Objectives and not enough at Goals.

The result, in major problems like pressure sores, is that the mass of knowledge about pressure on tissue grows and grows, and the actual management of the problem is almost unaffected, or may be getting worse, nationwide.

"Because of the multitude of uncontrollable variables in the life of a series of hospital patients, and because of the larger variety of variables in the home environment, most clinical scientists shy away from any attempt to evaluate total programs. They know they will be dissatisfied with the objectivity and validity of their findings -- and they know they will be torn to pieces by pure scientists and reviewers.

"...we need to look straight at the goal of prevention of pressure sores, and recognize that some of the most important objectives on the critical path towards that goal have escaped serious study because of the difficulty of analyzing the whole life of whole people in terms that fit the requirement of basic scientific research."

Paul W. Brand, FRCS  
in *Journal of Rehabilitation R&D*, Vol. 20,  
No. 1, 1983, page 73

It takes a certain amount of courage for a clinician to disseminate information about his/her approaches to seating. Nonetheless, publications of clinical usefulness are beginning to appear. They will be noted in this section.

A bibliography of publications focused on postural seating is included in this section; for bibliographic references on pressure relief, see the bibliographies in Zacherow's book *Wheelchair Posture and Pressure Sores*, in Krouskop's paper in the *Journal of R&D*, and in Jay's new book, *Choosing the Best Wheelchair Cushion*.

## THE FUNCTION OF A WHEELCHAIR CUSHION

"Most of the research into wheelchair cushions has been done with those people most at risk to pressure sores, such as paraplegics and quadriplegics, but they are minority users of wheelchairs. An English study found that 63% of wheelchair users were divided almost equally into people with osteoarthritis, rheumatoid arthritis, hemiplegia and multiple sclerosis (including those with closely related conditions). Among the remaining 37% only 6% were paraplegic or quadriplegic. Although one of the important functions of a wheelchair cushion is the prevention of pressure sores, there are other functions which, for some people, are more relevant. In our survey we asked people why they had been given wheelchair cushions. Forty-four percent replied that this was to make sitting more comfortable. Twenty-two percent said that it was to reduce the likelihood of tissue damage and the resultant pressure sores. Occasionally, and quite wrongly, a cushion was prescribed to compensate for a wheelchair which was the wrong size for the individual.

Ferguson-Pell has written that "The primary function of a wheelchair cushion is to provide an effective platform from which the patient may operate. It is remarkably difficult for a patient to work at a table or bench, or for him to propel a wheelchair, if the sling seat normally supplied is his only support. In addition to providing a stable seat, the wheelchair cushion improves comfort, aids posture and reduces the transmission of shock during propulsion over uneven surfaces. Wheelchair cushions are also provided to aid the patient when transferring to other support surfaces, and, for a relatively small proportion of wheelchair users, the wheelchair cushion provides a vital function by reducing local concentration of stress in tissues to prevent tissue ulceration."

"Not all these functions apply to every wheelchair user and not all cushions fulfill every function. Nevertheless, a sling seat would not normally be chosen for prolonged sitting. It is probable that if all patients were properly assessed, cushions would be automatically prescribed with most wheelchairs -- unless there were definite contraindications.

"People who sit for long periods of time may use wheelchair cushions on other seats. Elderly people who spend much of the day in an armchair may benefit from a wheelchair cushion, both to add to their comfort and to prevent tissue damage. Cushions are used by people with gynecological problems, prostate gland problems, post-hemorrhoidectomies and other lesions of this area particularly during travel and in recreational

They are used by people who are unduly sensitive to pressure in the region of the sciatic nerve and by people who are underweight or have gluteal muscle wasting who find sitting without a suitable cushion too uncomfortable. They are also used by hemophiliacs to reduce the likelihood of "soma".

from Choosing the Best Wheelchair Cushion for your needs, your chair, and your lifestyle Peggy Jay, Dip COT, SROY The Royal Association for Disability and Rehabilitation, 25 Mortimer Street, London W1N 8AB. Revised edition, 1984. Also available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814, 301/657-4142

**PRESSURE RELIEF**

"At home or work, prevention of pressure sores and treatment of the early stages of pressure-induced tissue damage are extremely difficult for even conscientious patients. Our understanding of the sore's etiology is not complete and what understanding does exist has not been transferred widely to practical solutions that accommodate daily activity patterns. Similarly, technological aids that effectively reduce an individual's risk of developing a sore are not widely disseminated and utilized."

"Pressure sores are a severe and potentially life-threatening complication for many individuals with physical disabilities. In 1968 the Veterans Administration estimated that 50 percent of all quadriplegic veterans will require hospitalization because of pressure-related problems during their lifetime and more than 30 percent of the paraplegic population will have a similar fate. It was also estimated by the VA that approximately one-fourth of these persons will die as a direct consequence of pressure sores. The magnitude of the problem is further emphasized when an analysis similar to those done by Robinson in Canada, Noble in Australia, and Motloch in California is performed on the problem in the US. Using the assumptions and data from these analyses, the medical costs associated with curing pressure sores in the USA are estimated to exceed \$2,000,000,000 per year. This estimate is consistent with the information presented in the Technology Section of the NIH long range plan 1981-1986, which emphasized that the effects of pressure on tissue is a high priority area for research and demonstration activities.

"The social costs associated with pressure sores are even greater than the medical costs. These costs include (1) time lost from a productive vocation with its attendant economic impact on individual and family, (2) time lost from school, which has far-reaching and long-term impact because the disabled person's vocational potential is limited, which generates long-term dependency, (3) loss of time from the family which can have a significant psychological impact on the person's social development, and (4) loss of general personal independence and productivity that ultimately contributes to a serious loss of self-esteem and self-worth.

"The most commonly cited causes of pressure sores included

- 1 Prolonged sitting during daily activities, activities such as card playing and video games
- 2 Use of old deteriorated wheelchair cushions
- 3 Activities that involve sitting on uncushioned areas such as a bathtub or sitting on a floor to play with young members of the family
- 4 Falls while transferring from a wheelchair or bed
- 5 Sitting too soon after a surgical procedure to correct a vertebral defect, or even during the comprehensive rehabilitation process
- 6 Excessive sweating or irregular attention to skin condition
- 7 Wearing clothing that has exaggerated seamlines (such as jeans), which can cause pressure to concentrate on areas that would normally not carry significant loads."

This article goes on to elaborate on a clinical program at TIRR, Houston, and to discuss the history of pressure management research.

Excerpted from the introduction of "The Effectiveness of Preventive Management in Reducing the Occurrence of Pressure Sores", in Journal of Rehabilitation R&D, Vol 20, No 1, July 1983, pp 74-83, by Thomas A. Krouskop, P.E., Ph.D., Philip C. Noble, M.S., Susan L. Garber, O.T.R., and William A. Spencer, M.D., at The Institute for Rehabilitation and Research in the Texas Medical Center, 1333 Moursund Avenue, Houston, Texas 77030

Available from  
Government Printing Office  
Washington, DC 20402  
Stock Number 051-000-00161-3

For Commercial Sources of Cushions, contact the ABLEDATA system, which currently lists over 170 different types of wheelchair cushions.

## SOME NEW PUBLICATIONS

Choosing the Best Wheelchair Cushion for your needs, your chair and your lifestyle Peggy Jay  
The Royal Association for Disability and Rehabilitation (RADAR), 25 Mortimer Street, London W1N 8AB, England 203 pages L5 1984

"Peggy Jay, a British occupational therapist, has written an excellent book which brings some sense of organization to the information currently available in the wheelchair cushion area. The book was prepared as part of the Aids Assessment Programme which the English government finances in order to assess a range of aids in a practical way, as distinguished from the more scientific evaluation necessary when undertaking a research project.

Information about wheelchair cushions was compiled from four different sources:

- 1 Experts in this field, including bioengineers, therapists and doctors, were asked for information about wheelchair cushioning.
- 2 Suppliers of cushions were invited to the hospital to demonstrate their cushions.
- 3 Gel, water, air and the more complicated foam cushions were purchased and tried out by a variety of wheelchair users.
- 4 A field study covering 45 people provided more information about cushion usage and spanned a longer cushion life than was possible on a cushion trial.

"This book does have some minor drawbacks for North American readers. Since she is writing from a British perspective, price and availability information refer to British prices and British suppliers. However, with the information that is provided about each cushion, however -- dimensions, composition, advantages and disadvantages -- a North American reader would have little difficulty in locating a particular cushion. Even relatively recent additions to the marketplace such as the VASIO-PARA cushion and the low profile Roho are included in this volume.

The Prevention of Pressure Sores in Persons with Spinal Cord Injuries Philip C Noble. Monograph No. 11. Available from World Rehabilitation Fund, Inc., International Exchange of Information in Rehabilitation Program, 400 East 34th Street, New York, NY 10016.

Although the subject of pressure sores has been well canvassed in the nursing and rehabilitation literature, in terms of techniques for management and resolution of established ulceration, the theme of pressure sore prevention has generally been neglected. This is particularly true in the case of the independent "rehabilitated" paraplegic or quadriplegic for whom pressure sores are a constant threat to continued independence in the home, workplace, and on the sports field. This monograph explains, with a practical inclination, the magnitude of the "pressure sore problems," the scientific basis of this form of skin ulceration,

and in considerable detail, practical measures which may be undertaken by rehabilitation workers and disabled individuals to reduce the risk of this complication to an absolute minimum. The monograph concludes with an analysis of the clinical results of the prevention program advocated, drawing from the experience of Royal Perth Rehabilitation Hospital over the decade 1970-1979, complete with a detailed estimate of its cost effectiveness. An attempt is made throughout to base all discussion upon the pooled experience of many rehabilitation centers throughout the world through repeated reference to the published literature, however, the practical and statistical aspects of this work are essentially drawn from experiences in Western Australia. Contents include basic data on pressure sores as a complication of spinal cord injury, etiological factors associated with pressure sores, practical measures for the prevention of pressure sores, the costs and benefits of a clinical pressure management program, the need for research and service in pressure sore prevention.

Wheelchair Posture and Pressure Sores Dennis Zacharkow, RPT. Charles C Thomas, Publisher, Springfield, IL 1984. 98 pages.

"The author of this book explores wheelchair sitting posture as a major etiologic factor in pressure sore formation. Following an introduction on the prevalence and medical expense of pressure sores among the spinal cord injured, chapters detail proper sitting posture for able-bodied individuals, inherent problems with the wheelchair as a seat, essential modifications for proper sitting posture, pelvic obliquity and pressure sores, wheelchair cushion selection, acute care considerations, and pressure sore recurrences. The application of posturing principles to other patient populations concludes the text."

## PROTECTIVE AIDS

Assistive and Protective Devices for the Handicapped M.J. Martin (editor). Georgia Retardation Center, 4770 North Peachtree Road, NE, Atlanta GA 30338. July 1981. This manual provides practical information on a selection of adaptive and protective devices such as helmets, eye protectors, mitts, protective gloves, elbow restraints, pelvic supports, etc.

A Resource Guide to Protective Aids J. Frank, K. Malik, W. Chiu, and Lowry. Job Development Laboratory, The George Washington University, 2300 Eye Street NW Suite 420, Washington, DC 20037. Protective aids are listed according to the part of the body to be protected and the type of protection required. Includes helmets, restraints and supports, slings and splints, pressure relief and skin protection. Lists manufacturers and suppliers.

See also *Beds*, page 57

## POSTURAL SEATING

"Specialized seating and mobility services for children and adolescents has become a clinical reality in increasing numbers of facilities during the past decade. More and more professionals are recognizing the positive contributions that can be made to the lives of these individuals through the judicious provision of appropriate seating and mobility technology. Commercial suppliers are also responding to this awakening market. Particularly in the past five years the number of commercial options available to families and clinicians has drastically increased. Current research efforts suggest that this trend will continue, but with increased emphasis being focused on the needs of the more severely handicapped."

from Preface, Seating for Children with Cerebral Palsy: A Resource Manual, Elaine Treffler, Editor

Although clinically useful publications are beginning to be available, seating workshops continue to be an important way to exchange practical information. The article by Rick Holte was originally presented at a seating workshop at Stanford (January 1983). He gives an overview of the technology currently being used to produce postural seating systems. Its tone is more informal than a publication usually permits, almost chatty, but it's a little less intimidating than some of the other discussions of foams, plastics, shells, etc. He also provides some useful tips to consider if you are thinking about getting into the custom-seating market.

(There is also a complete and somewhat more formal discussion of these technologies in Seating for Children with Cerebral Palsy: A Resource Manual, Elaine Treffler, Editor.)

## A BRIEF GUIDE TO POSTURAL SEATING TECHNOLOGY

## I CONVENTIONAL METHODS

A Traditional Insert Fabrication

1 **Description** Usually using plywood, polyurethane foam and vinyl upholstery, an insert is made to suit an individual based on anatomical measurements. Depending on how it's done, the insert may look like a foam-lined plywood shell (box insert) or a padded seat and separate back with lateral restrictions (bread-board insert).

2 **Advantages** Low overhead and readily available technology are the chief assets of this technique. With a bit of skill and patience a wide variety of insert styles can be produced.

3 **Limitations** Depending on the local labor rate, and degree of disability, this method may be more costly than similar inserts that are available commercially. Using this method, for example, it can be very difficult and costly to produce a total contact supportive back for someone with extreme scoliosis. Upholstery of an awkwardly shaped cushion can be a limitation.

Finally, the plywood itself can give off splinters, absorb fluids, and add excess weight to the seat.

4 **More Information** A good brochure entitled "Technical Aspects of Cerebral Palsy Seating and Terms" was prepared by the Rehabilitation Engineering Department, Ontario Crippled Children's Centre, Toronto, Canada.

Commercial sources of pre-fabricated plywood foam and vinyl inserts (or close variations) include ERAC, Portland, OR; Rifton Company, Rifton, NY; Kaye Products, Durham, NC; Canadian Wheelchair, Ltd., Toronto, Canada; MSC Corporation, Detroit, MI; Luxury Liners, Arcadia, CA; Mobility Plus (formerly Mulholland Corporation), Santa Paula, CA (they have a new wheelchair-based insert system).

B Old Methods, New Materials

1 **Description** Increasing numbers of centers are substituting thermoplastics for plywood in their custom seating programs. The thermoplastics -- usually ABS, Kydex, polyethylene or polypropylene -- can be thermoformed or bent to give contouring which is unavailable with plywood.

2 **Advantages** More contouring means less padding. This new generation of conventional inserts is usually lighter and more streamlined than their plywood predecessors.

Additionally, thermoplastics do not splinter or absorb moisture. Finally, if molds are made, repeatable seating modules can be made. This has proven useful in speeding service and reducing costs, as noted in reports by Douglas Hobson (University of Tennessee, Memphis -- MPI System) and Richard Holte (Rehabilitation Centre for Children -- another modular system). But we'll get to full-blown modular systems in a minute.

3 **Disadvantages** Some of the thermoplastics are susceptible to embrittlement in extremes of cold weather. Care must also be taken that parts which are vacuum formed are not thinned out and greatly weakened.

4 **More Information** Suitable thermoplastics can be bought from your favorite local supplier or big firms such as Cadillac Plastics. Borg Warner has assembled a useful booklet with tips on handling and forming ABS. Unitek, States Manufacturing Company of Pasadena, California, chiefly a supplier to the prosthetics/orthotics industry -- has also produced a monograph on thermoforming plastics. A heater for bending thermoplastics can be made inexpensively using a bar heating element -- but watch the local electrical and safety codes! Hand held heat guns are helpful for auxiliary heating sources, for delicate work, and for small local reliefs.

C Modular Plastic Seating Systems

1 **Description** A series of pre-fabricated seat and back modules is available, possibly in differ-



## MOBILITY DEVICES

ent sizes. These are selected by appropriate size (and style, if applicable) and usually positioned in a wheelchair on mounting hardware that is also part of the system. Thus a personalized custom insert is assembled from stock components, by careful selection and adjustment.

**2 Advantages** By utilizing the same modules in assessment phase as in the final insert, one has a fairly clear idea of the probable effect of the insert. Assessment is speeded and largely removed from the realm of conjecture. Prefabrication should allow central production, reducing price per unit, and making the service more widely available by avoiding the necessity of involving very highly specialized people in the fabrication of all inserts.

In addition to this theory, three reports have emerged (Trefler, Tooms, and Hobson, 1978; Holte, 1980; Seeger and Sutherland, 1981) stating the success and wide applicability of their systems.

**3 Disadvantages** If you have to wait for parts, your program grinds to a halt. The alternative is to stockpile, which adds to your overhead.

This concept does not work for everyone. Persons having moderate to severe disabilities are not generally good candidates, nor are high tone, profoundly involved individuals with spasticity.

The comments above in Section IB3 on durability of plastics are germane.

**4 More Information** The Memphis Insert System (MPI) is available through MED dealers. For information on the Winnipeg work, contact Mr. Michael Forbes, Director, Special Devices Department, at the Rehabilitation Centre for Children in Winnipeg. You can correspond with Dr. Barry Seeger at the Regency Park Centre for Physically Handicapped Children in Kilkenny, South Australia. A modular plastic system for young children is the Achiever Seat, distributed by GE Miller of Yonkers, New York. Finally, the Gunnell Company of Vassar, Michigan, produces a series of fiberglass shells (and several other accessories) which can be padded and upholstered as needed.

### D More Commercial Equipment

**1 Adapted Wheelchairs** There are a number of wheelchairs which are manufactured with postural support in mind. Some have quite a few adaptations, others almost none. And, some manufacturers will custom-make parts to your specifications. Adapted wheelchairs include those manufactured by Gendron Archbald of Ohio, the Avon DeLuxe by Newton of England, the Postura by Everest and Jennings of Camarillo, California, the Multi-Position Chair (more of a bed, really), also by Everest & Jennings, the original Mulholland chair, on its own base, and the Hogg Transportation Chair and the wooden relaxation chair, available through several catalog supply firms.

**2 Transport Chairs** The original transport chair by OrthoKinetics of Wisconsin has been joined by the Safety Travel Company chair, produced in Elyria, Ohio, and several other brands.

The Pogon or MacLaren umbrella-style stroller should be familiar to most. Another fold-up stroller offering less support than a transport chair but more than a simple unmodified stroller is the Cruiser stroller, made by Convaid of Palos Verdes, California.

For children up to 100 lbs., the Britax car seat is said to meet British safety standards. It is available through Abbey Medical, or Childsafe Company (new name Columbia Medical Manufacturing) in Pacific Palisades, California.

For automobile travel, infants could be seated in any number of safety-tested car seats. Larger children might use a trunk harness and lapbelt system offered by the Mothercare Company of England. Another system is manufactured by Safe 'n' Sound Pty Ltd. of Morphettvale (Box 421), South Australia. Strolee of California also manufactures a booster seat, and a harness system.

**3 Non-Insert Trunk Supports** The Burnett Body Support is a vest-like bag filled with polystyrene beads. When evacuated, the vest becomes nearly rigid. It can be molded to different shapes, and is manufactured by Innovention Products, Ltd. of Bushey, Hertsfordshire, England. They also produce a hand-operated pump for extracting the air.

Several companies offer adjustable lateral trunk supports which can be retrofitted to a wheelchair. The SYS pads are available through MED distributors, who also carry the MED trunk supports. Sci-medics Company of Anaheim, California produces its own trunk pads. Major catalog supply houses offer different styles of adjustable lateral trunk pads.

## II INDIRECT CUSHION FABRICATION TECHNIQUES

This section will include special fabrication techniques in which the insert component is not made directly on the patient's body, but remotely. Nearly all techniques start with a casting, then proceed to a plaster replica of the anatomy, on which is produced the final insert. This casting technique is a specialty unto itself, and will be presented as such.

Generally, custom fabrication techniques are not invoked unless standard approaches have been tried or assessed and rejected, usually for reasons of poor results, high cost, long delivery time, or all of the above. Custom fabrication techniques, direct or indirect, are thus a resource of last resort in many cases.

### A Plywood, Foam, Vinyl Custom Insert

**1 Description** Technique is applied as described in Sections IA and IB, except that more emphasis must be put on grinding out the foam to a suitable shape.

**2 Advantages** As before, this can be the cheapest method, when it works. This is my preferred method for making unusual seat components. It is possible to provide lateral bolsters to stabilize a drifting pelvis, allow for a leg-length discrepancy, produce a wedged or stepped anterior of seat for pelvic containment and hip

flexion, or provide selecting padding build-up under an oblique pelvis. By upholstering components separately, and positioning them by bolting to a plastic external shell, one can remove, replace, or adjust the components more easily and less expensively than if a total seat replacement were needed.

3 **Limitations** It can be quite difficult to make a deep total contact back support for the person with a significant scoliosis, rotation, rib hump, and so forth. But, it could be considered for a person with a slight deformity of the back, especially if lateral trunk bolsters are used in conjunction (they allow you to provide a shallower cutout by protruding forward to provide the support on the sides).

**B Traditional Orthotics**

An orthosis can be effective in a system for a wheelchair-using person. It can be combined with a simple insert, where the orthosis provides the structural support to the spine and the insert supplements the person's balance and secures him in the chair. An advantage of orthoses is that they can continue to provide support after the person has left the wheelchair, even to the point of being worn in bed or in the bath.

**C The Gillette Seating Support Orthosis**

1 **Description** The Gillette system borrows heavily from standard orthotics practice, and is literally a wheelchair-based orthosis. The patient is cast while prone with hips flexed. The insert is a combination seat-and-back support which may have a front closing apron and/or a head support appended to it.

2 **Advantages** Borrowing from orthotics practice is a good idea, as this opens up a tremendous potential source of custom inserts. Minor adjustments for growth, etc., can be made simply by heating and flaring the shell. An integral seat/back shell made from the casting assures the relative positions are not lost. The system is light in weight.

3 **Limitations** As with many custom-made orthoses, this seat will have a limited lifespan, depending upon the growth pattern of the user. Orthotists providing the insert should be experienced in seating as well as orthotics. The casting method is effective, but it will evoke controversy in the NDT-therapy community when used with cerebral palsied patients.

4 **More Information** More information can be found in the article entitled "The Gillette Seating Orthosis" by Martin Carlson and Robert Winter Orthotics and Prosthetics December 1978, or you can write to the authors at Gillette Children's Hospital in St. Paul, Minnesota. A central fabrication service is available through Symplex Orthotics Systems of Winter Park, Florida.

**D Thermoformed Shallow Back and Lateral Bolsters**

1 **Description** From a plaster positive, a shallow back is thermoformed and lateral trunk

supports affixed to it. The back provides a solid place to anchor the side trunk pads, and must be thermoformed to accommodate severe spinal deformities. It is not necessary for the back to come far forward on the sides of the trunk as the lateral pads will fulfill the support function here.

2 **Advantages** The lateral trunk pads can be moved, or replaced, without rejecting the entire back. Thus, an element of modification is available. The lateral bolsters should allow the user better natural ventilation by providing less circumference containment than some other techniques.

3 **Limitations** The relative positions of seat back and bolsters must be noted carefully. The process is fairly time consuming.

4 **Further Information** Further information is available from Rick Holte at the Rehabilitation Engineering Center, Children's Hospital at Stanford in Palo Alto, California.

**E Vacuum Fixation (one piece)**

1 **Description** Chailey Heritage, Surrey, England, was one of a few institutions who pioneered the vacuum-fixation (evacuated bean bag) casting technique. After producing a plaster positive of the client from head to toe if necessary, a seat was thermoformed over the plaster model. A trial fitting established trim and attitude lines. A second sheet was thermoformed to produce a more regular exterior and suitable base for interfacing. Variations on this large body cast from bean bag impression method have been reported by the University of Virginia, Tufts New England Medical Center, the Institute of Medical Physics in Utrecht, Moss Rehabilitation Center, Derbyshire Royal Infirmary, and Dundee Limb Fitting Center.

2 **Advantages and Limitations** As with many of the impression originated techniques, one trades off speed and low cost for predictability and process control with this method. As a one-piece thermoformed insert, it has the advantage of preserving the relative seat/back orientation, but lacks somewhat in adjustability. Large ones will be awkward to handle (and to make for that matter) one-piece inserts offer the hope of use in a non-wheelchair base which could be handy.

3 **More Information** Consult the following publications:

Prosthetics and Orthotics International, Cost Effective Molded Seating for the Handicapped Child, McQuilton and Johnson, 1981. Molded Supportive Seating for the Disabled, Ring, Nelham, and Person, 1978, Vol. 2.

A Method for Custom Seating of the Disabled, Pritham and Cooper, Orthotics and Prosthetics December, 1961.

Proceedings International Conference on Rehabilitation, 1980, Toronto. Useful Reusable Casting Technique for Customized Total Contact Seating, O'Reagan and Law, Individually Customized Postural



Support System, May, et al

F Foam-in-Box (FIB) Method

1 **Description** A plaster positive of the client's back is prepared and placed into an adjustable mold box. Liquid foam components are mixed, poured in the mold box, and react chemically to produce a flexible urethane foam. The cushion is then molded around the plaster positive. Later, it is upholstered and mounted in shell for support.

2 **Advantages** Because a foam cushion is produced, it will "forgive" areas of high point contact better than a padded rigid shell. A high quality, custom-formed cushion can be made with anterior "wrap" of the lateral portions past the thoracic midline.

3 **Limitations** Foam is an insulator, and in hot climates this could be a very uncomfortable insert. Because of the relative compressibility of the foam, firm auxiliary lateral trunk supports should be added for someone with a collapsing scoliosis.

4 **More Information** See the 1980 Proceedings of the International Conference on Rehabilitation Engineering, Toronto, A Comparison of Three Custom Seating Techniques, by Forbes, Holte, Paul, and van Kampen. John Rodgers, of Scimedics in Anaheim, California, may be able to provide technical and/or product assistance. Pin Dot products of Northbrook, Illinois, offers a central fabrication FIB service, calling it Contour-FIB. Their product is slightly different than that described above, and they can provide extra support for the trunk, head, feet, and so on.

G Evacuatable Bean Bag Casting Method

1 **Description** The patient is placed against a polymeric or latex bag filled with small polystyrene beads. By drawing the air out of the bag, the beads push close together, becoming nearly rigid with high vacuum. Because the bag itself is supple, it conforms to the person's surface anatomy.

Often, the beanbag is used to approximate the final insert cushion. Modifications for improved patient comfort and/or posture can be made by allowing a bit of air back into the bag, working the beads into the new, designed position, then reevacuating the air. Using several bags (or a multiple compartment bag) allows adjustment of part of the cushion while the rest of the position is retained.

2 **Advantages** This method of casting permits a well-controlled evaluation and impression-taking session. By using the bean bag to mock-up the final insert, the patient's reaction can be viewed.

3 **Limitations** The major drawbacks are the lengthy time required to produce an insert from the impression, and the investment in equipment that is necessary.

4 **More Information** A hand-operated vacuum

pump and fairly small bean bags can be obtained from Innovation Products, Ltd., 10 Coldharbour Lane, Bushey, Hertsfordshire, United Kingdom. PRA Plastics and Developments, Ltd., of 21A Kingsland High Street, Daiston, London, United Kingdom, will custom make a set of evacuatable bags to your specifications.

III **DIRECT CASTING METHODS**

A Foam-in-Place (FIP) Method

1 **Description** The patient is placed against a sheet of latex rubber draped over a closed box. Two-part liquid foam is mixed, poured into the mold box, and reacts chemically to produce a flexible polyurethane foam. The foam fills the cavity of the box, and forms an impression of the part of the patient pressed against and into the latex sheet. The cushion thus formed is removed from the mold box and installed in the wheelchair.

2 **Advantages** The greatest advantage of FIP over indirect methods is the immediacy of results. Delays to the patient are minimized. The final cushion is produced almost immediately, so there is no waiting to see if a useful cushion is produced from the casting impression.

3 **Limitations** Great caution should be exercised in handling and using the foam components. Misuse may result in quite unpleasant consequences.

Supporting the person in the desired position can be difficult. They should not be moved for three to five minutes while the foam "sets up," or it may collapse and one must start again.

The mold cannot be "packed" (overcharged) or the patient's position will be compromised. In the Foam-in-Box method (Section II-F), this "packing" produces a higher density, higher quality foam.

4 **Further Information** The FIP method has been described by Hobson, Driver, and Hanks in The Proceedings of the 5th Annual Conference on Systems and Devices for the Disabled (Houston, 1978) under the title "Foam-in-Place Seating for the Severely Disabled: Preliminary Results." Also worthy of note are the reports on toxicity (actually nontoxicity) and safe handling procedures prepared by Mr. Hobson, of the University of Tennessee, Memphis.

B Solidified Beanbag

1 **Description** The patient is placed against a flexible bag partly filled with small diameter polystyrene beads. The bag is evacuated, and the beads form an impression of the occupant. Next, adhesive is injected into the bag. It adheres the individual beads together, forming a cushion directly against the patient's body. The patient is removed, and the cushion is smoothed and mounted in the wheelchair.

2 **Advantages** This is also a very rapid method of making an insert. The speed of the FIB is combined with the control of position afforded by the bean bag evacuation technique. The plaster

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intermediary step is eliminated

3 Limitations This is one of the only methods where the patient interface material is the same as the structural body of the insert. Clearly, one may have problems balancing these, either producing an insert which is strong but too hard, or soft but not durable. The University of Tennessee Rehabilitation Engineering Center is considering this problem by investigating quick-cure flexible matrix materials. Alternatively, the insert could be supported in a rigid shell for strength and/or lined with a thin layer of compliant foam and upholstered.

The Orthopedic Research and Locomotion Assessment Unit (ORLAU) at Oswestry, Shropshire, United Kingdom, seems to have lost some of their enthusiasm for this method. Their 1981 report finds no problem with durability, but leaves the impression that smoothing the seats was proving to be more laborious than originally thought.

4 More Information Write to ORLAU and ask for their 1980 and 1981 reports, and to the University of Tennessee-Memphis Rehabilitation Engineering Program for Annual Report No. 6.

The Southern Research Institute produced an article entitled "The DESEMO Customized Seating Support -- Custom-Molded Support for Severely Disabled Persons". It was written by Sandy Moore, et al., and appeared in the April, 1982 edition of the Journal of the American Physical Therapy Association. A kit for providing inserts by this method is being marketed by Desemo, Inc., of Savannah, Georgia.

John Rodgers, of Scimedics Company, Anaheim, California, may be able to offer technical advice and/or product support.

### C Shapable Matrix

1 Description This system is unique in that it has an adjustable surface which can be shaped, adjusted, and enlarged to suit the client's needs. The surface is made up from literally hundreds of small interlocking plastic elements. Mechanical devices can be tightened to hold a shape, or loosened to permit local adjustments. The shapable surface is supported on a tubing frame, and covered by a layer of foam.

2 Advantages The shapable quality allows minor and major adjustments -- customizing. Extension for growth can be made. No intermediate plastic work is needed. An incidental benefit is the good natural ventilation with this approach.

3 Disadvantages There may be a problem with hygiene, as there are literally hundreds of small places to clean. Some large, strong patients may be able to bend the matrix out of shape. The issue of upholstery is not yet entirely resolved.

4 More Information Two prototype systems are under development. One is at the Medical Engineering Resource Center, University of British Columbia, Vancouver, Canada. The other is being done by Steven Cousins, at BRADU, Rushampton, London, United Kingdom. More than 1,000 units of

the UK design have been marketed in Europe. USA distribution is being undertaken by MED. Contact Jeff Offner, REHAB Co., 2811 Zulette Avenue, Bronx, NY 10461. The early work on this concept is described in a paper by the MERU group that appeared in the 1980 Proceedings of the International Conference on Rehabilitation Engineering in Toronto.

Richard N. Holte, MSc, Rehabilitation Engineering Center, Children's Hospital at Stanford, 520 Willow Road, Palo Alto, CA 94304.

Complete references to papers cited can be found in the Postural Seating Bibliography, page 173.

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**SEATING SERVICE PROGRAMS**

The facilities listed represent those responding to a request for information in the University of Tennessee Rehabilitation Engineering Seating Newsletter. They are listed alphabetically by STATE

Centers who provide seating services, but who did not have access to the initial questionnaire, are welcome to send information about their programs to University of Tennessee, Rehabilitation Engineering Program, 682 Court Avenue, Memphis, TN, attn Elaine Trefler, OT, for inclusion in an updated list

No endorsements are implied by inclusion on this list. If you have information to add to, change, or delete from this list, please send it to the RESNA Sourcebook editor

USA

Rehabilitation Engineering Center  
Children's Hospital at Stanford  
520 Willow Road  
Palo Alto, CA 94304  
415/327-4800

Newington Children's Hospital  
181 E Cedar Street  
Newington, CT 06111  
203/667-5260

University Hospital School  
University of Iowa  
Iowa City, IA 52242

Capper Foundation for Crippled Children  
3500 W 10th Street  
Topeka, KS 66604  
913/272-4060

University of Kansas Medical Center  
39th and Rainbow Blvd  
Kansas City, KS 66103  
913/588-6898

Lakeville Hospital  
Lakeville, MA 01602

Gillette Children's Hospital  
200 E University Avenue  
St Paul, MN 55101  
612/291-2848

University of Mississippi Medical Center  
Orthopedic Division  
2500 North State Street  
Jackson, MS 39216  
601/987-4557

Kessler Institute for Rehabilitation  
Pleasant Valley Way  
West Orange, NJ 07052  
201/731-3600

Blythdale Children's Hospital  
Bradhurst Avenue  
Valhalla, NY 10595  
914/592-7555

Case Western Reserve University  
Rehabilitation Engineering Program  
3395 Scranton Road  
Cleveland, OH 44123  
216/359-3480

Elizabethtown Hospital & Rehabilitation Center  
Elizabethtown, PA 17022  
717/367-1161

Shriners Hospital for Crippled Children  
Greenville Unit  
2100 N Pleasantburg Drive  
Greenville, SC 29609  
803/244-4530

University of Tennessee  
Rehabilitation Engineering Program  
682 Court Avenue  
Memphis, TN 38163

Texas Scottish Rite Hospital for Crippled Children  
2222 Welborn Avenue  
Dallas, TX 75219  
214/521-3168

University of Virginia  
Rehabilitation Engineering Center  
P O Box 3368  
University Station  
Charlottesville, VA 22903  
804/977-6736

Department of Rehabilitation Engineering  
University Hospital & Clinics  
Room E3/211  
600 N Highland Avenue  
Madison, WI 53792  
608/263-8060

Canada

Calgary General Hospital  
Orthotic Clinic  
841 Centre Avenue NE  
Calgary, Alberta T2E 0A1

Glenrose Hospital  
Physical Rehabilitation Unit  
10220-111 Avenue  
Edmonton, Alberta T5G 0B7

Rehabilitation Center for Children  
633 Wellington Crescent  
Winnipeg, Manitoba R2M 0A8  
204/452-4311

Forest Hill Rehabilitation Centre  
Woodbridge Street  
Fredericton, New Brunswick E3B 4R3  
506/455-3309

Izaak Walton Killam Hospital for Children  
5850 University Avenue  
Halifax, Nova Scotia B3J 3G9  
902/424-3025

Cerebral Palsy Centre  
 Chedoke-McMaster Hospital  
 Box 2000  
 Hamilton, Ontario  
 416/388-0240

KW Rotary Children's Centre  
 828 King Street W  
 Kitchener, Ontario W2G 1E8  
 519/579-3850

Ontario Crippled Children's Centre  
 350 Rumsey Road  
 Toronto, Ontario M4G 1R8  
 416/425-6220

Royal Ottawa Regional Centre  
 P&O Department  
 505 Smyth Road  
 Ottawa, Ontario K1P 8M2  
 613/737-7350

Hospital Marie Enfant  
 5200 est Belanger  
 Montreal, Quebec H1T 1C9  
 514/374-1710

Saskatchewan Council for Crippled Children &  
 Adults  
 1410 Kilburn Avenue  
 Saskatoon, Saskatchewan S7M 0J8  
 306/663-1694

University Hospital Physical Medicine & Pediatrics  
 Saskatoon, Saskatchewan  
 306/343-3560  
 306/652-3871

Also see the list of service centers in the  
**COMMUNICATION** section. Since it is usually neces-  
 sary to have the person properly seated before a  
 communication aid can be recommended, most commu-  
 nication services have a source for seating nearby.

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**SOME COMMERCIAL SOURCES OF SEATING AND MOBILITY SYSTEMS****WHEELCHAIR POSITIONING SYSTEMS**

Abbey Medical  
3216 El Segundo Blvd  
Hawthorne, CA 90252

Columbia Medical Manufacturing  
(formerly Childsafe)  
P O Box 633  
Pacific Palisades, CA 90272  
213/454-6612

ERAC - Creative Rehab Equipment  
513 NE, Schuyler Street  
Portland, OR 97212  
503/288-8179  
800/547-4611

Everest & Jennings, Inc  
3233 East Mission Oaks Blvd  
Camarillo, CA 93010  
805/987-6911

Gendron, Inc  
Lugbill Road  
Archbold Ohio 43502  
419/445-6060  
800/537-2521

Gunnell Manufacturing Company Inc  
221 N Water Street  
P O Box 1694  
Vassar, MI 48768  
17/823-8557

Invacare Corporation  
1200 Taylor Street  
Elyria, OH 44035

JA Preston Corp  
71 Fifth Avenue  
New York, NY 10003  
800/221-2425

Mobility Plus  
(formerly L Mulholland Corp)  
215 N 12th Street  
P O Box 391  
Santa Paula, CA 93060  
805/525-7165

Newton Aids (England)  
US Distributor  
Newton, USA  
469 Ridge Road W  
Rochester, NY 14615

Ortho-Kinetics  
P O Box 436  
W220 N507 Springdale  
Waukesha, WI 53187

Palm Beach Medical  
c/o Biomedics  
P O Box 131, FPS  
Springfield, MA 01188

Rifton Equipment for the Handicapped  
Rifton, NY 12471  
914/658-3141

Theradyne Corporation  
21730 Hanover Street  
Lakeville, MN 55044  
612/469-4404

Also see **WHEELCHAIR** section, Commercial Sources of  
**Wheelchairs**

**MODULAR SEATING SYSTEMS**

Aames Rents & Sells  
122 No Glassell  
Orange, CA 92666

Adaptive Rehab Equipment  
Conmed Equipment Corp  
1130 Donamy Glen  
Scotch Plains, NJ 07076  
201/561-0906

Canadian Wheelchair Mfg  
20 Magnetic Drive  
Downsview, Ontario M3J 2C4  
CANADA  
416/661-3556

ERAC - Creative Rehab Equipment  
513 NE, Schuyler Street  
Portland, OR 97212  
503/288-8179  
800/547-4611

Freedom Designs, Inc  
1884 Eastmar Avenue, Suite 11  
Ventura, CA 93003

Invacare Corporation  
1200 Taylor Street  
Elyria, OH 44035

R C Hayes (Leicester) Ltd  
Main Street  
Kirby Muxloe  
Leicester, England (0533)  
394738

JA Preston Corp  
71 Fifth Avenue  
New York, NY 10003  
800/221-2425

Kay Products, Inc  
Adaptive Equipment for Children  
1010 East Pettigrew Street  
Durham, NC 27707  
919/688-1601

Luxury Liners  
18929 Norwalk Blvd  
Suite 105  
Artesia, CA 90701  
213/926-4255

**Medical Equipment Distributors (MED)**  
 1701 S First Avenue  
 Maywood, IL 60153  
 312/681-2828

**Miller Rental & Sales**  
 284 Market Street  
 Akron, OH 44308

**Mobility Plus**  
 (formerly L Mulholland Corp)  
 215 N 12th Street  
 PO Box 391  
 Santa Paula, CA 93060  
 805/525-7165

**Modular Seating Components**  
 19326 Woodward Avenue  
 Detroit, MI 48203  
 213/368-3516

**Otto Bock US**  
 Orthopaedic Industry  
 4130 Highway 55  
 Minneapolis, Mn. 55422  
 800/328-4058

**Pin Dot Products**  
 PO Box 642  
 Northbrook, IL 60062

**Rehab Equipment Systems**  
 PO Box 21566  
 Seattle, WA 98111  
 206/285-1114  
 distributor for  
**Adaptive Engineering Lab**  
 4403 Russell Road  
 Building 2A, Unit A  
 Lynwood, WA 98037  
 206/774-7993

**Rifton Equipment for the Handicapped**  
 Rifton, NY 12471  
 914/658-3141

**Special Devices Department**  
 Rehab Centre for Children  
 633 Wellington Crescent  
 Winnipeg, Manitoba R3M 0A8  
 CANADA  
 204/452-4311

**Variety Village**  
 3701 Danforth Avenue  
 Scarborough, Ontario M1N 2G2  
 CANADA

**CONSTRUCT-A-FOAM SEATING**

**Alimed Inc**  
 68 Harrison Street  
 Boston, MA 02111  
 800/225-2610

**Modular Medical Corp**  
 1558 Hutchinson River Parkway East  
 Bronx, NY 10474  
 212/829-2626

**MOLDED BODY SUPPORT**

**DESEMO, Inc**  
 PO Box 22309  
 Savannah, GA 31403  
 800/342-7661

**Freedom Designs, Inc**  
 1884 Eastmar Avenue, Suite 11  
 Ventura, CA 93003

**Handicapped Educ. Learning Products (HELP) Inc**  
 PO Box 9763  
 Sacramento, CA 95823  
 916/421-1202

**Innovention Products, Ltd**  
 51 Coldharbour Lane  
 Bushey, Herts WD2 3NU  
 ENGLAND  
 01-950-3695

**JA Preston Corp**  
 71 Fifth Avenue  
 New York, NY 10003  
 800/221-2425

**Kay Products, Inc**  
 Adaptive Equipment for Children  
 1010 East Pettigrew Street  
 Durham, NC 27707  
 919/688-1601

**McLaren, Inc**  
 PO Box 2004  
 Department D  
 New York NY 10017  
 212/889-7547  
 800/233-1224

**Nottingham Medical Equipment Company**  
 Melton Road  
 W Bridgford  
 Nottingham, NG2 6HD  
 ENGLAND  
 0602-234251

**Ortho-Kinetics**  
 PO Box 436  
 W220 N507 Springdale  
 Waukesha, WI 53187

**Pin Dot Products**  
 PO Box 642  
 Northbrook, IL 60062

**Rogers & Associates**  
 700 N Valley St, #B  
 Anaheim, CA 92801  
 714/991-3880

**Symplex Orthotic System**  
 PO Box 2031  
 Winter Park, FL 32790  
 305/645-0414

**CAR SEATS**

**Century Products, Inc**  
 Stow, OH 44224

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## MOBILITY DEVICES

**Columbia Medical Manufacturing (Britax)**  
(formerly Childsafe)  
Box 633  
Pacific Palisades, CA 90272  
213/454-6612

**CORAM-Paris**  
209, rue de Saint-Maur  
75010 Paris, FRANCE  
205-48-46

**LIC-REHAB**  
Svetsarvagen 4  
S-17183 Solna  
SWEDEN  
Stockholm 98-10-60  
Telex 105-28-LICS

**Questor Corporation (Bobby-Mac)**  
1801 Commerce Drive  
Piqua, OH 45356  
513/773-3971

**RECARO Automobile Seating System**  
1152 E Dominguez Street  
Carson, CA 90746

### STROLLERS

**Adaptive Therapeutic Systems, Inc**  
965 Dixwell Avenue  
Hamden, CT 06514

**The Bobby-Mac Co., Inc**  
P O Box 209  
Scarsdale, NY 10583  
914/723-3442

**Childsafe (Britax)**  
Bo. 633  
Pacific Palisades, CA 90272

**Convaid Products, Inc**  
P O Box 2731  
Palos Verdes, CA 90274  
213/377-0016

**Credesign AB**  
Bergsunds Strand 31  
S-11738  
Stockholm, Sweden

**Equipment Shop**  
P O Box 33  
Bedford, MA 01730  
617/275-7681

**Handicapped Educ Learning Products (HELP), Inc**  
P O Box 9763  
Sacramento, CA 95823  
916/421-1202

**LIC-REHAB**  
Svetsarvagen 4  
S-17183 Solna  
SWEDEN  
Stockholm 98-10-60  
Telex 105-28-LICS

**MacLaren, Inc**  
P O Box 2004  
Department D  
New York NY 10017  
212/889-7747

**Newton, USA**  
469 Ridge Road W  
Rochester, NY 14615

**Ortho-Kinetics**  
P O Box 436  
W220 N507 Springdale  
Waukesha, WI 53187

**Rifton Equipment for the Handicapped**  
Rifton, NY 12471  
914/658-3141

**Theradyne Corporation - Genac/Pogon**  
21730 Hanover Street  
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## SIDE-BY-SIDE TRIALS AN EVALUATION METHODOLOGY FOR COMPARATIVE TESTING

## OF MODULAR WHEELCHAIR INSERT SYSTEMS

At the 6th Annual Conference on Rehabilitation Engineering, held in San Diego, California, in 1983, this paper was presented by Susan P Schaezlein, OTR, and Richard N Holte, MSc, of the Children's Hospital at Stanford Rehabilitation Engineering Center, Palo Alto, California

These are some excerpts from the paper, which was written in January, 1983. The findings presented at the conference were essentially the same as the preliminary findings noted in the report.

"Over the past five years a number of wheelchair based modular seating systems have been developed and marketed to provide postural control for individuals with cerebral palsy. Theories have been advanced to explain how seating systems should be configured for an individual. The characteristics and components of these seating systems have been designed to provide an orientation in space, provide support or exert forces on the body to improve anatomical alignment and stabilization, and influence muscle tone to improve seating posture. A method of comparing the relative merits between these systems has not yet been formalized.

"Side-by-Side Trial methodology was developed at the Rehabilitation Engineering Center, Children's Hospital at Stanford, as a process to evaluate functional and technical features of four commercially available modular wheelchair seating systems and to determine 1) the specific features and components of a modular seating system which improve or decrease user function, 2) technical modifications which could be made on existing seating systems to better meet functional needs of users, and 3) necessity for the development of a new modular seating system. Using a side-by-side evaluation methodology, child subjects with the diagnosis of cerebral palsy are fitted in each of the four seating systems and perform specific functional activities. Each seating system is rated on ability to provide postural control, effects on certain functional activities, manageability by a parent, and technical characteristics.

"At this publication, 4 out of 10 subjects have participated in the Side-by-Side trials of modular wheelchair insert systems. Preliminary impressions of the four systems under evaluation are:

Britax Seat

"The Britax is not felt to be appropriate as a definitive wheelchair insert system for the subject population in this study. Its size and shape were limiting factors in user function. It is best used as a car seat, as recommended by the manufacturer.

"Positive Features The user feels secure in the seat. Mid-line binocular hand use is facilitated by blocking excessive horizontal abduction at the shoulders. The harness system secures the pelvis. It can be adjusted without tools.

"Negative Features Elbows can get caught between body and side structure of seat during activities. The harness system cuts into the user's shoulders. Wheelchair wheels cannot be reached because of the side structure. Shell structure limits the user's visual field.

Mulholland Adaptive Positioning System for Standard Wheelchairs

"This is an appropriate insert system for the subject population. It provided better postural control for the more severely involved subjects.

"Positive Features Provides good postural control and has a wide range of adjustability to meet user needs. Functional activities were improved with the exception of transfers.

"Negative Features Appearance is very contraption-like. Technical knowledge and a variety of tools are needed to assemble and adjust the system. Shoulder pads, lateral trunk supports and pelvic stabilizers are not user operable, preventing independence in transfers. Attaching the assembled seat base and seat back onto the wheelchair frame is relatively difficult.

Winnipeg Modular System

"The system is appropriate for this subject population. It can be easily managed by parents and was favored for its appearance.

"Positive Features Overall appearance is good. It is easily removed and inserted to wheelchair base, functional activities were improved. It provided good control for moderately involved subjects.

"Negative Features Tools, machinery and technical knowledge are needed to assemble the system. It is not available on the commercial market in the United States.

MPI

"This is appropriate seating for this subject group. It provided postural control for the less involved subjects, but not quite enough for more severely involved subjects.

"Positive Features Seat depth, back height, and seat angle adjustments are versatile. It has the appearance of a child's chair.

"Negative Features Material is perceived as breakable and uncomfortable. Footrest and headrest hardware needed to be modified before they would fit into their brackets. Independent or standing transfers were limited by the footrest component. Handles for the angle adjustment clamps broke off.

## CONCLUSIONS

"The modular seating system which effectively positioned a child had a positive effect on performance of most functional activities. Components of the systems, however, can restrict user functions. Fixed footrests and abduction units which were not user operable decreased performance in transfers. The relationship between the modular seating system and its wheelchair base influenced effectiveness of the system. The relationship of the footrests to the seating system influenced mobility. Appearance was important to therapists and parents and was generally the first feature considered when assessing a system. Although manageability of a system by a parent was considered important, the parents tended to place the child's needs first. They indicated a willingness to put up with a cumbersome system if it helped improve posture and function of their child.

The Side-by-Side Trials have been a useful method of gathering comparative information about modular seating systems. The methodology developed for this project could be useful in the comparative evaluation of other seating systems and other assistive devices.

For the entire paper, see Proceedings, 6th Annual Conference on Rehabilitation Engineering, San Diego, 1983.

or contact the authors at

Children's Hospital at Stanford, Rehabilitation Engineering Center, 520 Willow Road, Palo Alto, CA 94304, 415/327-4800, x 345

More information on guidelines for evaluating the usefulness of mobility devices can be found in the section on **Wheelchair Mobility Device Evaluation Guide**.

## SOME PUBLICATIONS ON POSTURAL SEATING AND POSITIONING

Functional Aids for the Multiply Handicapped  
Isabel P. Robinault. Harper and Row Publishers,  
Hagerstown MD 1973. See pages 139-177

Handling the Young Cerebral Palsied Child at Home  
Nancie R. Finnie. E.P. Dutton. Second edition  
1975. Information on home management of children  
with cerebral palsy for parents, teachers, and  
therapists. Contains suggestions on do-it-your-  
self devices as well as commercially available  
equipment, particularly mobility aids. Also  
includes lists of resources for equipment and  
accessories.

Positioning the Client with Central Nervous System  
Deficits: Wheelchair and Other Adaptive Equipment  
A.F. Bergen and C. Colangelo. Valhalla Rehabili-  
tation Products Publications, Ltd., P.O. Box 195,  
Valhalla, NY 10595. 1982. 191 pages. "This  
manual is a guide for prescribing positioning  
devices which will allow maximum function with  
minimal pathology for the person who has abnormal  
muscle tone due to CNS dysfunction. It presents  
guidelines and principles for evaluation, problem  
solving, and constructing or ordering equipment.

"The text initially concentrates on the sitting  
posture -- adjusting the client's position to  
prevent deformity and to improve his or her capa-  
city to work, learn, and recreate. The section on  
sitting also explains how to best achieve that  
goal when ordering commercially available wheel-  
chairs. Wheelchair features are explained in a  
specific sequence to assist the reader in problem-  
solving in an orderly, logical fashion. A sample  
prescription blank is provided for use when order-  
ing traditional wheelchairs.

"Since human achievement is often related to eye-  
hand function, problem-solving for head and upper  
extremity positioning is dealt with at length. A  
separate section on lapboards includes a discus-  
sion on when they should be provided, how to  
measure, and what materials might be used, in  
relation to specific client problems.

"The last section of the text includes alternate  
positioning devices (such as for prone, sideline  
standing and mobility). Many items are from  
Selected Equipment for Pediatric Rehabilitation,  
and are described in a problem/solution format  
using photographs and construction suggestions.  
New pieces have been added and old ones updated.

"The text includes over 400 illustrations and  
photographs, a list of addresses for further  
information, and a bibliography."

Positioning the Handicapped Child for Function: A  
Guide to Evaluate and Prescribe Equipment for the  
Child with Central Nervous System Dysfunction  
Diane E. Ward, M.Ed., OTR. 316 Carmel Drive, St.  
Louis, MO 63119. March, 1983. 115 pages.  
\$20.00. "This manual discusses the current and  
popular practices used in positioning the severely  
handicapped child. In addition, it presents a  
systematic approach to evaluating posture from a  
posture-mobility context. It analyzes the vari-  
ables of posture that observably affect perform-

ance.

"This manual is written for occupational and phy-  
sical therapists who serve severely handicapped  
children, though it may also be of assistance for  
parents, teachers, and nurses. It intends to  
guide the therapist in optimizing posture so that  
it can best serve movement. Facilitating this  
interplay between posture and movement will allow  
the child to be more functional and to find more  
satisfaction through participation."

Seating for Children with Cerebral Palsy: A  
Resource Manual. Elaine Treffer, OTR, M.Ed.,  
editor. The University of Tennessee Rehabilita-  
tion Engineering Program, 682 Court Avenue,  
Memphis, TN 38163. 1984. \$20.00. "The  
manual is intended to provide guidelines and deci-  
sion making information in each of the critical  
aspects of the seating provision process. It is  
meant to supplement the UT-REC annual educational  
workshops, outreach presentations, as well as  
provide reference material and guidelines for  
clinicians seeking decision making criteria. The  
emphasis of the manual is on the needs of the  
cerebral palsied child, however, many of the prin-  
ciples, service delivery processes, and funding  
considerations apply equally to other populations  
of non-ambulatory individuals requiring seating  
and mobility.

"The manual begins with an overview of both normal  
and abnormal child development, followed by their  
implications relative to therapeutic decision  
making. This is followed by medical considera-  
tions: first, from the total perspective of the  
needs of the child and the family, and secondly,  
with specific concerns related to orthopedic  
management. An overview of basic biomechanical  
principles and their implications related to pro-  
viding body positioning and support is then given.  
With this as background and rationale, the remain-  
ing sections focus on specific guidelines related  
to therapy decision making, technical options,  
material selection, and characteristics of a  
working delivery system process, concluded by an  
overview of the exigencies associated with se-  
curing the necessary funding. The appendices  
provide resource material related to existing  
clinical facilities, commercial sources, and pub-  
lished literature."

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Evaluating the Environment: A Key to Function Bergen and Colangelo Everest & Jennings, 3233 E Mission Oaks Blvd., Camarillo, CA 93010, 805/987-8911 Call your Everest & Jennings representative for a free screening at your facility. Facility screenings include information booklets.

Handling and Positioning of the Child with Central Nervous System Dysfunction Bergen, Colangelo and Gottlieb Blythedale Children's Hospital, Valhalla, NY Slide/tape 1977

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Special Magic: Equipment for Handicapped Children University of Tennessee Rehabilitation Engineering Program, 682 Court, Memphis, TN 38163 Rental \$25.00

Wheels University of Kansas, Bureau of Child Research Available from: University of Kansas, Film Rental Service 746 Massachusetts Street, Lawrence KS 66044 16 mm, color, 13 minutes 1974 Demonstrates how the wheelchair modification team, working with a physician reconstructs and modifies standard wheelchairs to meet the needs of multiply handicapped children. The chair serves as transportation and has prosthetic and therapeutic purposes.

## PERSONAL VEHICLES

## INTRODUCTION

"One of life's activities often affected by motor or sensory impairment is the ability to operate a motor vehicle. Due to the resulting lack of mobility, persons with disabilities are often deprived of meaningful vocational opportunities, participation in community and cultural events, and recreational activities. Being able to drive offers the homebound person independence and greater self-sufficiency. However, if these potential drivers are to operate their vehicles safely, not only is adequate equipment necessary but also proper training.

"Much attention is now focused on mass transit for handicapped persons and on various para-transit and taxi transportation schemes. However, these alternatives only partially meet the transportation needs of disabled people. In addition, they need a convenient and economical means of getting to work and performing the many functions associated with daily living. A practical solution is to have many of these disabled persons operate motor vehicles independently.

"Some of the difficulty encountered by disabled drivers can be overcome by providing information on opportunities already available. For example

- Selecting the type of vehicle most appropriate for their functioning capabilities,
- Purchasing the most appropriate options and adaptive devices,
- Arranging for installation of special devices,
- Locating training facilities,
- Evaluating driving tasks,
- Employing appropriate operating procedures,
- Assuring proper maintenance of equipment, particularly adaptive equipment, and
- Taking precautions against problems encountered outside the car."

Rehab Brief, June 25, 1980

## HINTS ON OPERATING A SUCCESSFUL DRIVER EDUCATION PROGRAM

In general, the driver educational program for the physically disabled student follows the same steps and procedures as the one for the able bodied student. However, equipment and methodology must be tailored to the student's functional capabilities.

Be patient, let the students do things for themselves in a safe and confidence-building environment. They must become independent.

Try to know as much about the students and their functional capabilities as possible.

Be consistent -- keep your commands simple and consistent throughout the training period.

Keep in mind, to handicapped students driving is not a luxury, it is often a necessity.

Do not assume students can do something because others with similar disabilities can. Each student is an individual.

You, as the instructor, must be fully acquainted with and able to operate all the assistive devices. It will make you a better teacher.

Always check all assistive devices before you begin a lesson.

Learn how to handle a wheelchair.

Be firm -- disabled students must be able to control the vehicle with the same efficiency and safety as able-bodied students.

Try not to recommend more assistive devices than necessary.

Encourage the students to be totally independent -- they must do everything without your help.

Ask the students for their recommendations and comments -- after all, they are doing the driving.

Try to be available when your students purchase cars. Make suggestions and recommendations based on their capabilities and needs.

Know all about the different disabilities you will encounter and the functional limitations they impose. Apply the knowledge in relation to the driving task.

Good Luck -- you've entered a very important and rewarding career. Remember, "mobility is the final step in total rehabilitation of the disabled individual." You have opened a whole new world to your students by providing them with mobility.

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## ASSOCIATION OF DRIVER EDUCATORS FOR THE DISABLED - ADED

### ADED Membership Form

INDIVIDUAL MEMBERSHIP -- \$25.00  
(Membership Expires DEC.31)

Corporate Membership - \$50.00  
To join, please complete the below listed items  
in full and mail, with your check (payable to  
ADED) to

A.D.E.D. SECRETARIAT  
UNIVERSITY OF MICHIGAN  
REHAB ENGINEERING CENTER  
208 LAY AUTOMOTIVE LAB  
ANN ARBOR, MICH 48109

Name \_\_\_\_\_

(Please print or type)

Affiliate Organization \_\_\_\_\_

Address \_\_\_\_\_

Phone ( ) \_\_\_\_\_  
A C

Position or Title \_\_\_\_\_

Brief Description of Your Duties

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### What is ADED?

ADED is an association of professionals interested in driver education for disabled people, -- professionals who want to stay current in a rapidly changing field, -- people who get involved

### Who benefits from ADED membership?

ADED members represent a cross-section of professionals from various parts of our country. Some of the groups interested in and directly affected by ADED members' activities include

*Medical community*  
*Rehabilitation community*  
*Educational community*

*local and national*  
*high school and college*  
*guidance counselors, special educators,*  
*driver educators, administrators*

*Engineers*

*Equipment designers, manufacturers, and vendors*

*Government agencies*

*Vocational rehabilitation personnel*  
*motor vehicle licensing personnel*  
*legislators*

*Enforcement agencies*

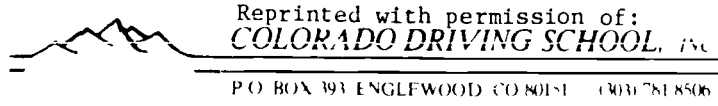
*Insurance industry*  
*Individuals, companies, and associations with an*  
*interest in SAFETY*  
*general population*

### What are the advantages of ADED membership?

Basically ADED offers an opportunity for professional growth by

- 1 Facilitating an exchange of ideas between members
  - a Sharing research and innovations in adaptive equipment
  - b Sharing methods of evaluation
  - c Sharing teaching techniques
- 2 Publishing "The ADED Newsletter"
- 3 Referring resource people to present workshops or courses on disabled driver education and related subjects
- 4 Maintaining a library for members' use
- 5 Sharing a common interest and therefore an opportunity for unique professional friendships
- 6 Surveying the membership to provide information on program development, program improvement, and national trends
- 7 Holding a yearly conference

*The benefits of the association are many and the cost is small so you are invited to join ADED by filling out and sending in the attached membership application along with your dues of only \$25.00*



Name: \_\_\_\_\_ Date(s) \_\_\_\_\_  
 (Last) (First) Total hours of instruction \_\_\_\_\_ Date of driving release \_\_\_\_\_  
 Address \_\_\_\_\_ Phone \_\_\_\_\_  
 Special information (directions or equipment) \_\_\_\_\_  
 License/permit No \_\_\_\_\_ State \_\_\_\_\_ Expiration date \_\_\_\_\_  
 Restrictions \_\_\_\_\_ Birth date \_\_\_\_\_ Instructor \_\_\_\_\_  
 Referred by \_\_\_\_\_ Reports to \_\_\_\_\_

KEY  
 X evaluated and successfully completed  
 O problem area (explanation)  
 ★ key point of evaluation  
 NA Not applicable/not evaluated

**DRIVING SKILLS EVALUATION**

- I Residential area
  - \_\_\_\_\_ A Entering & exiting the vehicle
  - \_\_\_\_\_ B Miscellaneous controls operation
  - \_\_\_\_\_ C Physical limitations
  - \_\_\_\_\_ D Attitude
  - \_\_\_\_\_ E Perceptual skills
  - \_\_\_\_\_ F Equipment operation
  - \_\_\_\_\_ G Straight driving
  - \_\_\_\_\_ H Stopping
  - \_\_\_\_\_ I Corners
  - \_\_\_\_\_ J Backing
  - \_\_\_\_\_ K Parking
- II Light Traffic
  - \_\_\_\_\_ A Straight driving
  - \_\_\_\_\_ B Lane changing
  - \_\_\_\_\_ C Corners
  - \_\_\_\_\_ D Defensive driving
  - \_\_\_\_\_ E Observation habits
- III Highway driving
  - \_\_\_\_\_ A Entering
  - \_\_\_\_\_ B Lane control
  - \_\_\_\_\_ C Speed control
  - \_\_\_\_\_ D Passing
  - \_\_\_\_\_ E Exiting highway
- IV Advanced driving
  - \_\_\_\_\_ A Heavy traffic driving
  - \_\_\_\_\_ B Mountain driving
  - \_\_\_\_\_ C Night driving
  - \_\_\_\_\_ D Adverse weather driving
- V Areas of Discussion
  - \_\_\_\_\_ A Emergency driving situations
  - \_\_\_\_\_ B Medical considerations
  - \_\_\_\_\_ C Adaptive equipment failure
  - \_\_\_\_\_ D Vehicle maintenance
  - \_\_\_\_\_ E Licensing requirements
  - \_\_\_\_\_ F Insurance requirements

**TRAINING RECOMMENDATION:**

- \_\_\_\_\_ Proceed to licensing
- \_\_\_\_\_ Independent driving without adaptive equipment
- \_\_\_\_\_ Independent driving with required adaptive equipment (see equipment recommendations)
- \_\_\_\_\_ Further evaluation necessary
- \_\_\_\_\_ Time suggestion
- \_\_\_\_\_ Reason

Driving restrictions recommendations:  
 Explain \_\_\_\_\_  
 Terminate training driving program:  
 Reason \_\_\_\_\_

**GENERAL COMMENTS:**

**EQUIPMENT RECOMMENDATION**

Driving a van (see attached sheet)  
 Driving a car \_\_\_\_\_

- A Vehicle limitations
  - 1 None
  - 2 Power steering power brakes automatic transmission 2 door air conditioner
  - 3 Other \_\_\_\_\_
- B Hand controls
  - 1 Right side mount
  - 2 Left side mount
  - 3 Paraplegic style (with horn button and dimmer switch)
  - 4 Quadriplegic style (with horn button, dimmer button and wrist rest)
  - 5 Other \_\_\_\_\_

- C Steering device
  - 1 None
  - 2 Steering knob
  - 3 Trip pin
  - 4 Position rotation
  - 5 Other \_\_\_\_\_
- D Safety features
  - 1 Park brake extension
  - 2 Upper body belt for balance
  - 3 CB radio
  - 4 Right and left outside mirrors
  - 5 Other \_\_\_\_\_

- E Other accessories
  - 1 Left foot gas pedal
  - 2 Left hand shift lever extension
  - 3 Right hand turn signal lever
  - 4 Headlight dimmer switch location
  - 5 Horn button location
  - 6 6 way power seat
  - 7 Other \_\_\_\_\_

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## Limited Evaluation

Name: \_\_\_\_\_ Date(s) \_\_\_\_\_

Address: \_\_\_\_\_ Total Evaluation Time \_\_\_\_\_

Evaluator: \_\_\_\_\_

Referred By: \_\_\_\_\_

Evaluation Limitation: \_\_\_\_\_ stationary  
 \_\_\_\_\_ parking lot  
 \_\_\_\_\_ limited time  
 \_\_\_\_\_ other

Reports to: Student: \_\_\_\_\_  
 Referring agent: \_\_\_\_\_  
 Funding source: \_\_\_\_\_  
 Other: \_\_\_\_\_

Paperwork. Pre-Driving information sheet \_\_\_\_\_  
 Prescription \_\_\_\_\_  
 Contract \_\_\_\_\_  
 Evaluation Completed \_\_\_\_\_  
 Billing \_\_\_\_\_

### DRIVING EVALUATION PROCEDURE:

### EVALUATION RECOMMENDATION:

\_\_\_\_\_ Proceed to licensing  
 \_\_\_\_\_ Independent driving without adaptive equipment  
 \_\_\_\_\_ Independent driving with required adaptive equipment  
 (see equipment recommendations)  
 \_\_\_\_\_ Further evaluation necessary  
 Reason \_\_\_\_\_  
 Time suggestion \_\_\_\_\_

\_\_\_\_\_ Driving restrictions recommendations  
 Explain \_\_\_\_\_  
 \_\_\_\_\_ Terminate from driving program  
 Reason \_\_\_\_\_

### EQUIPMENT RECOMMENDATION

\_\_\_\_\_ Driving a van (see attached sheet)  
 \_\_\_\_\_ Driving a car

\_\_\_\_\_ A Vehicle limitations  
 \_\_\_\_\_ 1 None  
 \_\_\_\_\_ 2 Power steering, power brakes, automatic transmission,  
 2-door, air conditioning  
 \_\_\_\_\_ 3 Other.  
 \_\_\_\_\_ B Hand controls  
 \_\_\_\_\_ 1 Right side mount  
 \_\_\_\_\_ 2 Left side mount  
 \_\_\_\_\_ 3 Paraplegic style (with horn button, and  
 dimmer switch)  
 \_\_\_\_\_ 4 Quadriplegic style (with horn button, dimmer  
 button, and wrist rest)  
 \_\_\_\_\_ C Steering device  
 \_\_\_\_\_ 1 None  
 \_\_\_\_\_ 2 Steering knob  
 \_\_\_\_\_ 3 Tri-pun  
 \_\_\_\_\_ 4 Position notation  
 \_\_\_\_\_ 5 Other

\_\_\_\_\_ D Safety features  
 \_\_\_\_\_ 1 Park brake extension  
 \_\_\_\_\_ 2 Upper body belt for balance  
 \_\_\_\_\_ 3. CB radio  
 \_\_\_\_\_ 4 Right and left outside mirrors  
 \_\_\_\_\_ 5. Other  
 \_\_\_\_\_ E Other accessories  
 \_\_\_\_\_ 1 Left foot gas pedal  
 \_\_\_\_\_ 2. Left hand shift lever extension  
 \_\_\_\_\_ 3. Right hand turn signal lever  
 \_\_\_\_\_ 4. Headlight dimmer swith  
 location  
 \_\_\_\_\_ 5 Horn button  
 location.  
 \_\_\_\_\_ 6. 6-way power seat  
 \_\_\_\_\_ 7 Other:

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**PRE-DRIVING EVALUATION**

Name \_\_\_\_\_ Referred by \_\_\_\_\_  
 Date of Birth \_\_\_\_\_ Age \_\_\_\_\_ License/Permit # \_\_\_\_\_  
 State \_\_\_\_\_ Restrictions \_\_\_\_\_ Evaluation Date \_\_\_\_\_  
 Disability \_\_\_\_\_ Caused by \_\_\_\_\_ Date of Onset \_\_\_\_\_  
 Present Dcminance \_\_\_\_\_ Pre-Onset Dominance \_\_\_\_\_  
 Past Driving Experience \_\_\_\_\_ Driver Education Plan \_\_\_\_\_

Pre-Onset Driving Record \_\_\_\_\_

Need for Driving \_\_\_\_\_

**MOTOR STATUS**

I Upper extremity function  
 A Muscle picture  
 \_\_\_\_\_ bilateral function  
 \_\_\_\_\_ unilateral function  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left

Comments (how affects function)

B Strength  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitations  
 \_\_\_\_\_ shoulder  
 \_\_\_\_\_ elbow  
 \_\_\_\_\_ wrist  
 \_\_\_\_\_ hand  
 right left

Comments (how affects function)

C Range of motion  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitation  
 \_\_\_\_\_ shoulder  
 \_\_\_\_\_ elbow  
 \_\_\_\_\_ wrist  
 \_\_\_\_\_ hand  
 right left

Comments (how affects function)

D Sensory  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitation  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left

Comments (1 type of impairment position sense pain touch, etc 2 how affects function)

II Lower extremity function  
 A Muscle picture  
 \_\_\_\_\_ bilateral function  
 \_\_\_\_\_ unilateral function  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left

Comments (how affects function)

B Strength  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitations  
 \_\_\_\_\_ hip  
 \_\_\_\_\_ knee  
 \_\_\_\_\_ ankle  
 right left

Comments (how affects function)

C Range of motion  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitation  
 \_\_\_\_\_ hip  
 \_\_\_\_\_ knee  
 \_\_\_\_\_ ankle  
 right left

Comments (how affects function)

D Sensory  
 WNI  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 functional limitation  
 \_\_\_\_\_ right  
 \_\_\_\_\_ left  
 Comments (1 type of impairment position sense pain touch, etc 2 how affects function)

**MOTOR STATUS**

I Upper extremity function  
 F Reflex patterns  
 \_\_\_\_\_ present  
 \_\_\_\_\_ absent

Comments (1 type of impairment 2 how affects function)

F Coordination  
 \_\_\_\_\_ no functional limitations  
 \_\_\_\_\_ slowed response  
 \_\_\_\_\_ tremors  
 \_\_\_\_\_ spasticity  
 \_\_\_\_\_ right left

Comments (how affects function)

G Reaction time  
 \_\_\_\_\_ Normal  
 \_\_\_\_\_ Slowed  
 right left

Comments (how affects function)

I Balance  
 WNI  
 \_\_\_\_\_ functional limitation  
 Comments (how affects function)

I Equipment (indicate R or L)  
 \_\_\_\_\_ sling  
 \_\_\_\_\_ hand/splint  
 \_\_\_\_\_ other (describe)  
 Comments (how affects function)

II ADL Evaluation  
 (Describe typical problems that may affect driving)  
 ADL dependent on attendant  
 ADL independent  
 family attitudes  
 alternative transportation accessibility  
 types of roads necessary for independent driving  
 availability of money for equipment and vehicle  
 Comments (comment completely in each area)

II Lower extremity function  
 F Reflex patterns

\_\_\_\_\_ present  
 \_\_\_\_\_ absent

Comments (1 type of impairment 2 how affects function)

F Coordination  
 \_\_\_\_\_ no functional limitations  
 \_\_\_\_\_ slowed response  
 \_\_\_\_\_ tremors  
 \_\_\_\_\_ spasticity  
 \_\_\_\_\_ right left

Comments (how affects function)

G Reaction time  
 \_\_\_\_\_ normal  
 \_\_\_\_\_ slowed  
 right left

Comments (how affects function)

H Endurance  
 \_\_\_\_\_ normal  
 \_\_\_\_\_ decreased  
 Comments (how affects function)

I Mobility  
 \_\_\_\_\_ transfers  
 \_\_\_\_\_ independent  
 \_\_\_\_\_ assistance required  
 \_\_\_\_\_ describe  
 walking

\_\_\_\_\_ independent  
 \_\_\_\_\_ assistance required  
 \_\_\_\_\_ describe  
 Comments (how affects function)

I Equipment (indicate R or L)  
 \_\_\_\_\_ wheelchair  
 \_\_\_\_\_ full leg brace  
 \_\_\_\_\_ cane/walking aid  
 \_\_\_\_\_ short leg brace  
 \_\_\_\_\_ other (describe)  
 Comments (how affects function)



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 P.O. BOX 393  
 Englewood, Colorado 80151

**EQUIPMENT RECOMMENDATIONS**

**Driving A Van**

Name \_\_\_\_\_

Date \_\_\_\_\_

Evaluator \_\_\_\_\_

**Original Vehicle Equipment:** Power steering, power brakes, automatic transmission, air conditioning, large outside mirrors, 3/4 ton, heavy duty cooling, heavy duty alternator

**Vehicle Modifications:**

- |  |   |
|--|---|
| <p>_____ A Hand controls</p> <ul style="list-style-type: none"> <li>_____ 1 Right side mount</li> <li>_____ 2 Left side mount</li> <li>_____ 3 Paraplegic style (with horn button and dimmer switch)</li> <li>_____ 4 Quadriplegic style (with wrist rest, horn button and dimmer button)</li> <li>_____ 5 Lever type (push-pull)</li> <li>_____ 6 Brake bracket to mount the hand controls</li> <li>_____ 7 Other.</li> </ul> <p>_____ B Steering device</p> <ul style="list-style-type: none"> <li>_____ 1 Steering knob</li> <li>_____ 2 Tri-pin</li> <li>_____ 3 Position notation</li> <li>_____ 4 Other</li> </ul> <p>_____ C Fully automatic lift</p> <ul style="list-style-type: none"> <li>_____ 1 Door actuators</li> <li>_____ 2. Outside access door for switches</li> <li>_____ 3 Position notation</li> <li>_____ 4 Other</li> </ul> <p>_____ D Vehicle body modifications</p> <ul style="list-style-type: none"> <li>_____ 1 Raised roof (17" or 24")</li> <li>_____ 2 Raised doors (57")</li> <li>_____ 3 Vehicle body stabilizers</li> <li>_____ 4 Heavy duty suspension</li> <li>_____ 5 Smooth floor</li> <li>_____ 6 Other</li> </ul> <p>_____ E Steering wheel modifications</p> <ul style="list-style-type: none"> <li>_____ 1 Extended steering column length notation</li> <li>_____ 2. Tilting/telescoping steering</li> <li>_____ 3. Steering wheel size variance explain</li> <li>_____ 4 Sensitized steering</li> <li>_____ 5 Other</li> </ul> | <p>_____ F Steering wheel access modifications</p> <ul style="list-style-type: none"> <li>_____ 1 Swivel-base driver's seat</li> <li>_____ 2 Power seat base for driver's seat</li> <li>_____ 3 Floor channels                             <ul style="list-style-type: none"> <li>_____ a. 2" standard</li> <li>_____ b. 5" electric</li> </ul> </li> <li>_____ 4 Elevator floor</li> <li>_____ 5. Quick release alternate driver's seat</li> <li>_____ 6 Other</li> </ul> <p>_____ G Control modifications</p> <ul style="list-style-type: none"> <li>_____ 1 Relocate ignition switch</li> <li>_____ 2 Transmission selector extension</li> <li>_____ 3 Turn signal extension</li> <li>_____ 4 Dash mounted control extensions<br/>Special notations.</li> <li>_____ 5 Power windows</li> <li>_____ 6 Power door lock</li> <li>_____ 7. Elbow turn signal, horn, and wiper controls</li> <li>_____ 8 Control console</li> <li>_____ 9. Electric emergency brake</li> <li>_____ 10 Emergency brake switch</li> <li>_____ 11. Other:</li> </ul> <p>_____ H Safety features</p> <ul style="list-style-type: none"> <li>_____ 1. Upper body belt for balance                             <ul style="list-style-type: none"> <li>_____ a. To wheelchair</li> <li>_____ b. Shoulder belts-underarm support</li> </ul> </li> <li>_____ 2 Electric lockdown for driver's wheelchair</li> <li>_____ 3 Manual lockdown for passenger's wheelchair</li> <li>_____ 4 Dual battery system</li> <li>_____ 5 CB radio</li> <li>_____ 6 Orthodic device explain</li> <li>_____ 7. Other.</li> </ul> |
|--|---|

## CAR SELECTION AND PURCHASE

Reproduced with permission from Teaching Driver Education to the Physically Disabled Human Resources Center, Albertson, New York

## General Requirements

The automobile to be utilized by the disabled driver may include all or some of the following factory equipment in addition to the hand controls and assistive devices that must be installed to compensate for functional limitations.

- 1) 8 Cylinder Car - to accommodate all the power devices
- 2) 2-Door Sedan - to permit easier entry of wheelchair to car
- 3) Automatic Transmission - to reduce vehicle operation efforts
- 4) Power Steering - to facilitate one hand steering for individuals with upper extremity weakness
- 5) Power Brakes - to facilitate braking by use of hand controls for individuals with limited ranges of motion and/or concurrent weakness
- 6) Power Windows - to permit individuals who lack hand and wrist dexterity to pay tolls, ask directions, etc
- 7) 6-way Power Seat - to aid in transfer and seating position adjustments, as well as to compensate for some functional limitations
- 8) Air Conditioning - to assist individuals with low respiratory levels and those who have skin problems
- 9) Bench Seat (Vinyl) - to allow for ease and safety while transferring
- 10) Tilt Steering Wheel - to facilitate steering for individuals utilizing a quad cuff and to allow for ease of transfer by the disabled individual. A telescopic steering wheel can also be helpful in certain disabilities
- 11) Power Door Locks - to permit the disabled individual to unlock and lock the doors independently
- 12) Fold-down Arm Rest - to aid in hip stability for certain disabilities
- 13) Inside Adjustable Side View Mirror - to enable the disabled individual to operate right and left side view mirrors. If there is an absence of a functional grip or finger dexterity, a toggle switch is recommended for ease of operation
- 14) CB Radio - to assist the disabled individual in case of vehicle breakdown and when there is a need for emergency assistance

- 15) Rear Window Defroster - mandatory on all cars since 1978
- 16) Cruise Control - to reduce the fatigue when driving for long distances on highways
- 17) Available Space - to permit transfer of the wheelchair into the back seat of the car. Available space for the wheelchair and the height of the car floor from the ground should be measured to determine if the disabled individual has sufficient strength to pull the wheelchair into the car.

## Car Purchase

Car purchase should be done with much attention to ensure that the disabled individual will have the functional capabilities to drive the particular car he or she wishes to buy. Items that should be investigated are cost, steering effort required, braking effort required, available space for wheelchair, height of stepwell, visibility accessibility of dashboard controls, efficiency and reliability of vehicle (as the disabled individual cannot afford a breakdown), and insurance rates.

Car purchase is extremely difficult for individuals who utilize hand controls and assistive devices because they cannot test-drive the vehicle but rather must rely on the judgment of others.

Not all the vehicle requirements mentioned are necessary for all disabled drivers. Decisions as to what is needed depend on functional limitations and capabilities. The driver educator must impress upon the disabled trainee the importance of regular car maintenance and checkups in order to minimize the chance of failure. Any kind of Tires, engine, hand controls and assistive devices should be maintained in as nearly perfect conditions as possible.

After the proper vehicle has been selected, optimal assistive devices should be installed to compensate for functional limitations. They should be safe and provide the most efficient compensation for functional limitations. It is important that these assistive devices be installed so that they do not interfere with the able-bodied driver when operating the vehicle.

For names and addresses of manufacturers of adapted driving aids, contact the ABLEDATA system.

Reprinted with permission from Hand Controls and Assistive Devices for the Physically Disabled Driver, Human Resources Center Albertson, New York

# GUIDE TO THE USE OF HAND CONTROLS AND ASSISTIVE DEVICES

	COMPLETE HAND CONTROL	HAND CONTROL EXTENSION	COMPLETE FOOT CONTROL	SPINNER KEYS	REAR DRIVING RING	UPSHIFT QUAD SWITCHER	FLAT QUAD SWITCHER	TRUCK QUAD SWITCHER	QUAD STEERING CUFF	ADJUSTABLE STEERING VALVE (CANNOT BE SEEN)	RIGHT SIDE DIRECTIONAL	LEFT SIDE GEAR SHIFT	RIGHT GEAR SHIFT EXTENSION	LEFT FOOT GAS PEDAL	PARKING BRAKE EXTENSION	HAND CLUTCH	HAND BRAKE	HAND DIMMER SWITCH	REVERSE POSITION (CANNOT BE SEEN)	WORM EXTENSION	WEE SEPARATOR	SLIDING BOARD	GUTTER POCK	HELPER BAR AND STRAP	CARRY ALL	CHEST HARNESS	FULL VIEW MIRROR (NOT SHOWN)	PEDAL BLOCKS	PILLOW (NOT SHOWN)	AUTOMATIC TRANSMISSION	POWER STEERING	POWER DISC BRAKES	5 WAY POWER BENCH SEAT	POWER WINDOW	TILT AWAY STEERING WHEEL	DEEP DISH STEERING WHEEL	TWO DOOR SEAT	AIR CONDITIONING	BUILT UP REAR FLOOR	SPECIAL FACTORS TO CONSIDER	
LEFT LEG													X	X		X																									1. IF TRANSFER IS IMPOSSIBLE A MODIFIED VAN IS RECOMMENDED
RIGHT LEG													X			X																									2. SELECTION OF ASSISTIVE DEVICES SHOULD ALWAYS CONSIDER A DEGREE OF WEAKNESS OF INDIVIDUAL
BOTH LEGS	X		X					X					X			X			X	X	X	X																		3. IF THERE IS CONCURRENT BRAIN DAMAGE PSYCHOLOGICAL FACTORS SHOULD BE CONSIDERED	
RIGHT ARM		X							X																				X	X										4. IF INDIVIDUAL CANNOT OPERATE EXISTING SWITCHES TOGGLE SWITCHES ARE RECOMMENDED	
LEFT ARM		X							X																				X	X										5. VEHICLE SHOULD BE EQUIPPED AS DISCUSSED IN TEXT	
BOTH ARMS		X	X																										X	X	X									6. AIRCONDITIONING IS NECESSARY FOR ALL INDIVIDUALS WITH LOW RESPIRATORY LEVEL	
LEFT LEG AND LEFT ARM			X						X				X				X												X	X										7. FOR INDIVIDUALS WITH SHORT ARMS A HAND CONTROL EXTENSION MAY BE NECESSARY TO FACILITATE BRAKING AND ACCELERATING	
RIGHT LEG AND RIGHT ARM			X							X			X				X												X	X											
LEFT ARM AND RIGHT LEG			X						X				X				X												X	X											
RIGHT ARM AND LEFT LEG			X							X			X				X												X	X											
SHOULDER ALL FOUR LIMBS INVOLVED	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
BALANCE BOTH PALM PLEDS	X		X										X				X												X	X											
NECK ROTATION ARTHRITIS																									X																
LACK OF HEIGHT	X	X	X		X												X										X	X	X	X	X										

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## RESOURCES PERSONAL VEHICLES

## PUBLICATIONS

Driver Education Curriculum Guide for the Physically Handicapped Des Moines Public Schools, 1800 Grand Avenue, Des Moines, IA 50307

Driver Education for the Handicapped A Driving Guide for Behind the Wheel Instruction David G Kraemer Materials Development Center, Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout, Menomonie, Wisconsin 54751 Revised 1980 63 pages, figs Spiral bound \$350 A driver training educational program field tested with persons having various disabilities including instructional forms, 16 structured lessons, guidelines for teaching glossary of medical terms, and list of manufacturers of special automotive equipment

Driver Education for the Severely Physically Disabled Equipment and Adapted Methodologies for Teaching in a Fully Modified Van Human Resources Center, Albertson, New York 11507 This instructional manual describes the special equipment and adapted methodologies used to teach severely disabled individuals to drive a van independently The manual offers useful training techniques and illustrates many adapted devices for the severely physically disabled person

Driving for the Physically Handicapped Proceedings of a National Symposium 1981 Education and Training Center, Rehabilitation Institute of Chicago, 345 E Superior Street, Chicago, IL 60611 \$10.00

"Driving Systems for Independent Mobility" ADL, Inc, 6 Hurlow Court, Rockville, Maryland 20850 Attn Elise Brown \$250

Evaluating Driving Potential of Persons with Physical Disabilities Menahem Less, Edward C Colver, Gerald E DeMauro, and Judy Young Human Resources Center, Albertson, New York 11507 1978 36 pages Evaluation of potential must be the starting point in any driver education program designed for the physically disabled The program must be adapted to the needs of each student This manual brings together assessment expertise in the areas of driver education and muscle testing It presents contributions of experts and resources in both these fields as well as the experiences of the Human Resources Center adaptive driver education program Particular attention is given to those muscle movements that are most directly involved in driving

The evaluation process, which is described here is divided into two main areas functional and in-car Both are concerned with strength, range of motion, coordination, reach, and speed and reaction time of those muscles involved in driving The functional test is an in-depth evaluation of the general performance of the muscles while the in-car evaluation assesses muscle performance specific to driving The use of these tests provides the basis for determining whether the disabled individual can drive and for recommending assistive devices

Going Places in Your Own Vehicle Betty Garee, editor Accent Special Publications, P O Box 790, Bloomington, Illinois 61701 1982 65 pages \$7.15

Guide for Physicians in Determining Fitness to Drive a Motor Vehicle, revised 1981 The Canadian Medical Association, 1867 Alta Vista Drive, Ottawa, Ontario, CANADA K1G 0G8

Hand Controls and Assistive Devices for the Physically Disabled Driver Menahem Less et al Human Resources Center Albertson, NY 11507 1981 52 p This manual includes a practical evaluation of functional disabilities, a summary of hand controls, assistive devices and modified vans, and a guide to the use of hand controls and assistive devices

The Handicapped Driver's Mobility Guide, 3rd edition Traffic Engineering and Safety Department American Automobile Association, Falls Church, VA 22047 1981 75 pp Contact your local AAA club regarding the availability of this publication Information on equipment, selection, training, and a national license plate - blue curb law survey Contains a 54 page state by state annotated list of organizations providing services such as driver training, evaluation, van modification

A Manual on the Driver Training Programme for the Physically Handicapped Glenrose Hospital, 10230 11th Avenue, Edmonton, Alberta T5G 0B7 Canada

Outdoor Transport (4th edition) ER Wilshire Equipment for the Disabled Series Oxford Regional Health Authority, 2 Foredown Drive, Postslade, Brighton, BN4 2BB, ENGLAND Lists and describes, with photographs, transportation and outdoor accessibility equipment for disabled persons Covers categories such as children's mobility aids, outdoor wheelchairs, cars, and car accessories, van conversions, harnesses, garages and ramps Includes reference and resource lists  
Physician's Guide for Determining Driver Limitation American Medical Association, 535 N Dearborn, Chicago, IL 60610

Perceptual Cognitive Skills and Driving Effect of Brain Damage, University of Michigan, Rehab Engineering Center, Highway Safety Research Institute, Ann Arbor, Michigan 48109 January 1980

"Physically Disabled Driver" Rehab Brief, Volume III, No 9, June 25, 1980 National Institute of Handicapped Research, Office of Special Education and Rehabilitative Services, Department of Education, Washington, DC 20201

Preliminary Testing of Techniques to Improve Driving Performance of Persons with Brain Damage via Perceptual/Cognitive Training Sivak, Hill, Olsen, Henson University of Michigan, Rehab Engineering Center, Highway Safety Research Institute, Ann Arbor Michigan 48109

Teaching Driver Education to the Disabled  
Teaching Driver Education to the Hearing Impaired

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## MOBILITY DEVICES

Memphis City School, 2687 Avery, Memphis, TN 38112

Teaching Driver Education to the Physically Disabled Menahem Less et al Human Resources Center, Albertson, NY 11507 1978 64 pages \$5.00 The driver education instructor will find in this manual the information necessary to provide an efficient driver training program for physically disabled students. The adapted teaching methodology presented here provides detailed information on special driving techniques for the disabled, including the use of driving aids in training, functions of hand controls and assistive devices, transfer methods, use of simulators, use of vans, and preparation for the road test.

Teaching the Handicapped to Drive - Resource Manual Marvin Mills, principal author, editor Murray State University Printing Services, Murray, Kentucky 1980

Teacher's Preparation Course in Driver Education for the Physically Disabled - A Sample Course Edward Colverd, et al Human Resources Center, Albertson, New York 1978 40 pp \$4.25 This is a course outline for teaching driver educators the art of teaching adapted driver education. It presents lesson plans to provide guidelines and suggests a general sequence of progress for the knowledgeable instructor.

The manual also includes listings of available training films, manufacturers of hand and foot controls and assistive devices, companies that specialize in van modifications, as well as a bibliography, a sample final examination, and a course evaluation form.

### SELECTED ARTICLES

Andrews, Paul, Erickson, John, Vision Beyond Compare, Paraplegic News-November 1979

Bardach, Joan, Ph.D., Psychological Factors in the Handicapped Driver Archives of Phys Med & Rehab Vol 52 July 1971

Clack, T.D., Olsen, D.J., The Hearing Handicapped in Automobile Operations, Kresge Hearing Institute, University of Michigan Medical School, Ann Arbor, Michigan 48109

Gurgold, Gary, Harden, David, Assessing the Driving Potential of the Handicapped American Journal of Occupational Therapy - January 1978

Handicapped Drivers Education and Training American Rehabilitation, Jan/Feb 1982

Jacobs, Stanley, M.D. Reporting the Handicapped Driver Archives of Phys Med & Rehab Vol 59 August 1978

Kent, Herbert, M.D., et al, A Driver Training Program for the Disabled Archives Phys Med Vol 60 June 1979

Kopsa, Rodger, M.A. McDermott, Make, Jr., Ph.D., Handicapped Driver Controls Operability - A Device

for Clinical Evaluation of Patients, Archives of Phys Med & Rehab Vol 59 May 1978

Mittiemann, Michael, M.D., Greenfield, Walter, Jr. The Handicapped Driver - An Insurer's Point of View Archives of Phys Med Aug. 1977 Vol 58

Negri, Barry, Ibson, Richard, Ph.D., Accidents Involving Handicapped Drivers Rehab Literature May - June 1979 Vol 40

Reger, S.I., et al Aid for Training and Evaluation of Handicapped Drivers Bulletin of Prosthetics Research, Fall 1981 Government Printing Office, Washington, DC 051-000-00157-5

Risk, Harold, M.S. Driving Control and Equipment for a Quadruple Amputee Patient, Archives Phys Med Vol 61 January 1980

Sivak, Michael, Ph.D., Olsen, D.J., Driving and Perceptual Cognitive Skills Behavioral Consequences of Brain Damage, Archives of Phys Med Vol 62 October 1981

Szeto, A.Y. J. and Hogan, H.A. An Evaluation Simulator for the Scott Van Proceedings of the First Southern Biomedical Engineering Conference, June 1982 LSU Medical Center, Shreveport, LA

Zider, Steven J., Gold, Marc W., Behind the Wheel Training for Individuals Labeled Moderately Retarded, 'Exceptional Children' May 1981

### NEWSLETTERS

#### ADED Newsletter

Carmello Strano, Editor  
Moss Rehabilitation Hospital  
Transportation Center  
12th Street and Tabor Road  
Philadelphia, PA 19141

Official publication of the Association of Educators for the Disabled. Published quarterly and distributed to ADED members.

#### Driver Education Digest

Virginia Anderson, Staff Editor  
P.O. Box 5038  
Southfield, MI 48037

Publication of the Chevrolet Motor Division

### AUDIOVISUALS

"On Par" 28 minute color film/video describing the Driver Education Program. Available from Coordinator, Driver Education Programme, Rehabilitation Medicine, Glenrose Hospital, 10230 111th Avenue, Edmonton, Alberta T5G 0B7, Canada

"Driver Education for the Handicapped" Available from Memphis City Schools 2687 Avery, Memphis, Tennessee 38112

"Special Equipment for Handicapped Drivers", 21 minutes "Vehicle Selection for the Disabled Driver" Available from Supervisor of Physical Education, Health and Safety, Des Moines Public Schools, 1800 Grand Ave., Des Moines, IA 50307

"Right of Way" 25 minutes Available from Margaret Young, O.C.C.C., Toronto, Canada, also Canadian Filmmakers Distribution Centre, 144 Front Street W, Toronto, Ontario M5J 2L7, (416) 593 1808 (rental or purchase), and COE Film Associates, 65 E 96th Street, New York, NY 10028, (212) 831-5355

"Physically Disabled Drivers": Part I "Assistive Devices" (28 30 minutes, 3/4" video), Part II "Applicants" (30 15 minutes) Available from Mr Michael Bloom, A/V Department, New York University Medical Center, 550 1st Avenue, New York, NY 10016, (212) 340-5449, and Mr Bernie Macklin, Sales Department, Movielab Incorp., 619 W 54th Street, New York, NY 10019 Training films produced for New York State Motor Vehicle License Inspectors, by NYU Medical Center

## RESEARCH

NIHR-funded research in this area is being done by

Louisiana Tech University  
PO Box 10348  
Ruston, LA 71272  
318/257-4562  
Duane F Bruley, Ph.D., director  
Core area Transportation of the handicapped -- personal licensed vehicles

The Emergency Reaction Driver Training Program (ERD), taught at Liberty Mutual Research Center in Hopkinton, Massachusetts, has trained licensed drivers in improvement of skills necessary to handle typical highway emergency situations for a number of years. The center conducted a pilot program to investigate the feasibility of improving, through instruction and practice, the capability of physically handicapped licensed drivers to handle emergency driving situations. The center offered 2-day classes in 1982. Eleven physically disabled drivers took part in the pilot program and each driver felt he benefited from the training and recommended that ERD training be included as part of rehabilitation training.

For organizations that provide driver evaluation and training, see The Handicapped Driver's Mobility Guide or contact ADED

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## CONTROL

### INTRODUCTION

"Access to the present day world of technological aids to mobility, communication, environmental control and computer use for people with physical limitations is frequently dependent upon a rather commonplace device, the switch. One or more switches are used to create controls. A control is defined as 'a mechanism used to regulate or guide the operations of a machine, apparatus, or system,' and, more philosophically, as 'power or authority to guide or manage' (Webster's New Collegiate Dictionary, 1973) 'The most wondrous device or the simplest toy will be useless or underused if the user cannot make it work'"

from the introduction to A Guide to Controls Selection, Mounting, Applications

A Guide to Controls Selection, Mounting, Application has been compiled to help users select and locate the most useful switches and controls for operating assistive devices. Included in the guide are illustrations and descriptions of the most frequently used commercially available controls, information on matching controls to devices and users; examples of methods used to effectively mount and stabilize controls, and applications of systems with controls in use.

The resource section refers users to manufacturers, research organizations, service/assessment centers and selection publications concerning controls, and directs users to information on controls not included in the guide. References are included on communication aids, using devices in the classroom, microcomputer applications, funding sources and do-it-yourself projects.

Rehabilitation Engineering Center, Children's Hospital at Stanford, December 1982. Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814, 301/657-4142 \$15.00

### Selecting a Control

People use controls such as steering wheels, knobs, levers, pushbuttons and toggle switches to interact with systems. Controls usually enable a user to make a change in the system, and are often used with displays. A system is a machine designed to carry out a purpose, such as communicating with a telephone and/or speech synthesizer, getting around in an automobile and/or wheelchair, or controlling the environment by turning on lights and opening doors.

The controls which a person is able to use must be determined before making decisions regarding the selection of assistive devices. A systematic approach can be used to select an appropriate control that can be used by an individual to interact with a device. There are three major steps in selecting a control: (1) control site selection, (2) control selection and (3) comparative testing of the control site/control combination.

The chart on the next page summarizes control approaches.

### Service Centers

For a list of agencies that can provide assessment and other services in the area of communication and control, see the list in the Communication section.

CONTROLLER CHARACTERISTICS

The following table summarizes what might be expected for various controller approaches. All but the last two entries are for proportional controllers. Any controller type can be implemented as a four switch solution, but one should expect a reduction in rate of maneuverability.

Type	Control Scheme	Potential Effectiveness of Control	Special Requirements	Major Advantages	Major Disadvantages
CHIN (normal joystick)	push in corresponding directions	good, proportional	large range of motion of head needed	can be attached to wheelchair main frame	large and bulky, range of motion, appearance, interferes with face oriented tasks
CHIN (short throw)	push in corresponding directions	good, proportional	worn as collar which should be fitted	requires very small range of motion, not tiring	cosmetics, might interfere with face oriented tasks
HEAD REST CONTROL	see opposite page	good, proportional	control for reverse is not continuous (extra switch)	good appearance slight interference with face oriented moves	during control phases the head rest is not a resting place
JOYSTICK	push in corresponding directions	good, proportional	"functional" hand or arm	good appearance	requires some remaining arm/hand function
ARM/ ELBOW	arm for /back = velocity, elbow in/out = turn	fair to good, proportional	reasonably strong movements needed	good appearance	arm movements must be able to resist jerk and other inertial inputs
HEAD CONTROL	push in corresponding direction	fair to good, proportional	must maintain head position		inertially induced movements of head can interfere
SHOULDER POSITION	elev./depress = velocity, protract/retract = turn	good, proportional	adhesive or harness for attachment to chest and shoulder	worn under clothing, little interference, extremely cosmetic	may involve extensive training requirements, allergic reaction to adhesives, mounting requirements.
FOOT/ LEG/ KNEE/	many possible configurations	fair to good, proportional	accommodation of entrance and exit from wheelchair	in CP, may be wheels available	potential interference whenever leg hits anything
PNEUMATIC (puff/sip)	hard puff/sip = for /back time = speed soft puff/sip = turn rates	slow to med maneuvering, good straight-aways	good breathing capabilities	good appearance - may be among the few possible solutions	does not provide continuous proportional control, saline
SWITCH SOLUTIONS	e 1 sw = forw e 2 sw = right e 3 sw = back e 4 sw = left	slow and hard to maneuver, awkward on straight-aways	can be least demanding solution for the operator	most tolerant to severe spasticity	difficult to maneuver



## GUIDELINES FOR SWITCHES

"Switch Rules and Considerations for Communicator Use" in Communication Outlook, Volume 5, No 3, Winter 1984, page 7, was written by William F Tracy and Debra Bevans, of the Department of Psychology, Clover Bottom Developmental Center, 275 Stewarts Ferry Pike, Nashville, Tennessee 37214

This article is applicable for people putting switches on devices for severely motor impaired persons. Besides listing the 10 factors (see below) which should be considered, they also explain some safety procedures to be followed

- 1) Any switch must be safe for the user
- 2) The switch must be operated with a minimum of user effort and maximum user comfort
- 3) The switch must be reliable
- 4) Switches must be minimally noticeable and, if possible, cosmetically pleasing
- 5) If possible, the switch should move with the user, who must be able to activate the switch without the need to "find" it
- 6) Switches must permit disassembly for cleaning and maintenance
- 7) Switches should use standard components which are readily available and replaceable whenever possible
- 8) The switch should be the simplest to serve its purpose -- do not overdesign
- 9) The switch must be sturdy
- 10) All switches should be duplicable and duplicated

## SOME GUIDELINES FOR GOOD INTERFACES

These guidelines for mass market products appeared in the April 1980 issue of High Technology magazine. They can and perhaps should be used by people working with technology for special needs, too. (Editor)

- 1 The device should provide what the user wants, needs, and expects. If it requires the user to adapt (and every product will do this to some extent), the initial changes should be as small as possible and in a direction that the user will perceive in advance as positive
- 2 The user -- not the product -- should be in command. Users should never feel that the product is arbitrarily dictating how they must interact with it, but should feel that the product is adapting to their individual requirements
- 3 The user should feel confident in the product -- its usefulness and reliability -- right from the start. The new user should view the product as friendly and helpful, and a sophisticated user should be able to operate it without unnecessary constraint. As the user progresses, he should be able to speed up his interaction, increasingly viewing the device as an extension of himself
- 4 The product should provide unambiguous feedback to the user. Alternatives should be clearly spelled out and easy to execute
- 5 Ideally, the product should require no instruction manual. The user should feel that he and the product are a self-sufficient whole. If some guidance must be provided, the simpler the better

## INTERNATIONAL STANDARDIZED INTERCONNECTION PROJECT

There has been a very rapid increase in electronic communication and control aids for individuals having severe and multiple physical disabilities within the last few years. A large variety of different aids, interfaces, and accessories has been developed to meet the very diverse needs and capabilities of the different disabled individuals. As might be expected, nearly every researcher and manufacturer chose a slightly different connector, pin-out, voltage convention or format for their aids, interfaces, and accessories. The restrictions brought on by incompatibility of different systems has created severe (and unnecessary) problems. The end result can be that the handicapped individual is fitted with an aid, interface, and accessories which do not adequately meet his/her needs.

A group of manufacturers, clinicians and researchers are working on the development of a set of proposed compatibility standards for electrical communication aid devices for conversation, writing, and computer access. Developing a common format will allow easier identification of interfaces, aids, and accessories which can work together, and will ensure that such aids can, in fact, be connected. This objectives of the project are

- 1) to develop common technical formats/ for aids and interfaces. This includes factors related to voltage, writing, etc.
- 2) the designation of an agreed-upon common connector/s
- 3) to develop of a simple, straightforward naming or labeling format which will enable non-technical people to mix and match aids, interfaces, and accessories which are electronically and mechanically compatible to meet the needs of the handicapped individual

In trying to develop a single standard, the group found that one standard would be insufficient. It was determined that compatibility for communication aid interconnections would be facilitated by the development of separate compatibility standards for functionally distinct situations. This makes each separate standard simpler and easier to implement, and will make it easier to get the necessary consensus. They are currently working on the following compatibility standards proposals.

#### Simple Electrical Transducer Compatibility Standard (SET)

The SET Compatibility Standard is meant to cover the connection between simple electrical transducers (switches, potentiometers, and rheostats) and communication aids. More sophisticated transducers such as EMG transducers can be used with the SET Compatibility Standard if they emulate one of the simple transducers.

#### SET Serial Conversion Compatibility Standard (SETSC)

The SETSC Compatibility Standard proposal allows information from switches and puts to be trans-

mitted on a single RS-232C serial channel simultaneously. This standard is also used for sending position information from long range light pens, and other devices that send X x Y coordinates.

#### Input Selection Array Compatibility Standard (ISA)

The ISA Compatibility Standard is meant to cover separate Input Selection Array devices that can be plugged into a communication aid or computer. These include touch panels, special keyboards (keyboards that are meant for one-at-a-time selection by location), scanning panels that can output discrete selection after interacting with the user through a simple switch, and other devices that allow the user to make a single selection at a time from a displayed array of selections.

#### Keyboard Emulator Input Compatibility Standard (KEI)

The KEI Compatibility Standard proposal is meant to cover the connection between a communication aid and the keyboard emulator, for a computer running standard software. Keyboard emulators are devices designed to accept electronic data input and to introduce that data into a computer running standard software in such a way that it is indistinguishable from data input on the keyboard. The form of the data input to the keyboard emulator is the focus of the KEI Compatibility Standard proposal (the output of the keyboard emulator will always be specific to a particular computer and therefore not standardizable).

#### Keyboard Emulator Input Morse Code Compatibility Standard (KEIMC)

The KEIMC Compatibility Standard is a superset of international Morse code. Using a three-state sequential code, it will produce the complete ASCII character set, common non-ASCII keys such as arrow keys, and the special KEI functions such as "HOLD" for emulating key combinations.

#### Subsystem Bidirectional Communication Compatibility Standard (SBC)

The SBC Compatibility Standard is meant to cover bidirectional communications between communication aid subsystems such as a portable main processor, input display, output display, printer, voice output subsystem, environmental controller, modem, and wheelchair controller.

The International Standard Interconnection Project began with funding by the National Science Foundation, and is currently being supported by the National Institute of Handicapped Research.

For more information about the current status of the project, please contact The International Communication Aids Compatibility (ICAC) Standards, c/o Trace Research and Development Center, 314 Waisman Center, 1500 Highland Avenue, Madison, WI 53706, 608/262-6966.

## SELECTED PUBLICATIONS RELATED TO CONTROLS AND ASSESSMENT

An Assistive Equipment Controller for Quadriplegics, by G Schmisser and W Seamone, The Johns Hopkins Medical Journal 145 3, 84-88, Sept 1979

A Comparative Study of Control and Display Design Principles Which Affect Efficient Use of Communication Aids by the Severely Disabled, Final Report, Rehabilitation Engineering Center, Children's Hospital at Stanford, 520 Willow Road, Palo Alto, CA 94304

"Computers Can Play A Dual Role for the Disabled," by Gregg Vanderheiden, Byte, Vol 7, No 9, Sept 1982

"Controls," by Larry Weiss, Proceedings of the 1981 Conference on Access to Technology Rehabilitation Engineering Center, Children's Hospital at Stanford, Palo Alto, CA, 1981

Enhancing the Educational Potential of Non-Oral Children Through Matching Communication Device Capabilities to Children's Needs, Final Report submitted to Department of Education for Field Initiated Research Project Colette L Coleman, PhD, Albert M Cook, PhD, and Lawrence Meyers, PhD, Grant #G0C 2261, CFDA #13,443c, 1982

"Factors Affecting Communication Rate in Non-Vocal Communication Systems," by Michael J Rosen and Cheryl Goodenough-Trepagnier, Proceedings of the Fourth Annual Rehabilitation Engineering Conference, Washington, DC Available from Rehabilitation Engineering Society of North America, 4405 East West Highway, Bethesda, MD 20814

Guide to Controls Selection, Mounting, Applications Rehabilitation Engineering Center, Children's Hospital at Stanford, 520 Willow Road, Palo Alto, CA 94304, \$10.00 prepaid

"Human-Controlled Electric Wheelchair," by J H Aylor, B W Johnson, R L Ramsey, and C T Swanson, Medical and Biological Engineering and Computer Journal, 17 6, 776-778, Nov 1979

Human Performance Engineering A Guide for Systems Designers, by Robert W Bailey Prentice-Hall, Inc, Englewood Cliffs, NJ, 1982

"Interface Control Training for Persons with Cerebral Palsy A Pilot Study," by G F Shein and M Chown, Proceedings of the Fifth Annual Rehabilitation Engineering Conference, Houston, Texas, 1982 RESNA, 4405 East West Highway, Bethesda, MD 20814

"Interfacing Computers for the Disabled," by Alan Kirschenbaum, Zohar Eilam, and Arie Melnik, Proceedings of the Fifth Annual Rehabilitation Engineering Conference, Houston, Texas, 1982

Manual on Management of the Quadriplegic Upper Extremity, by M H Malick and C M Meyer, 1978 201 pages Available from Fred Sammons, Inc, Brookfield, Illinois Includes a section on environmental control systems, wheelchair control systems and criteria for selection of orthoses,

controls and power sources

"Microprocessor-Based Assessment of Controller Interfaces for Disabled Users," by C Basacchi, S Naumann, PhD, and M Milner, PhD, Proceedings of the Fourth Annual Rehabilitation Engineering Conferences, Washington, DC, 1981

"Model for a Computer-Based Procedure to Prescribe an Optimal Keyboard," by Cheryl Goodenough-Trepagnier, and Cheryl and Michael J Rosen, Proceedings of the Fourth Annual Rehabilitation Engineering Conference, Washington, DC, 1981

Proceedings of the Second International Conference Non-Speech Communication November 15-17, Ontario Institute for Studies in Education Toronto, Ontario, Canada, 1982

Proceedings of the Seminar on Electronic Controls for the Severely Disabled Vancouver British Columbia, Canada, 1974 Available from Kinsmen Rehabilitation Foundation, 2256 W 12th Ave, Vancouver, British Columbia, V6K 2N5, Canada

"Specification of Interfaces for Communication Aids" by Nigel Ring, Proceeding of Workshop on Communication Aids Canadian Medical and Biological Engineering Society, c/o National Research Council, Ottawa, Ontario 10, Canada, KIA OR8, June, 1977

"A Single Switch Control for Wheelchairs and Other Equipment," by Nelson D Durie, Med Progr Technol, 6 15-18, 1978

"Sensors, Controls and Man-Machine Interface for Advanced Teleoperation," by Antal K Bejczy Science 208 4450, 1327-135, June 20 1980

"A Study of Neuromotor Control in Athetoid Children," by E Paul Goldenberg, Proceedings of the Fourth Annual Rehabilitation Engineering Conference, Washington, DC, 1981

"A Systematic Approach to Choosing Interfaces for Assistive Devices," by A M Cook and M R Barker, Final Report submitted to Department of Education for Field Initiated Research Project, Grant #G007902261

"A Systematic Approach to Evaluating Physical Ability for Control of Assistive Devices," by Margaret R Barker and Albert M Cook, PhD, Proceedings of the Fourth Annual Rehabilitation Engineering Conference, Washington, DC, 1981

"Towards Standardization of Communication and Control Systems for Motor Impaired People," by I Mousso, P M Penso, G P Suetta, and V Tamasco, Medical & Biological Engineering & Computing, 17 481-488, 1979



**SOME MANUFACTURERS AND DISTRIBUTORS OF CONTROLS**

**Abbey Medical**  
 Catalog Sales  
 13782 Crenshaw Blvd  
 Gardena, CA 90249  
 (800) 421-5126 - national  
 (800) 262-1294 - California  
 Distributes some controls for communication aids, environmental control and mobility systems. Durable medical goods, therapy equipment

**Allied Business Machines**  
 9281 Earl Street  
 La Mesa, CA 92041  
 (714) 461-6361  
 Distributes control switches and telephone devices

**Arizona State Division of Developmental Disabilities**  
 Adaptive Aids Program  
 P O Box 13178  
 Tucson, AZ 85732  
 (602) 745-5588  
 Has available therapist-developed, client-manufactured switches and systems for cognition and motor training, communication and environmental control

**Basic Telecommunications Corporation**  
 4414 E Harmony Road  
 Ft Collins, CO 80525  
 (303) 226-4688  
 Designs, manufactures and/or distributes technical aids, with emphasis on environmental control, telephone and telecommunications, bed control, and switch interface equipment. Will do private label manufacturing

**BSR**  
 Route 303  
 Blauvelt, NY 10913  
 (914) 358-6060  
 Manufacture control switches for use with their environmental control systems

**Linda L Burkhart**  
 8315 Potomac Avenue  
 College Park, MD 20740  
 Designs and manufactures switches and adaptations for control of toys, provides how-to books for toy adaptation

**Computers for the Physically Handicapped**  
 7602 Talbert Ave, Unit 4  
 Huntington Beach, CA 92647  
 (714) 848-1122  
 Design, manufacture, and distribute controls for access to computers, environmental control, and communication systems

**Contemporary Artistic Tech**  
 Station L  
 P O. Box 58430  
 Vancouver, BC V6P 6K2 Canada  
 (604) 324-8119  
 Distribute controls, switches, expanded keyboard systems, communication systems, elec-

tronic reading and speech synthesizer systems

**Dickey Engineering**  
 3 Angel Road  
 North Reading, MA 01864  
 (617) 664-2010  
 Design, manufacture and distribute control switches for use with call systems, environmental control, and page turning systems

**Dufco**  
 901 Iva Court  
 Cambria, CA 93428  
 (805) 927-4392  
 Design and manufacture communication aids, wheelchair control systems, Borg Warner System80 teaching system interfaces

**Du-It Control Systems Group, Inc**  
 8765 Township Road 513  
 Shreve, OH 44676-9421  
 (216) 567-2906  
 Designs and distributes wheelchair control systems for the severely disabled, including same-switch access to environmental control, typing and computer

**EKEG Electronics Co. Ltd**  
 P O Box 46199  
 Station 'G'  
 Vancouver, B C, Canada  
 Distribute expanded keyboard control switches' lever

**FashionABLE**  
 15 Crescent Avenue  
 Rocky Hill, NJ 08553  
 (609) 921-2563  
 Distribute devices and gadgets, some of which are controls, addressed to the rehabilitation area

**General Teleoperators, Inc**  
 15118 Downey Ave  
 Paramount, CA 90723  
 (213) 634-6531  
 Distribute switches (body contact, tongue, lever, remote control, pneumatic) for use with their environmental control systems

**Hammacher Schlemmer**  
 147 East 57th Street  
 New York, NY 10012  
 Distribute remote control on/off for appliance control, other devices and gadgets targeted to the general consumer

**Hammatt and Sons**  
 1721 South 2nd Street  
 Mt Vernon, WA 98273-5299  
 Distribute gadgets and devices of general and consumer interest, some of which are of interest to the rehabilitation market (i.e., small headset microphone)

Neil Henson Company  
P O Box 132  
Jackson, MO 63755

Distribute general consumer devices and gadgets, some of which are of interest to the rehabilitation area, e.g. appliance on/off controls).

KY Enterprises  
3039 East Second Street  
Long Beach, CA 90803  
(213) 433-5244

Design and manufacture controls for Atari electronic games systems

Linemaster Switch Corporation  
Woodstock, CT 06281  
(203) 974-1000

Distribute general market control switches, many of which are of interest to the rehabilitation area

MED, Inc  
1701 South First Avenue  
Maywood, IL 60513  
(312) 681-2828

Design and/or distribute, through affiliated vendors, durable medical goods, therapy equipment, self-help devices, and technical aids, including wheelchair and environmental control systems

Ontario Crippled Children's Centre  
350 Rumsey Road  
Toronto, Ontario M4G 1K8 Canada  
(416) 425-6220

Design, manufacture and distribute various aids to the disabled, including switches for wheelchair control and Blissymbol communication boards

Phonic Ear/Phonic Mirror, Inc  
250 Camino Alto  
Mill Valley, CA 94941  
(415) 383-4000

Design and manufacture augmentative and training aids for the hearing impaired and communication impaired. Distribute switches

Possum, Inc (USA)  
c/o International Hospital Products  
82 Birch Avenue  
Little Silver, NJ 07739  
(201) 842-1246

Develop and distribute technical aids to the disabled, including typing systems (with or without word processing capability), environmental control systems, and teaching machines

Prentke Romich Company  
8769 Township Road 513  
Shreve, OH 44676-9421  
(216) 567-2907

Design, manufacture and/or distribute switches and technical aids for communication, environmental control, computer access

Pres Air Trol Corp  
895 Mamaroneck Avenue  
Mamaroneck, NY 10543  
(914) 698-9332

Distribute switches: pneumatic, pendant, soft button, push button, handle grip, foot pedal, remote control

Quadra Productions, Inc  
13 East 37th Street  
New York, NY 10003  
(212) 673-7810

Design, manufacture and distribute control switches for use with their emergency call systems

R/M Systems, Inc  
22903 Fern Avenue  
Torrance, CA 90505  
(213) 534-1880

Design, manufacture and distribute control switches and computer access systems

SciTronics, Inc  
523 S Clewell Street  
Bethlehem, PA 18015  
(215) 868-7220

Distribute encoding control switches for their communication and environmental control systems

Simon Associates  
1019 Trillium Lane  
Mill Valley, CA 94941  
(415) 381-0835

Distribute Audiolite, a sound-activated light switch

Tapeswitch of America  
100 Schmitt Blvd  
Farmingdale, NY 11735  
(516) 694-6312

Distribute tape and leaf switches for touch or foot control

TASH, Inc  
c/o Sunnybrook Medical Centre  
2075 Bayview Avenue  
Toronto, Ontario, M4N 3M5, Canada  
(416) 486-3568

Develop and distribute switches and systems (either simple or sophisticated) for communication, typing, and computer access

Technical Aids to Independence, Inc  
17 Hille Road  
Bloomfield, NJ 07003  
(201) 388-8826

Distribute remote control, pneumatic, touch and cushion systems for use with their telephone and environmental control systems

Tellagraphics  
401-DN Interurban St  
Richardson, TX 75080  
(214) 238-9297

Distribute foot, lever and position control switches, for use with their communication systems and adapted toys

## CONTROL, COMMUNICATION AND SENSORY AIDS

Trujillo Industries  
5040 Firestone Boulevard  
South Gate CA 90280  
(213) 564-7943

Distribute body contact switches. Also,  
devices and systems related to mobility aids  
and vehicles

Universal Controls Corp  
10829 Wilshire Blvd  
Los Angeles, CA 90024  
(213) 208-4509

Distribute control switches, remote controls  
for appliances

Zygo Industries, Inc  
P O Box 1008  
Portland, OR 97207-1008  
(503) 297-1724

Design and/or distribute switches and systems  
for wheelchair control, communication, com-  
puter access, and toys. Also modify, for the  
use of the disabled, devices designed for the  
general consumer market

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## ALTERNATIVES TO PURCHASING SPECIAL CONTROLS: DO-IT-YOURSELF

There are alternatives to purchasing special controls. Be creative in shopping! Look for regular mass market products, especially electronic games and convenience appliances.

You can also make adapted controls. These publications have instructions for do-it-yourself projects. Most of them assume that you will not have much previous experience with control fabrication.

Guidelines for Adapting Battery Operated Toys, revised 1982, by Jayne Higgins. California Avenue School, Jayne Higgins, Speech Pathologist, 214 W California Avenue, Vista, CA 92083. \$3.00. This 25-page booklet includes procedures and materials for making a pillow switch, touch panel switch, and on-off switch. Toy to in-line jack procedures are also given which permits easy and immediate interchange of information on common pitfalls and problems. Information on where to obtain materials and toys through nation wide stores is included (i.e. Sears catalog, Radio Shack catalog). All switches are relatively inexpensive to make (\$2.00-\$5.00).

Helping the Handicapped: A Guide to Aids Developed by the Telephone Pioneers of America. Call the Telephone Company Headquarters in your city and ask for the local chapter of the Telephone Pioneers of America. Though many of the devices are for the communication impaired, there are sections on mobility aids, ADL equipment, and toys.

Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children, second edition, by Linda Burkhart, 8315 Potomac Avenue, College Park, MD 20740, 1982. 50 pages. \$5.00 plus \$1.00 postage and handling. This book gives simple directions for constructing toys and switches that can be easily operated by severely and profoundly handicapped children. No special skills are needed to make them. All supplies can be found around the house or purchased inexpensively at local stores. One example is a head control switch. The materials cost about \$2.50 and takes about half an hour to construct. The switch is attached to the child's head with a barrette and plugged into a toy or tape recorder. When the child lifts his or her head, the music or toy turns on, thus giving the child a reason to lift their head.

"Instructions for Constructing a Large Area Flip Switch (LAFS) to Allow Disabled Children to Control Battery Operated Toys," by G. Fraser Shein. Biofeedback Research Project, Rehabilitation Engineering Department, Ontario Crippled Children's Centre, 350 Ramsey Road, Toronto, Ontario M4G 1R8, Canada, November, 1980.

More Homemade Battery Devices for Severely Handicapped Children with Suggested Activities, by Linda Burkhart, 8315 Potomac Avenue, College Park, MD 20740, 1982. \$12.50. Continuation of the first book. Includes a section on suggested activities for incorporating these devices into the child's program.

Making Aids for Disabled Living, by Stuart Grainger. Accent Special Publications, Box 700, Bloomington, IL, 1981. 88 pages.

Rehabilitation Engineering Sourcebook. Institute for Information Studies, 200 Little Falls Street, Suite 104, Falls Church, VA 22046, 1979.

Telephone Accessories You Can Build by Jules H. Gilder. Hayden Book Company, Inc., Rochelle Park, NY, 1976. 84 pages. \$6.50.

"Therapeutic Devices 1956-1976," by J. Bellman, et al, American Journal of Occupational Therapy. American Occupational Therapy Association, Inc., 6000 Executive Blvd., Rockville, MD 20852, 1977. 112 pages. Do-it-yourself instructions for devices which have appeared in AJOT, includes wheelchair trays, ADL devices, communication aids, etc.

Toy Adaptation, by Chris Wethered. Canadian Association of Toy Libraries, 60n Quebec Avenue, Suite 1207, Toronto, Ontario M6P 4B4, Canada, June 1979. 14 pages. Basic information needed to adapt battery-operated toys for activation by disabled children.

Toy Modification Note: Build it Yourself Battery Interrupter, by Gregg Vanderhaiden. TRACE Center, University of Wisconsin, Madison, WI. 13 pages.

Wobble Switch Toy Control Switch: A Do-It-Yourself Guide, by Ben Brown. TRACE Center, University of Wisconsin, Madison, WI, 1980. 3 pages.

Local Radio Shack Stores are convenient places to buy electrical supplies. Electronics stores also sell these parts, they are listed in the yellow pages under "Electronic Equipment and Supplies."

**RESEARCH AND DEVELOPMENT ORGANIZATIONS**

The following organizations are currently doing research in the area of control

**Artificial Language Laboratory**  
Department of Computer Science  
Michigan State University  
East Lansing, MI 48824  
(517) 353-6622  
Contact John Eulenberg

**Assistive Device Center**  
California State University, Sacramento  
6000 "J" Street  
Sacramento, CA 95814  
(916) 454-5422

**Cerebral Palsy Research Foundation**  
of Kansas, Inc  
Rehabilitation Engineering Center  
P O Box 8217  
2021 N Old Manor  
Wichita, KS 67208  
(316) 688-1881

**Children's Hospital at Stanford**  
Rehabilitation Engineering Center  
520 Willow Road  
Palo Alto, CA 94304  
(415) 327-4800, ext 345

**Children's Hospital Medical Center**  
Rehabilitation Engineering Center  
300 Longwood Avenue  
Boston, MA 02115  
(617) 735-6594

**Institute of Rehabilitation Medicine**  
Rehabilitation Engineering Center  
New York University Medical Center  
400 East 34th Street  
New York, NY 10016  
(212) 340-6042  
Contact Myron Yodanis

**Massachusetts Institute of Technology**  
Rehabilitation Engineering Center  
Building 31, Room 63  
Cambridge, MA 02139  
(617) 253-5333  
Contact Michael Rosen

**Moss Rehabilitation Hospital**  
Rehabilitation Engineering Center  
12th Street and Tabor Road  
Philadelphia, PA 19141  
(215) 329-5715  
Contact: Serge Minassian

**Northwestern University**  
Rehabilitation Engineering Center  
345 East Superior St., Room 1441  
Chicago, IL 60611  
(312) 649-8560  
Contact: Dudley Childress

**Ontario Crippled Children Centre**  
Rehabilitation Engineering Dept  
350 Rumsey Road  
Toronto, Ontario MTG 1R8  
Canada  
(416) 425-6220

**Palo Alto Veterans Administration**  
Medical Center  
Rehabilitation Engineering R&D Service  
3801 Miranda, Bldg 51  
Palo Alto, CA 94304  
(415) 493-5000  
Contact David Jaffe

**The Trace Center**  
University of Wisconsin  
1500 Highland Avenue  
314 Waisman Center  
Madison, WI 53706  
(608) 262-6996

**Tufts New England Medical Center**  
Rehabilitation Engineering Center  
171 Harrison Avenue  
P O Box 1014  
Boston, MA 02111  
(617) 956-5625

**University of Tennessee**  
Rehabilitation Engineering Center  
682 Court Avenue  
Memphis, TN 38163  
(901) 528-6445

**University of Virginia**  
Rehabilitation Engineering Center  
P O Box 3363, University Station  
Charlottesville, VA 22903  
(804) 977-6730

The following commercial manufacturers are also doing focused research in the area of control. They can also develop or adapt special one-of-a-kind controls

**Du-It Control Systems Group, Inc**  
8769 Township Road 513  
Shreve, OH 44676  
(216) 597-2906

**Prentke Romich Company**  
8769 Twp Road 13  
Shreve, OH 44676  
(216) 567-2906

**Zygo Industries, Inc**  
P O Box 1008  
Portland, OR 97207  
(503) 297-1724

## COMMUNICATION

This response to a commonly asked question was written by the Trace Center, although focused on a child, it is also relevant for adults who need communication assistance. It is particularly interesting for its inclusion of WRITING as a communication technique, an area is far too frequently overlooked. (editor)

**Q: I HAVE A SEVERELY PHYSICALLY HANDICAPPED SON/DAUGHTER, WHAT KIND OF COMMUNICATION TECHNIQUES ARE AVAILABLE?**

"In answering this question, you should be aware that there are two basic areas with which your child may need help: 1) Conversation/interaction, and 2) Writing.

Communication

"The communication need that we think of first is conversation/interaction. A basic problem is that many individuals are not able to use speech for communication and interaction. As a result, we need to look toward some augmentative or supplemental technique to help him/her with communication. In some cases, they may not be able to speak, but may be able to communicate regarding some topics in some environments with some people at some times. However, unless the person is able to communicate and be understood at all times, some type of supplemental technique is indicated.

"In general, an augmentative aid is necessary unless the individual can communicate about all topics with all people. The augmentative aid would not replace his/her residual speech, but would simply back it up. When the individual could speak, he/she would use that mode (or any other mode that was most efficient). When he/she was unable to communicate through his/her other means, he/she would turn to the back-up or augmentative system to communicate.

"There is a wide variety of specific techniques which can be used for communication. All of these techniques can be implemented in one form or another without the use of electronic aids. Pointing to words or symbols on a communication board is one example. There are also techniques which can be used by an individual who is so severely involved that he/she is barely able to move an eye in one direction, and has no other volitional body movements at all. These techniques, all of which can be implemented without any technology, can provide even the most severely physically involved individual with a mechanism for communicating. For individuals who can spell, the techniques can allow the individual to spell out exact messages, to write letters, etc. These unaided techniques, however, require the presence of a second person to interpret signals.

"Communication aids are also available. These aids are essentially automated versions of the fundamental (non-technical) techniques described above. The primary advantage of aids is that they allow the individual to be able to assemble messages independently. While not as essential for

conversation and interaction (since a second person is there by definition in conversation), these aids can be very important for providing the individual with a means of doing independent work and writing.

Writing

"The second area of need is writing. Essential to any educational process is the ability to write and do independent work, take notes, do homework, and complete assignments. We would not think of sending a normal individual to school without pencil and paper, nor would we allow him/her to go to school without doing the homework and assignments. It would be very difficult if not impossible for him/her to receive a full and adequate education. For those individuals who have the ability to recognize words and learn to spell, some type of writing system will be needed.

"When choosing a communication aid, it should be remembered that the need for aids stems from their ability to be used independently. The primary need for this independence is in messaging and writing. For conversation, the fundamental and unaided techniques are usually faster and more flexible. When looking at independent aids, the writing needs must be considered very carefully, and should weigh heavily in the selection process.

Rate

"A key factor that you will want to look for with conversation or writing systems is the rate of communication. The various techniques (whether aided or unaided) each require different abilities from the handicapped user, and have different efficiencies or speed factors. Some techniques can be used by only a small portion of the handicapped population, but are faster. Other techniques can be used by anyone but are generally slow (for example, scanning techniques). Thus the problem is not finding a technique which an individual can use, but rather finding the technique which will allow a given individual to communicate most rapidly. It is not uncommon for different techniques to vary in their communication rates by a factor as great as ten to one. Thus, what would take a minute to communicate using one aid might take ten minutes on another, and what would take five minutes on one aid might take almost an hour on another. Since there are many specific techniques and aids as well as variations on their application, it is not a simple task to find the best aid for a given individual. For this reason, it is usually best to involve someone with special training and an in-depth knowledge of all of the various techniques and approaches, especially the newer ones, when making a selection for a more expensive aid.

"This problem is compounded by the fact that there are many therapy and training techniques which can greatly enhance the physical abilities which a given child (or adult) is able to exhibit. Someone familiar with and trained in these specific strategies may well be able to interface a child

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to a much faster aid than a person less familiar with these strategies. Because the field is so new, there is a severe shortage of these specially trained individuals at the present time. Efforts are being made to document these specific strategies and to make them available to individuals through special training materials and programs.

### Information Sources

"In the meantime, you may want to invest some time learning about the various techniques and approaches yourself. This will assist you in your interactions with professional teams. The first recommendation is that you subscribe to Communication Outlook. This very application-oriented newsletter gives you a window on all of the latest developments in this field. This includes information on new aids as well as new books and publications which come out in this area. In addition to subscribing to the newsletter, you may want to also get copies of the back issues, since there are many things which have already occurred about which you may want to be aware, but which would otherwise be very difficult to find.

"For general introduction information on the various techniques, you might look at Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped, by Vanderheiden and Grilley, and/or several chapters in Non-Speech Language Intervention Strategies by Richard Schiefelbusch. Both of these books contain overviews of the basic approaches as well as specific information on symbol systems and the design of fundamental communication boards. For a listing of all of the existing commercially available aids, the most comprehensive source available is the Non-Vocal Communication Resource Book. This is a three-ring binder which contains a two-page description, including photograph, of each of the aids which is available in this area. There is also an Update Subscription Service for the book, which prepares and sends out new entries so that you can be apprised of all of the latest developments. (Also see The Comparative Chart of Commercially Available Communication Aids, available from Prentke Romich Company, 8769 Township Road 513, Shreve OH 44676.)"

### **PUBLICATIONS RELATED TO COMMUNICATION AVAILABLE FROM THE TRACE CENTER**

#### 1983 Revised Non-Vocal Communication Resource Book. G. C. Vanderheiden, L. Krause, 1983

This resource book provides a two-page description (including picture) of over 90 commercially available aids for non-vocal communication. Revised in 1983 to include all of the entries which have been added in the three sets of updates since original publication. 3-hole punched and bound in a 3-ring plastic binder. NOTE: If you have the original book AND ALL THE UPDATES, you will not want to order this book, since it does not contain additional information. Updates are made available periodically to keep the Resource Book current.

#### AUGMENTATIVE MODES OF COMMUNICATION FOR THE SEVERELY SPEECH AND MOTOR IMPAIRED. G. C.

Vanderheiden, 1979. (Prepared for Congenital Malformation - Its Clinical Management: Clinical,

Orthopedic, and Related Research) (15 pgs) A summary/overview presentation of 5 augmentative modes of communication for severely physically involved individuals. This was prepared as an introduction for individuals not familiar with the field but interested in a short overview of the issues. This paper includes SELECTING APPROPRIATE COMMUNICATION AND CONTROL AIDS: A PARALLEL PROFILE APPROACH.

Initiating Communication Systems for Severely Speech-Impaired Persons. L. Bottorf and D. DePape. Published in Topics in Language Disorders, March, 1982. (16 pgs) Describes the goals of an effective augmentative communication program facilitating interaction between nonspeaking clients and their environments. Diagnostic intervention techniques, assessment of present strategies, and standardized assessment tools are discussed.

Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped. Edited by G. C. Vanderheiden and K. Grilley. Based upon transcriptions of the 1975 Trace Center National Workshop Series on Non-Vocal Communication Techniques and Aids. Designed for clinicians and teachers, this book forms an introductory text and sourcebook summarizing information on non-vocal communication aids and techniques that have been developed and applied around the world.

The Rehabilitation Aids Resource Book: Telecommunication, Monitoring, and Environmental Control. Currently being prepared by the Trace Center, 314 Waisman Center, University of Wisconsin, 1500 Highland Avenue, Madison, WI 53705.

These publications, and a list of other Trace publications, can be obtained from the Trace Center Reprint Service, Waisman Center, 1500 Highland Avenue, Madison WI 53705, 608/262-6966.

### Writing & Typing

Aids for Handicapped Learners. Reference and Information Section, Division for the Blind and Physically Handicapped, Library of Congress, Washington DC 20542. Devices and techniques for handling books, writing, and typing. Free.

IBM's Handicapped Purchasing Program offers rebuilt, used typewriters at a low price to individuals having a letter from their doctor indicating they are disabled and would receive therapeutic benefit from a typewriter. Call your local IBM or write to IBM, 10100 Santa Monica Blvd, Suite 2100, Los Angeles, CA 90067, attn: Dave Kelley.

"Non-Conversational Communication Technology Needs of Individuals with Handicaps." G. Vanderheiden Rehabilitation World, Vol 7, No 2, Summer 1983. \$60. Six basic areas of concern are described as encompassing the full spectrum of communication needs for the severely physically handicapped person. A review of current technology available to meet address these needs, and a vision of future developments, is presented.

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**INTERNATIONAL SOCIETY FOR AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (ISAAC)**

ISAAC is a new organization (formed in May, 1983) bringing a unique focus to the field of augmentative and alternative communication. Through its publications, conferences, and scientific meetings, ISAAC will keep its members abreast of the latest developments in the field.

ISAAC is the only organization whose sole focus is the advancement of the transdisciplinary field of Augmentative and Alternative Communication techniques and aids. ISAAC will facilitate an exchange of information and focus attention upon the work being done to help people with communication difficulties throughout the world.

ISAAC's membership is international, and includes all those interested in augmentative communication: users and potential users of communication systems and devices; professionals from the field of speech pathology, education, occupational and physical therapy, social work, linguistics, engineering, computer science, medicine, psychology and others; family, friends, and community members wishing to support the communication of those using augmentative and alternative communication systems and devices. The ISAAC membership chairperson is Susan Sansons, c/o NY State Association for the Help of Retarded Children, 2900 Veterans' Memorial Highway, Bohemia, NY 11716. Contact Tamara Redburn, Secretary/Treasurer, at the Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824, for information on membership outside North America. All members of ISAAC receive a one-year subscription to Communication Outlook, which is the official ISAAC newsletter. Members will also be entitled to a special reduced subscription rate of \$10 to Communicating Together, a quarterly publication of the Blissymbolics Communication Institute (BCI).

ISAAC will produce several publications: a registry of ISAAC members and others concerned about or working in the area of augmentative and alternative communication; a quarterly journal, Augmentative and Alternative Communication, D. Yoder, editor, Williams & Wilkins, publishers (first issue January 1985); and proceedings of the bi-annual conference.

An international conference will be held every two years. The first conference will be held October 18-20, 1984, at the Massachusetts Institute of Technology in Cambridge, Massachusetts. The 1986 conference will be held in the United Kingdom. Other conferences, institutes, and workshops will be scheduled in the future. Further information will appear in future issues of Communication Outlook.

Also see Confer in **INFORMATION RESOURCES**, p. 14

**GUIDES TO COMMUNICATION AIDS**

Communication Enhancement Bibliography, compiled by Donald Rabush, Coordinator of Special Education at Western Maryland College, Lyle Lloyd, Professor and Chairman of Special Education at Purdue University, and Michael Gerdes, undergraduate Research Assistant at Purdue University, 1982. 758 entries, annotated \$10.00-\$23.00. Available in computer diskette form for the Apple II or TRS-80 Model III microcomputers. Readers of Communication Outlook can obtain bound print copies of the bibliography for \$15. Communication Outlook will publish yearly updates of the bibliography at an additional cost. Availability of these inserts will be announced in each Fall issue.

All recent papers, books, proceedings, etc., concerned with communication enhancement will be included in the updates. If you know of any publications which should be included, please send the publication or a complete citation of it to Communication Outlook.

Address all orders, additions and corrections to Communication Outlook, Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824-1042.

Comparative Chart of Commercially Available Communication Aids is presently available from Prentke Romich Company (PRC). The chart was developed by Arlene Kraat and Marsha Silver of the Augmentative Communication Program, Queens College, Flushing, NY, and funded by PRC.

The chart features communication aids currently available and distributed in the US. Aids are divided on the chart into portable and non-portable, and further into categories of scan, direct selection, and scan/direct selection. Features of the aids are classified by selection technique, language content, standard communication outputs, optional outputs available, power used, weight and size, rental possibilities and price range. Many of the devices are pictures, and all of the manufacturers' addresses are listed. A glossary of terms is included at the bottom of the chart.

Single copies of the chart are available at no cost from PRC. Multiple copies are available at a cost of \$1 each for printing, postage and handling. For further information, contact Prentke Romich Company, 8769 Township Road 513, Shreve, OH 44676.

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## SELECTED PUBLICATIONS

"In the past 10 years, there has been a virtual explosion of information and equipment available for the development of nonverbal communication systems for severely disabled individuals. The field has grown from an isolated specialty area of several disciplines into an integral multidisciplinary component of rehabilitation programs. Fortunately, several excellent texts on nonverbal system selection and implementation have been recently published -- e.g., Silverman (1980) and Musselwhite and St. Louis (1982). In addition, Communication Outlook, a publication focusing on communication aids and techniques, has become an effective vehicle for updating the rapid advance of technology in this area." James Heller, Rehab Literature, November, 1983, p. 364

## Books

Communication for the Speechless. F.H. Silverman. Englewood Cliffs, New Jersey: Prentice-Hall, 1980.

Communication Programming for the Severely Handicapped: Vocal and Non-Vocal Strategies. C.R. Musselwhite and K.W. St. Louis. College Hill, San Diego, CA, 1982.

Communication Systems for Severely Handicapped Persons. Brenda C. Fairweather, Donna H. Haun, and Louis J. Finkle. Charles C. Thomas, Springfield, IL, 102 pp, figures. 1982. "Fairweather, Haun and Finkle present a historically incomplete approach to non-verbal communication system selection. Although their description of switches is clear and relatively current, their evaluation of technical systems has already been dated by the rapid advance of technology. This text is best utilized as one of many resources for nonverbal system selection." (James H. Heller, Rehabilitation Literature, November-December 1983, Vol. 44, No. 11-12)

Directory of Telecommunication Aids for Disabled People. Prepared by Beil Canada, on behalf of the Canadian Telecommunication Carriers Assn., Ottawa, Ontario, Canada. This directory of telecommunication aids is intended to be a quick reference for people who are concerned with the telecommunications of hard-of-hearing, deaf, speech impaired, visually-impaired and motion handicapped people. An attempt has been made to compile the information which is available for various sources both in North America and abroad.

The devices are categorized by the function which they perform in relation to telecommunications, especially with reference to the telephone. Each aid is described briefly. Its manufacturer, distributor or contact is listed, and its approximate price, when available, is recorded. Research which is known to be currently underway for developing more aids related to these functions is also briefly outlined. Following this list of aids and research, some existing services relating to telecommunications for disabled people are discussed.

NonSpeech Language and Communication Analysis and

Intervention. Language Intervention Series, Volume IV. Richard Schiefelbusch, Editor. University Park Press, 233 East Redwood Street, Baltimore, MD. 529 pages. 1980. This book examines a wide range of issues relating to language and communication to find viable alternatives for children who cannot speak. It takes a broad look at communication functions and presents models and strategies for developing alternatives for impaired individuals.

Making the important point that communication without speech is better than no communication at all, the chapter authors discuss the design of other ways that will enable children to enjoy the benefits of communication, enhance cognitive development, extend social participation, and strengthen their eventual economic well-being.

For some individuals, an alternative symbol system will facilitate the attainment of far more complex and more standard forms of communication, including speech. For others, the alternative mode will provide a way into a subculture, into a learning environment, into human fellowship, or into a new world of human dignity. It offers specialists in communication a deeper understanding of symbolic processing, as well as specific reviews of research into nonspeech communication.

The book is based on invited papers given at The Nonspeech Language Conference held at Gulf Shores, Alabama, in March, 1977, and is considered by many to be a classic in the field.

See also Publications Available from the Trace Center on page 204.

## Periodicals

Communication Outlook. Artificial Language Laboratory, Computer Science Department, Michigan State University, East Lansing, MI 48824. Subscriptions \$10.00 (\$12.00 outside North America) for whole volumes (4 issues), \$3.00 for single copies. Communication Outlook is a quarterly newsletter addressed to the community of individuals interested in the application of technology to the needs of persons who experience communication handicaps due to neurological or neuromuscular conditions, edited and published jointly by the Artificial Language Laboratory, Michigan State University, and the Trace Center for the Severely Communicatively Handicapped, University of Wisconsin. It is the principal publication of the International Society for Augmentative and Alternative Communication (ISAAC).

Medical World News. The Newsmagazine of Medicine, Vol. 23, No. 13, June 21, 1982. 211 E. 43 Street, New York, NY 10017. This issue carried two articles on technology for rehabilitation, "For the Disabled New Voices, New Freedom," and "Computers May Let Two Quadriplegics Walk in This Summer's Sunshine."

**Rehabilitation World**, Summer, 1983 Available from Rehabilitation International USA, 1123 Broadway, New York, NY 10010, 212/620-4040 This issue devoted to communication aids for people with speech impairments. In this special issue, experts in a number of communication-related areas probe new technological possibilities, from key-board-operated speaking systems to simple micro-phones. Many of the articles are supplemented with photographs and other illustrations, and even some of the technically oriented advertisements may be found informative.

Articles include the following "Communication Disabilities -- An Overview," Bruce Baker, pp 3-7, "Non-Conversational Communication Technology Needs of Physically Handicapped Individuals," Gregg Vanderheiden, pp 8-13, "Impressions of Eulenberg," John F. Moses, pp 14-19, "Unspoken Barriers," Jeffrey J. Moyer, pp 20-22, "Aids to Communication A British Perspective," Robert Fawcus, pp. 23-25; "Diplomacy's End," Michael B. Williams, p. 26; "Communication for Access," Lucy C. Spruill, p. 27, "Communication Outlook," Tamara Redburn, pp. 28-31, "A Personal View," William L. Rush, pp. 32-39; "Nonspeech Communication A Position Statement, from the American Speech-Language-Hearing Association," pp 40-43, "Talking Computers Enhance Careers of Blind People," John M. Williams, pp 53-56

**Seminars in Speech and Language**, Volume 5, Number 1, February, 1984 Augmenting Language Skills with Microcomputers Laura F. Meyers, Ph.D., Guest Editor Available from Thieme-Stratton, Inc., 381 Park Avenue South, New York, NY 10016 Articles include: "Computer Enhancement of Message Formulation and Presentation for Communication Augmentation System Users," David R. Beukelman, Ph.D., and Kathryn M. Yorkston, Ph.D.; "Using Microcomputers in the Diagnosis and Treatment of Chronic Aphasic Adults," Richard C. Katz, Ph.D., "Unique Contributions of Microcomputers to Language Intervention with Handicapped Children," Laura F. Meyers, Ph.D., "An Environmental Approach to Delivery of Microprocessor-Based and Other Communication Systems," Jane Mills, MA, CCC, and Jayne Higgins, MA, "Fostering Progress in Literacy Development Technology and Social Interaction," Teresa J. Rosegrant, Ph.D., "Technology Needs of Individuals with Communication Impairments," Gregg C. Vanderheiden

#### Audiovisuals

**Breaking Through the Wall** Gordon News Film Available from HC Electronics Inc., 250 Camino Alto, Mill Valley, CA 94941. 16mm, color, 14 minutes 1979. Shows the application of the Phonic Mirror Handi-voice, a synthetic speech output communication aid for those without speech, e.g. people with severe cerebral palsy

**Finding a Voice** Martin Freeth, WGBH-Boston Available from Time-Life Video, 100 Eisenhower Drive, Paramus, NJ 07652 3/4" videocassette, color, 60 minutes. 1982 A WGBH-Boston/NDVA program about the development of electronic aids for the communications-impaired population. Concentrates on the visit of an Englishman with cerebral palsy, Dick Boydell, to the Artificial

Language Center in East Lansing, MI Under the supervision of the Center's Director, John Eulenberg, appropriate technology for Mr. Boydell and others is devices. Second prize, 1982 International Rehabilitation Film Festival in Technical Aids

**Nonspeech Communication Augmentative Systems** Videotape, color, 330 minutes 1981 Presented by Macalynne Fristoe and Lyle L. Lloyd, Purdue University Produced and distributed by Purdue University, Continuing Education Business, Rm 110 Stewart Center, Purdue University, West Lafayette, IN 47907 Presents information concerning the use of manual signs and gestures, graphic representations such as Rebus, Blissymbols, and communication prostheses, ranging from picture array to sophisticated electronic devices

**To Say I Am!** KDCE-TV, California Distributed by Lawren Productions, Inc., 12121 Pinewood Drive, PO Box 666, Mendocino, CA 95460 Severely handicapped children who are also without speech are shown using an array of electronic and mechanical communication devices which enable them to learn and "talk" with friends

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**SERVICE CENTERS**

These are some agencies that can provide assessment and other services in the area of communication and control for people with physical disabilities. No endorsements are implied by inclusion on this list. If you have information to add to, change, or delete from this list, please send it to the RESNA Sourcebook editor.

California

Assistive Device Center  
 Calif State University Sacramento  
 6000 "J" Street  
 Sacramento, CA 95819  
 (916) 454-6601  
 Contact: Colette Coleman, PhD, Director

Blissymbolics Resource Center  
 Dept of Speech and Language Development  
 Loma Linda University Medical Center  
 Loma Linda, CA 92354  
 (714) 824-4401  
 Contact: Melvin S. Cohen, PhD, Director

Children's Hospital and Health Center  
 Speech, Hearing and Neurosensory Center  
 Speech-Language Pathology Department  
 3001 Frost Street  
 San Diego, CA 92123  
 (619) 292-3482  
 Contact: Chris Hagen, PhD, Director

Children's Hospital at Stanford  
 Rehabilitation Engineering Center  
 520 Willow Road  
 Palo Alto, CA 94304  
 (415) 327-4800, ext 345

Daniel Freeman Hospital  
 Communication Disorders Department  
 333 N. Prairie Avenue  
 Inglewood, CA 90301  
 (213) 674-7050, ext 3328  
 Contact: Jane Bensussen, Director

Friends of Handicapped Children  
 UCLA Foundation  
 23-10 Rehabilitation Center  
 1000 Veteran Avenue  
 Los Angeles, CA 90024  
 213/825-4821

Glendale Adventist Hospital  
 Non-Speech Communication Program  
 1509 Wilson Terrace  
 Glendale, CA 91026  
 (213) 240-8000, ext 416  
 Contact: Beth Prol, Director

Non-Verbal Communication Center  
 Los Angeles Unified School District  
 c/o Widney High School  
 2302 S. Gramercy Place  
 Los Angeles, CA 90018  
 (213) 732-1976  
 Contact: Mary Knerl, Teacher Advisor

Northridge Hospital Medical Center  
 Innovative Communication Aids for  
 the Non Verbal (ICAN)  
 183200 Rosco Blvd  
 Northridge, CA 91328  
 Contact: Gail L. Pickering  
 Program Coordinator

Rancho Los Amigos Hospital  
 Communication Disorders Department  
 7601 East Imperial Highway, Bldg 900  
 Downey, CA 90242  
 (213) 922-7682  
 Contact: Frank DeRuyder, PhD, Director  
 Adult Eval. Contact: Diane Bangar  
 Ped Eval. Contact: Linda Lafontaine

Florida

The Communication Systems  
 Evaluation Center  
 1600 Silver Star Road  
 Orlando, FL 32804  
 (305) 293-0473 or 291-7469  
 Contact: Patty Smith, CSEC Coordinator

Blissymbolics Resource Center  
 Forrest Park School  
 1600 Silver Star Road  
 Orlando, FL 32804  
 (305) 293-5841  
 Contact: Sandra Osborn, Principal  
 (Blissymbols Teacher)

Illinois

Aian J. Brown Center for Alternative Communication  
 and Environmental Control  
 Rehabilitation Institute of Chicago  
 345 East Superior Street  
 Chicago, IL 60611  
 (312) 649-8560  
 Contact: Ken Kozole

Indiana

Ft. Wayne State Hospital & Training Center  
 4900 St. Joe Road  
 Ft. Wayne, IN 46815

Kansas

Cerebral Palsy Research Foundation  
 of Kansas, Inc  
 Post Office Box 8217  
 2021 Old Manor  
 Wichita, KS 67208  
 (316) 688-1881

Maryland

United Cerebral Palsy of Central  
Maryland  
Non-Vocal Communications Aid Equipment  
Delrey Preschool  
18 Delrey Avenue  
Catonsville, MD 21228  
(301) 744-3151  
Contact Noreen Rysticken

Massachusetts

Massachusetts Hospital School  
Adaptive Equipment  
Canton, MA  
(617) 828-2440  
Contact Carol Sargent, OTR

Children's Hospital Medical Center  
Communication Enhancement Clinic  
300 Longwood Avenue  
Boston, MA 02115  
(617) 735-6000  
Contact Howard C. Shane, PhD

Tufts-New England Medical Center  
Special Equipment Clinic  
171 Harrison Avenue  
Boston, MA 02111  
(617) 956-5622  
Contact Dr Bruce Gans

Michigan

Communication Enhancement Center  
Learning Assessment Clinic  
Oakland Schools  
2100 Pontiac Lake Road  
Pontiac, MI 48054  
Contact Nathaniel Peters, Director  
(313) 858-1943  
Ina Kirsten, Clinician  
(313) 856-1901

Communication Enhancement Program  
Jackson County Intermediate School Dist  
6700 Browns Lake Road  
P O Box 1160  
Jackson, MI 49204  
(517) 787-2800  
Contact Dianne Taulbee, Supervisor

Communication Enrichment Resource Center  
(CERC)  
Northville Public Schools  
405 W Main Street  
Northville, MI 48167  
Contact Mark Miko, Program Admin  
(313) 349-3400, ext 277  
Contact John Smallwood, Classroom Eng  
(313) 349-6210, artif lang lab

PAM Assistance Center  
110 Marshall Street  
P O Box 21037  
Lansing, MI 48090  
(517) 371-5897

Minnesota

Cambridge Area Developmental  
Rehabilitation and Education (CADRE)  
430 N W 8th Street  
Cambridge, MN 55008  
(612) 689-4466 (after-noon)  
Contact Mary Ruprecht

Courage Center  
3915 Golden Valley Road  
Golden Valley, MN 55422  
(612) 588-0811

New Jersey

Cerebral Palsy Association of  
Middlesex County  
Roosevelt Park, Oak Drive  
Edison, NJ 08817  
Contact Ms Travis M Tallman, CCC-SP  
Director, Speech Pathology

Communication Technology Center  
P O Box 4111  
Atlantic City, NJ 08404  
(609) 345-5191  
Contact Joan Bruno, MS, CCC  
Chief Speech Pathologist

New York

The Burke Rehabilitation Center  
785 Mamaroneck Avenue  
White Plains, NY 10605

Cerebral Palsy Center  
Scheier Communication Unit  
1603 Court Street  
Syracuse, NY  
Contact Carol Cohen, Director  
(315) 455-5726

Ohio

Prentke Romich Company  
8769 Twp Road 13  
Shreve, OH 44676  
(216) 567-2906  
Contact Susanne Shealey, OTR  
Director, Client Services

Oregon

Good Samaritan Hospital  
Portland, OR

Tennessee

University of Tennessee  
Rehabilitation Engineering Center  
682 Court Avenue  
Memphis, TN 38163  
(901) 528-6445  
Contact Elaine Trefler, OTR

## **CONTROL, COMMUNICATION AND SENSORY AIDS**

### Texas

Callier Center for Communication Disorders  
1966 Inwood Road  
Dallas, TX 75235  
(214) 783-3033  
Contact Delva Culp

Education Service Center, Region 20  
Augmentative Communication Evaluation  
System  
1314 Hines Avenue  
San Antonio, TX 78208  
(512) 828-3551  
Contact Patricia Wasson

### Washington

University of Washington Hospital  
Department of Rehabilitation Medicine  
1959 N E Pacific Street  
Seattle, WA 98199  
(206) 543-3674  
Contact Dave Beukelman, PhD

### Wisconsin

Communications Aids and Systems Clinic  
S-120 Waisman Center  
1500 Highland Avenue  
Madison, WI 53706  
(608) 263-2522

### Canada

Augmentative Communication Service  
Ontario Crippled Children's Centre  
350 Rumsey Road  
Toronto, Ontario M4G 1E8  
(416) 425-6229  
Contact Penny Parnes, Director

The Kinsmen Rehabilitation Foundation  
Technical Aids Program  
Vancouver, British Columbia  
(604) 734-8841

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## NONSPEECH COMMUNICATION ADVOCACY ORGANIZATIONS

Arkansas

Evelyn G. Albritton  
Speech & Hearing Clinic  
University of Arkansas at Little Rock  
33rd & University  
Little Rock, AR 72204  
(501) 569-3155

California

Bay Area Non-Oral Communication Group  
c/o Marywin Deegan  
4802 Lawton Avenue  
Oakland, CA 94609

San Diego Non-Oral Advocacy Group  
c/o Nany Oro  
United Cerebral Palsy center  
7947 Birmingham Drive  
San Diego, CA 92123  
(619) 278-5429

Southern California Communication Group  
8114 West 83rd Street  
Playa Del Rey, CA 90293

Idaho

Idaho Nonvocal Group  
Susan Ljogreen  
Department of Speech Pathology & Audiology  
Idaho State University  
Box 8116  
Pocatello, ID 83209-0009  
(208) 236-3495

Massachusetts

Northeast Communication Enhancement Group  
Box 268  
Brookline, MA 02146-0268

Michigan

Michigan Association for Communication Enhancement  
c/o Ina Kirstein  
Learning Assessment Clinic/Communication  
Enhancement Center  
Oakland Schools  
2100 Pontiac Lake Road  
Pontiac, MI 48054  
(313) 858-1901

Parent Advocacy Group  
6700 Browns Lake Road  
P O Box 1160  
Jackson, MI 49204  
Contact: Lucylee Neiswander-Whiting

Nebraska

Nebraska Advocacy Services  
Lincoln Center Building  
215 Centennial Mall, South  
Room 422  
Lincoln, NE 68508  
(402) 474-3183

New Jersey

New Jersey Augmentative Communication Task Force  
c/o Joan Bruno  
Children's Seashore House  
4100 Atlantic Avenue  
Atlantic City, NJ 08404  
(609) 345-5191

New York

Buffalo Augmentative Communication Group  
c/o Cheryl Rogers, LSP/Speech Department  
United Cerebral Palsy Association  
of Western New York  
31 Rosslor Street  
Cheektowaga, NY 14225  
(716) 897-1351

METRO 1 CAN  
c/o Roslyn Holiday Moore  
116-39 167 Street  
Jamaica, NY 11434

Non-Vocal Communication Group  
of Greater New York  
19-10 Parsons Boulevard  
Whitestone, NY 11357  
Contact Arlene Kraat  
(212) 520-7358

North Carolina

Ninevah Murray  
Speech/Language programs  
Division for Exceptional Children  
State Department of Public Instruction  
Raleigh, NC 27611  
(919) 733-3004

Ohio

Great Lakes Communication Enhancement Group  
Fran Watkins  
795 Burnside Drive  
Tripp City, OH 45371

Oregon

Pacific Northwest Non-Vocal Communication Group,  
Portland Chapter  
P O Box 1065  
Portland, OR 97207



## CONTROL, COMMUNICATION AND SENSORY AIDS

### Pennsylvania

Pittsburgh Communication Enhancement Group  
c/o Marie Capozzie and Jacky Territo  
Pioneer School  
Dunster and LaMoine Streets  
Pittsburgh, PA 15226  
412/531-0626

### Texas

Augmentative Communication Task Force  
c/o Delva Culp, Speech-Language Pathologist  
Callier Center for Communication Disorders  
1966 Inwood Road  
University of Texas at Dallas  
Dallas, TX 75235  
(214) 783-3137

Non-Oral Communication Advocacy Group  
4339 El Campo  
Fort Worth, TX 76107

### Washington

Pacific Northwest Non-Vocal  
Communication Group (PNWNVCG)  
Louise Cooch, President  
10545 Meridian Avenue Northeast  
1-302  
Seattle, WA 98133

### Canada

Blissymbolics Communication Institute  
Ontario Crippled Children's Centre  
Penny Parnes  
350 Rumsey Road  
Toronto, Ontario  
CANADA M4G 1R8

Communication Awareness & Action --  
Toronto Region  
c/o Lynette Norris  
78 Glentworth Drive  
Willowdale, Ontario  
CANADA M2J 2E8

Hamilton Wentworth Communication Collective  
c/o Barbara Rush  
64 Magnolia Drive  
Hamilton, Ontario  
CANADA L9C 5T2

All groups are urged to add these addresses to their mailing lists. Groups wishing to add, delete, or change their names or addresses should write to Judy Montgomery, James H Cox School, 17615 Los Jardines East, Fountain Valley, CA 92708. Ms Montgomery writes an ADVOCACY UPDATE column in Communication Outlook.

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## SOME COMMUNICATION AID MANUFACTURERS

- Abbey Medical**  
8004 Westchester Pike  
Upper Darby, PA 19082  
215/789-5220
- Adaptive Communication Systems, Inc**  
PO Box 12440  
Pittsburgh, PA 15231  
412/264-2288
- American Communications Corporation**  
180 Roberts Street  
East Hartford, CT 06108  
203/289-3491
- C-Phone**  
553 Wolfner  
Fenton, MO 63026  
314/343-5883
- Canon, Inc**  
7-1 Nishi-Shinjuku  
2 Chome  
Shinjuku Dai Ichih Bldg  
Shinjuku-ku  
Tokyo, JAPAN
- also: Canon**  
c/o Telesensory Systems, Inc  
455 N Bernardo  
Mountain View, CA 94043  
415/960-0920
- C. by Heritage School & Hospital**  
Rehabilitation Engineering Unit  
North Chailey, Lewes  
East Sussex BN8 4EF  
ENGLAND  
062-572-2112
- Cleo Living Aids**  
3957 Mayfield Road  
Cleveland, OH 44121  
216/382-9700
- Communications Research Corporation**  
1720-130th Avenue NE  
Bellevue, WA 98005  
206/881-9550
- Computers for the Physically Handicapped, Inc**  
Department RB  
7602 Talbert #5  
Huntington Beach, CA 92647  
714/848-1122
- Contemporary Artistic Technology**  
P O Box 58430, Station L  
Vancouver, BV V6P 6X2  
604/324-8119
- Crestwood Company**  
PO Box 045313  
Milwaukee, WI 53207  
414/351-0311
- Developmental Equipment**  
981 Winnetka Terrace  
Lake Zurich, IL 60047  
312/438-3476
- Dufco**  
2410 Broad Street  
San Luis Obispo, CA 93401  
805/541-5022
- Educational Microcomputer Systems**  
1 Clear Spring  
Irvine, CA 92715  
714/553-0133
- Executive Distributors of America, Inc**  
15055 32 Mile Road  
Romeo, MI 48065  
313/752-3518  
313/237-0554 (Detroit)
- Foundation for Communication for the Disabled**  
31 Southampton Row  
London WC1B 5HJ  
ENGLAND  
Ph 01-405-1019
- Genalex, Inc**  
64 Gough Avenue  
Lylyland, PA 18974  
215/672-6643
- Handicapped Children's Technological Services**  
Box 64  
Foster, RI 02825  
401/822-4622
- Handicapped Educational Learning Products, Inc**  
PO Box 9763  
Sacramento, CA 95823  
916/451-9654
- INNOCOMP Innovative Computer Applications**  
1121 Vegas Court  
Charlottesville, VA 22901  
804/924-3781
- IOR Enterprises**  
229 Harrison Avenue  
Highland Park, NJ 08064  
201/846-5200
- Jim's Instrument Manufacturing, Inc**  
PO Box 5157  
Coralville, IA 52241  
319/351-3429
- Kahlstrom, Gunnar**  
Barkspadevagen  
S-752 47 Uppsala  
SWEDEN
- Krown Research, Inc**  
6300 Arizona Circle  
Los Angeles, CA 90045  
213/641-4306

**CONTROL, COMMUNICATION AND SENSORY AIDS**

**Medelec, Limited**  
 Manor Way  
 Old Woking, Surrey GU22 9JU  
 ENGLAND  
 Ph Woking (04862) 70331

**Micro Communication Devices**  
 12388 Priscilla Lane  
 Los Altos Hills, CA 94022  
 415/981-5568

**National Association for the Deaf**  
 814 Thayer Avenue  
 Silver Spring, MD 20910

**Oskar Foundation**  
 Halfeiken 11  
 3956 VT Leersum  
 THE NETHERLANDS  
 Ph 03434-2013

**Phonic Ear, Inc**  
 250 Camino Alto  
 Mill Valley, CA 94941  
 415/953-4000

**Phonic Ear, Limited**  
 7475 Kimbel St Unit #10  
 Mississauga, Ontario L5S 1E7  
 CANADA  
 415/677-3231  
 415/677-3035

**Plantronics, Inc**  
 345 Encinal Street  
 Santa Cruz, CA 95060  
 408/426-5858  
 TWX 910/598-4415  
 Telex 357419

**PMV Systems B V**  
 Post Box 16  
 4273 ZG Hank  
 THE NETHERLANDS  
 016/22 958

**Possum Controls Limited**  
 82 Birch Avenue  
 Little Silver, NJ 07739  
 201/842-1246

**Prentke Rich Company**  
 8769 Township Road 513  
 Shreve, OH 44676-9146  
 216/567-2906

**JA Preston**  
 60 Page Road  
 Clifton, NJ 07012  
 800/631-7277

**Rehabilitation Products Limited**  
 UK Distributors for Iron Bridge Works  
 Hasketon, Woodbridge, Suffolk IP1 6HF  
 ENGLAND  
 Grundisburgh (047 335) 475

**Rikscentralen**  
 Bracke Ostergard  
 S-417 22 Gothenburg  
 SWEDEN

**Scitronics**  
 523 S Clewell Street  
 P O Box 5344  
 Bethlehem, PA 18015  
 215/868-7220

**SFERE Projekt B V**  
 P O Box 16  
 4273 ZG Hank (NB)  
 THE NETHERLANDS  
 Ph 016/22-2958

**SHARP Electronics Corporation**  
 Consumer Calculator Division  
 10 Sharp Plaza  
 Paramus, NJ 07652  
 201/265-5600

**SI/COMM**  
 7475 Whitlock Avenue  
 Playa del Rey, CA 90291  
 213/823-1202

**Sontek Medical, Inc**  
 Sontek Industries, Inc  
 P O Box 549  
 Lexington, MA 01873  
 617/863-1410

**Specialized Systems, Inc**  
 6060 Corte del Cedro  
 Carlsbad, CA 92008  
 619/438-1800  
 TTY 619/481-6060

**TASH, Inc**  
 2075 Bayview Avenue  
 Toronto, Ontario  
 416/486-3569

**Technical University of Denmark**  
 Electronics Laboratory  
 Building 344 DK-2800  
 Lyngby, DENMARK  
 Ph 45 2 88 15 66

**Telegraphics**  
 P O Box 1061  
 Carrollton, TX 75006  
 214/492-1629

**Texas Instruments**  
 Educational Division  
 P O Box 10508  
 Lubbock, TX 79408  
 800/858-1802

**Toby Churchill, Ltd**  
 Designer of Equipment for the Disabled  
 20 Pantou Street  
 Cambridge CB2 1HP  
 ENGLAND

**Trendcom**  
 311 Turquoise Street  
 Milpitas, CA 95035  
 408/943-1970

**Tufts-New England Medical Center**  
 171 Harrison Avenue Box 1014  
 Boston, MA 02111  
 617/956-5000

Typewriting Institute for the Handicapped  
3102 W Augusta Avenue  
Phoenix, AZ 85021  
602/939-5344

Ultratec, Inc  
P O Box 4062  
Madison, WI 53711  
608/273-0707

Words+, Inc  
1125 Stewart Ct, Suite D  
Sunnyvale, CA 94086  
408/730-9588

ZYGO Industries, Inc  
P O Box 1008  
Portland, OR 97207-1008  
503/297-1724

**Research & Development Organizations**

NIHR supports the following centers in the area of  
nonvocal communication

Medical Rehabilitation R&T Center  
Tufts University  
171 Harrison Avenue (Box 1014)  
Boston, MA 02111  
617/956-5031  
Richard Foulds, Project Director  
Core area Communication Systems for Individuals  
with Nonvocal Disabilities

Trace R&D Center  
314 Waisman Center  
1500 Highland Avenue  
University of Wisconsin-Madison  
Madison, WI 53705  
608/262-6966  
Gregg C Vandenberg, Project Director  
Core area Access to Communication, Control, and  
Information Processing Systems

A list of other research organizations can be  
found in this section on page 202

## SENSORY AIDS

## TECHNOLOGY FOR PEOPLE WITH IMPAIRED VISION

## SELECTED PUBLICATIONS

Aids and Appliances Review is a quarterly journal that provides high quality information on technology that is useful to people with impaired vision. Each issue discusses one topic in depth. The first twelve issues have covered:

- |      |  |               |
|------|--|---------------|
| 1    | Sunglasses   | January 1979  |
| 2    | Large Print Media  | July 1979     |
| 3    | Handwriting Guides   | January 1980  |
| 4    | Speech Compression   | December 1980 |
| 5    | Alternative Labels Aids for Independent Living                                       | December 1981 |
| 6    | Diabetic Control Equipment for Use with Vision Loss                                  | June 1982     |
| 7    | The Light Probe A Versatile Aid  | Winter 1982   |
| 8    | Kitchen Aids Resources for the Visually Impaired                                     | Spring 1983   |
| 9/10 | Voice Output for Computer Access   | Fall 1983     |
| 11   | Braille and Computers  | Winter 1984   |
| 12   | Job Modifications Case Presentations of Job Modifications Through Adaptive Equipment | Spring 1984   |

The next two will cover

- |    |  |             |
|----|--|-------------|
| 13 | Aids for the Visually Impaired Elderly | Summer 1984 |
| 14 | Tactile Maps                           | Fall 1984   |

These publications are a valuable source of information, as they are designed to be a consumer report on aids and appliances for visually impaired people. The Review is available in print for free, or on tape in the Library of Congress format. For a taped copy, send one C-\$0 blank cassette to the AAR Editorial Office at the address below. Contact the AAR Editorial Office and ask to be included on their mailing list. Available from Aids and Appliances Review, The Carroll Center for the Blind, 770 Centre Street, Newton, MA 02158, 617/969-6200.

Aids for the 80s: What They Are and What They Do C. Michael Mellor. American Foundation for the Blind, 15 West 16th Street, New York, NY 10011. 1981. Free.

Braille Research Newsletter is a periodic newsletter devoted to providing state-of-the-art information on the production and use of the Braille reading system throughout the world. The Newsletter reviews new equipment, discusses new or innovative programs, described the results of Braille-related research projects, and provides resource listings of manufacturers of various Braille devices. Issue #14 contains such technology-related articles as "Cognitive Processes in Braille Reading," "Telebraille: The New Telecommunication System for Deaf-Blind People," "Tactile Diagrams," "Braille Stereotypes and Duplicators" and others. Each issue is \$6 (specify print or

Braille), available from National Braille Press, Inc., 88 St. Stephen Street, Boston, Massachusetts 02115.

Journal of Visual Impairment & Blindness, February 1983, Vol 77, No 2. American Foundation for the Blind, 15 West 16th Street, New York, NY 10011, 212/620-2000. This issue of the Journal has several articles regarding technology for visually impaired persons. "The Night Vision Aid for Legally Blind People with Night Blindness: An Evaluation," written by Diane L. Morrissette, Ph.D., and Gregory Goodrich, Ph.D., in which the Night Vision Aid and the Wide Angle Mobility Light are compared and evaluated, "AFB's Computerized Travel Aid: Two Years of Research and Development," by Mark M. Uslan, W. Robert Smith, Kenneth Schreiberman and Douglas R. Maure, in which the progress in developing the aid is described, and "Reading Machines for Blind People," by Derek H. Fender, which discusses the problems of providing blind people with practical verbal reading machines.

Low Vision Services. American Foundation for the Blind, 15 West 16th St., New York, NY 10011. \$2.00.

Reading Aids for the Partially Sighted: A Systematic Classification and Procedure for Prescribing. Louise Sloan. Williams & Wilkins, Baltimore, MD. 150 pages. \$12.95. 1977. Criteria for selecting and evaluating optical and non-optical reading aids. Illustrations accompany many of the descriptions.

Sensory Aids for Employment of Blind and Visually Impaired Persons: A Resource Guide. American Foundation for the Blind, 15 West 16th Street, New York, NY 10011. Available in large print and Braille editions. \$7.50. 1978. Lists devices and equipment which provide on-the-job assistance to visually impaired people. Each entry describes the function of the device, employment application, vendor, availability, and, in some instances, price. Listings include hard copy and paperless Braille devices, Braille readout, tone output or voice output calculators, computer terminals and accessories, labeling aids, measuring aids, communication devices, etc. Indexed by employment area.

"Sensory Aids for Visually-Impaired Clients" Rehab Brief, November 1982, 5-11. Many of the difficulties experienced by persons with visual disabilities are met by technology in the form of sensory aids. This issue looks at sensory devices, techniques, and systems, primarily within the context of aids that will be of particular help on the job. Available from US Department of Education, Office of Special Education and Rehabilitative Services, Mail Stop 2305, Switzer Building, Washington, DC 20202.

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Sensory Aids Technology Update is a monthly newsletter on technology and employment issues concerning disabled people. This new publication is a rich source of information on technology applications. It is particularly valuable to people looking for information on sensory aids (hearing and vision), but is also useful for other types of technology. It has features on new products, special employment, education and training programs, unusual applications of technology, and new developments in research. New publications and interesting audiovisual programs are regularly reviewed, and each month the product comparison section profiles similar devices. It includes new from overseas. The articles are concise, and include references to guide you to further information. A typical issue includes **Accessing dedicated word processors** what works, what doesn't, and what's coming, **Financing adaptive aids** with government funds fading, where to look for money; **Project Partnerships** what it promised and what it delivers, **Equipment demo centers for hearing impaired** where they are in the U.S., **Apple software customized for speech output in project for SF Bay Area blind children**, **Tacti-Phone**: new device lets deaf-blind talk on standard phone; **Reader's Forum** advice on recruiting disabled college students (December, 1983). A one-year subscription to Update is \$30.00; available from Sensory Aids Foundation, 399 Sherman Avenue, Suite 12, Palo Alto, CA 94306.

Smith-Kettlewell Technical File, a quarterly technical journal for blind and visually impaired readers, is available from the Smith-Kettlewell Eye Research Foundation. This do-it-yourself magazine is based upon the concept that given the proper tools and knowledge of exemplary prototype assistive devices, persons who are blind can become involved in solving some of the problems they face. The journal provides its readers with information such as: electronics and radio theory; data on integrated circuits; instructions for constructing devices designed by the Rehabilitation Engineering Center located at the Smith-Kettlewell Institute for Visual Sciences; available electronic test equipment, hints on soldering and the use of power tools, and related bibliographies produced in Braille, large print, and recorded form by various organizations. The Technical File is available for \$15.00 per year (Braille or large print edition), and \$8.00 per year (Talking Book version). Available from Smith-Kettlewell Institute of Visual Sciences, Rehabilitation Engineering Center, 2232 Webster Street, San Francisco, CA 94115, 415/563-2323.

Visual Aids and Informational Material National Association for Visually Handicapped. New York, NY

Vocational and Educational Aids Developed by the Rehabilitation Engineering Center at the Smith-Kettlewell Institute of Visual Sciences. Second edition, 1983. 32 pages. 2232 Webster Street, San Francisco, California 94122.

## PRODUCT CATALOGS

Aids and Appliances for the Visually and Physically Disabled, Independent Living Aids, Inc., 11 Commercial Avenue, Plainview, NY 11803

International Guide to Aids and Appliances for Blind and Visually Impaired Persons, American Foundation for the Blind, 15 West 16th Street, New York, NY 10011

Products for People with Vision Problems American Foundation for the Blind, 15 West 16th Street, New York, NY 10011. Annually, in print and braille editions. Free. A guide to products for blind and visually impaired people. Includes watches, clocks and timers, canes and accessories, products for recreation, kitchens, household, sewing, medical use, writing and communication, and mathematics. Lists low vision products, tools and instruments, and travel concessions and programs. Five sources of product information indexed by product. Contains photographs.

Vision Aids Resource Guide, Science Products, (Wayne) Box A, Southeastern, Pennsylvania 19399, 800/233-3121 (in Penn., 800/222-2148). This catalog has been developed to serve as a complete resource guide for the visually impaired consumer or professional in the field of the visually impaired. It includes a wide selection of products from hand-held magnifiers and monoculars to Macular Degeneration Reading Aids, and talking clocks, calculators, and computers.

## AUDIOVISUALS

Dark Silence United States Social Rehabilitation Services. Distributed by National Audiovisual Center, National Archives and Records Service, General Services Administration, Order Section/RT, Washington, DC 20409. 16mm, color, 12 minutes. 1975. Reports on the research programs of the National Center for Deaf-Blind Youths and Adults in New Hyde Park, NY. Features new communications hardware for the deaf/blind.

The Handicaps of Blindness and Deaf-Blindness CBS-TV and St. Johns University. Distributed by Mr. Winston Kirby, Director, Television Center, Grand Central Parkway, Jamaica, NY 11439. 3/4" video, color, 28 1/2 minutes. 1979. Discussion of blindness with Dr. Hellinger, depicting different visual handicaps, illustration of devices to aid the visually handicapped, an introduction to deaf-blindness and the Helen Keller National Center, and an interview with Dr. Smithdas, the Director.

Reading Aids for the Blind Kidsworld #135 Story Bob and Betsy Behrens. Distributed by The Behrens Company, Inc., 170 SE 14th Street, Suite 6, Miami, FL 33131. 3/4" videocassette, color. 4.31 minutes. 1981. Kidsworld is a half-hour weekly television news program made for and by kids and telecast in over 90 U.S. cities. In this segment, Sherrie Liu reports on reading aids at the Maryland School for the Blind. Second Prize, Series, 1981 International Rehabilitation Film Festival.

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OTHER RESOURCES ON SENSORY AIDS FOR VISION

**Organizations**

American Foundation for the Blind  
15 West 16th Street  
New York, New York 10011

American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, KY 40206

Carroll Center for the Blind  
770 Centre Street  
Newton, MA 02158  
617/969-6200

Information for the Partially Sighted (IPS)  
9012 Old Georgetown Road  
Bethesda, Maryland 20814

Sensory Aids Foundation  
399 Sherman Avenue  
Suite 12  
Palo Alto, CA 94306  
415/329-0430

National Institute of Handicapped Research (NIHR)  
Supported Organizations

RECs

Rehabilitation Engineering Center  
Smith-Kettlewell Institute of Visual Sciences  
2232 Webster Street  
San Francisco, California 94115  
415/563-2323  
Development and evaluation of sensory aids for  
blind and deaf individuals  
Dr. Arthur Jampolsky  
Dr. John Brabyn

Research and Training Centers

Pennsylvania College of Optometry  
Office of Academic Development  
1200 W Godfrey Avenue  
Philadelphia, Pennsylvania 19141  
215/424-5900, ext 252  
Orientation and mobility research for persons with  
low vision  
Laura Edwards, project director

Mississippi State University  
PO Drawer LQ  
Mississippi State, Mississippi 39762  
601/325-2001  
Blindness and low vision rehabilitation  
William H Graves, PhD, project director

Western Pennsylvania School for Blind Children  
201 N Bellefield Street  
Pittsburgh, Pennsylvania 15213  
412/621-0100  
Assessment and treatment of families with visually  
handicapped children  
Janet Simon, project director

National Library Service for the Blind and  
Physically Handicapped  
Library of Congress  
1291 Taylor Street NW  
Washington, DC 20502  
202/287-5100

The National Library Service for the Blind and  
Physically Handicapped (NLS) collection of full-  
length braille and talking books and magazines is  
loaned free to individuals who cannot hold,  
handle, or read conventional printed matter.  
Books, magazines, and playback equipment provided  
by NLS are distributed through a national network  
of 160 locally funded cooperating libraries and  
agencies where they are circulated to eligible  
residents of the US and its territories

The NLS Reference Section provides information on  
various aspects of blindness and physical handi-  
caps. Its reference collection consists of ap-  
proximately 4,000 print books and 500 professional  
journals dealing with handicaps and related sub-  
jects. Information on aids and appliances is  
included as one of the many topics covered in the  
reference section. Specific reference circulars  
and bibliographies are available on reading and  
writing aids for the handicapped, reading machines  
for the blind, and closed-circuit reading devices  
for the visually impaired.

See also **PERSONAL MOBILITY** "Mobility Aids for the  
Blind", **MICROCOMPUTER APP'ICATIONS**, "Access for  
Blind People", **HOMEMAKING**, **RECREATION**

**DO-IT-YOURSELF TECHNOLOGY FOR BLIND PEOPLE**

"Known affectionately to its graduates as the  
'little school,' the Smith-Kettlewell Institute of  
Visual Sciences in San Francisco is offering a  
free electronics assembly class. Open to all  
blind or visually impaired people, positions are  
available for three students on a first-come,  
first-served basis.

"Unique in the United States, the 'little school'  
provides pre-vocational instruction in soldering,  
parts layout and hardware mounting. Twenty-five  
students have participated in the program since it  
began in 1980. There is no formal certification  
upon completion of training. Assistance is avail-  
able for finding living accommodations. For more  
information, contact the program director, Jay  
Williams, at 2232 Webster Street, San Francisco,  
California 94115, 415/561-1677."

from Sensory Aids Technology Update, November,  
1983

Home Mechanics for the Visually Impaired R G  
Utrup. Western Michigan University, Department of  
Blind Rehabilitation, Kalamazoo, Michigan 49001  
96 pages \$1.50 1974. Series of 17 lessons for  
teaching blind students to make their own home  
repairs. Supplementary reading list included.



## TECHNOLOGY FOR PEOPLE WITH IMPAIRED HEARING

## EQUIPMENT DEMONSTRATION CENTERS

"The growing availability of assistive devices for the hearing impaired makes it increasingly difficult for consumers and rehabilitation professionals to determine what devices might be most helpful

"In the last two years, several centers have been established in the U.S. offering hands-on demonstrations to help consumers and professionals assess different devices. There is no charge for visiting these centers. In addition to the working models of equipment, all of them provide up-to-date information on device prices and availability

## 1st U.S. Center

"The Fort Lauderdale Oral School pioneered the first such center in 1981. More than 20 devices, including vibrating and visual alarms, captioning devices and Telecommunication Devices for the Deaf (TDDs), are set up for display and demonstration. The center is open on Tuesdays and Thursdays and tours are led by people trained in the use of each device. For more information contact The Fort Lauderdale Oral School, 3100 S.W. 8th Ave., Fort Lauderdale, Florida 33315, (305)525-7251

## California Center

"In Northern California, The San Francisco Hearing Society's Lions Den Project offers hands-on demonstrations of various devices, including TDDs. A trained audiologist, who can explain the devices, guides visitors through the display. Since it has no regular scheduled hours, make appointments ahead of time by calling (415)775-5700, or with a TTY (415)776-DEAF

## New York Centers

"In New York City, the New York League for the Hard of Hearing accepts appointments for demonstrations of many devices, including alarms, listening devices and TDDs. They also dispense devices. To make an appointment call (212)741-7640, with a TTY (212)255-1932, or write the New York League for the Hard of Hearing, 71 West 23rd Street, New York, New York 10010

"The National Institute for the Deaf in Rochester, New York houses another demonstration center. The Institute has an extensive telephone laboratory where TDDs and other phone devices can be examined. In a separate hearing lab, signaling devices are on display. A trained staff member takes visitors through the displays. To arrange a demonstration call Dr. Diane Castle (716)475-6476 or Jackie Gauger (716)475-6553

## Home Setting

"The Hearing and Speech Agency of Metropolitan Baltimore has organized a unique demonstration center that simulates a home setting. The display area is arranged like a living room. Evelyn Burns, the center director, believes it is im-

portant to try a device in the environment in which it will be used. (She even taped a baby crying to help test warning devices.) At the moment, they do not have a TDD to demonstrate. The center is open on Tuesdays, but special appointments can be arranged by calling in advance. An interpreter is available to guide deaf visitors. For more information contact Evelyn Burns, Hearing and Speech Agency of Metropolitan Baltimore, 2220 St. Paul Street, Baltimore, Maryland 21218, or call (301)243-3800, with a TTY (301)243-2672

## Northwest Center

"In the Northwest, the Seattle Hearing and Speech Center schedules device demonstrations by appointment. Clock timers, pillow buzzers, bed vibrators, amplifiers, and TDDs are on display. Many devices can be bought at the center. For more information call Rose Dias (206)323-5770"

This article appeared in the December 1983 issue of Sensory Aids Technology Update, which is available from Sensory Aids Foundation, 399 Sheridan Avenue, Palo Alto, CA

## DEAFNET

"The Word's Getting Around: Local Implementation of Telecommunications Networks for Deaf Users" American Annals of the Deaf, September, 1983, Volume 128, No. 5, pages 613-618. Accessible by both telecommunication devices for the deaf (TDDs) and ASCII-based computer terminals, DEAFNET is the communications network for deaf persons. It provides bulletin-board access, electronic message service, and real-time linking capabilities for deaf users, their hearing friends, businesses, and various services.

DEAFNET is scheduled to be up and running in the 20 largest U.S. cities by 1985

For more DEAFNET information, contact:

Teresa Middleton  
415/859-2236 (voice)  
415/326-1802 (TTY)  
SRI International  
Menlo Park, California

## PUBLICATIONS RELATED TO TECHNOLOGY FOR PEOPLE WITH IMPAIRED HEARING

A Survey of Current Developments in Assistive Devices for Hearing-impaired Persons in the United States George W. Fellendorf, Ed D 71 pages \$5.00. 1982. Gallaudet Research Institute, Office of Research Dissemination, House Three, Gallaudet College, 800 Florida Avenue NE, Washington, DC 20002. This report is a current summary and information source for the field of assistive devices for the deaf and hearing impaired. It is intended primarily for professionals but will also be useful to consumers. Assistive devices are broadly defined to range from simple visual "door-bells" to teletypewriters to advanced concepts such as computer mail and automatic speech recognizers. Existing devices are described in the following classes: alerting and alarm systems, telephone assistive systems, personal listening systems, captioned TV, and large-room amplification systems. Descriptions are functional, in terms of the consumer-community and client needs, rather than in technical terms. In addition to existing devices, prototype new devices and trends in research and development are discussed, these include concepts such as Picturephone, computerized teletext services, speech synthesis, and speech recognition systems. Device demonstration centers and other methods of dissemination of devices for the hearing impaired are presented as models for meeting the consumer's needs to obtain and try out devices. Studies of consumer needs, preferences, and actions are summarized (nine studies are covered 1974-1982). Recommendations are made for future action to improve and develop further devices and to provide better education, cooperation of the concerned parties and dissemination of assistive devices. An appendix lists representative devices that are currently available, their price, and sources of supply.

## Other Publications of Interest

Advances in Prosthetic Devices for the Deaf: A Technical Workshop D McPherson, M Davis, editors. National Technical Information Services, 5285 Port Royal Road, Springfield, VA 22161 334 pages. \$7.50. 1979. Examines 45 topic areas dealing with amplification, cochlear implant, vibrotactile devices and the physiology and psychoacoustics of hearing and hearing impairment. It also examines the social and educational aspects of deafness.

Assistive Listening Devices and Systems (ALDS) and You Dr Gwenth Vaughn, Robert K Lightman, Rocky Stone SHHH/AD, 4848 Battery Lane, Suite 100, Bethesda, Maryland 20814. A six pamphlet series with information and illustrations of hard-wire, infrared, FM and loop systems available from SHHH. Titles are: I Screen Yourself for an Assistive Listening Device or System (ALDS), II How You Can Select an Assistive Listening Device or System (ALDS), III Telephone Listening and Talking, IV Listening to Television, Radio, Stereo; V Special Techniques for One-to-One and Small Group Listening and Talking. Automobile, Restaurant, Industry, Clinic, Conference, Party, Exhibit; VI Medium and Large Area Listening Conferences, Classrooms, Places of Worship,

Theaters, Out-of-doors

"Contributions of Technology to Deaf and Hearing-Impaired Individuals" Rehab Brief Bringing Research Into Effective Focus, Vol III, No 11, August 20, 1980. National Institute of Handicapped Research, Office of Special Education and Rehabilitative Services, Department of Education, Washington, DC 20201. No charge.

Directory of Telecommunication Aids for Disabled People Prepared by Beil Canada on behalf of the Canadian Telecommunication Carriers Assn. A reference for people who are concerned with the telecommunications of hard-of-hearing, deaf, speech-impaired, visually-impaired and motion handicapped people. An attempt has been made to compile the information which is available for various sources both in North America and abroad. The devices are categorized by the function which they perform in relation to telecommunications, especially with reference to the telephone. Each aid is described briefly. Its manufacturer, distributor, or contact is listed, and its approximate price, when available, is recorded. Research which is known to be currently underway for developing more aids related to these functions is also briefly outlined. Following this listing of aids and research, some existing services relating to telecommunications for disabled people are discussed.

Equipment Designed to Improve the Communication Skills of the Deaf. Donald Johnson, William E Castle, editors. National Technical Information Services, 5285 Port Royal Road, Springfield, VA 22161 77 pages \$7.50 1976. This booklet presents equipment designed and developed at the National Technical Institute for the Deaf, Rochester Institute of Technology, to improve communication skills of the deaf. The report includes seven chapters demonstrating the actual design and rationale for development of several items of equipment and their related work space.

Getting the Most Out of Your Hearing Aid Joan M Armbruster and Maurice H Miller. AG Bell Association, 4317 Volta Place, NW, Washington, DC 20007 40 pages \$2.00 1981. This is a step-by-step guide to living with your hearing aid. It covers the components of a hearing aid, how to wear an aid, how to get accustomed to your aid, common solutions to common complaints, and hints on basic care for hearing aids.

"Help for Hearing Impaired Persons" PAM Repeater, No 18, June 1983. Barbara Warren Arselia S Ensign, Editor. PAM Assistance Center, 601 W Maple Street, Lansing, MI 48906, 517/371-5897.

Helpful Hearing Aid Hints Earl Harford and Elizabeth Dodds. AG Bell Association, 4317 Volta Place, NW, Washington, DC 20007 21 pages \$1.75 1970. How to achieve maximum benefit from hearing aids and overcome common communication problems. For adult hearing aid users.

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Helping the Handicapped A Guide to Aids Developed by the Telephone Pioneers of America Telephone Pioneers of America 195 Broadway, New York NY 10007 Call your local phone company for the name of your local area chapter administrator

Learning Technology and the Hearing Impaired Frank B Withrow, Ph.D., editor A.G Bell Association, 4317 Volta Place, NW, Washington, DC 20007 106 pages. \$4.95 1981

New Trends for Instructing Deaf People Rochester Institute of Technology, National Technical Institute for the Deaf, One Lomb Memorial Drive, P.O. Box 9837, Rochester, New York 14623

Non-Vocal Communication Resource Book G.C. Vanderheiden, L. Krause \$20.00 1983 Trace R&D Center, Reprint Service, 314 Waisman Center, 1500 Highland Avenue, Madison, WI 53705, 608/262-6966

Orientation to Hearing Aids Jaclyn S. Gauger A.G Bell Association, 4317 Volta Place, NW, Washington, DC 20007 \$9.45 1978 This package was developed to motivate and train students to use hearing aids to improve communication skills. It is designed as an individualized instruction guide for a hearing aid user and audiologist. Written at an eighth grade vocabulary level, the package includes the following six component workbooks: Hearing Aids and What They Do (46 pages), Ear molds and Hearing Aid Batteries (32 pages), Maintenance and Care of Hearing Aids (26 pages); Troubleshooting Hearing Aid Problems (22 pages); Consumer Information Hearing Aids (32 pages); Student Manual (20 pages)

Reasonable Accommodation Handbook Frank Bowe American Telephone & Telegraph Company Available from National Center for a Barrier Free Environment, Information Service, 1015 Fifteenth Street NW, Washington, DC 20005, 202/466-6896 323 pages \$37.50 1983 Although produced for AT&T, this document would also be helpful to other employers and vocational counselors. It contains an introductory section discussing the concept of reasonable accommodation and reviewing the legal and regulatory requirements. The book provides one-page descriptions, with photographs, of hundreds of products and devices which may prove suitable for use as reasonable accommodations for certain individuals having job-related limitations. The following information is entered for each product or service for which it was available: product name, what it is, what it does, advantages, disadvantages, cost, available from, Bell System experience, photograph. The data are accurate as of June, 1982.

Sensory Devices for the Hearing Impaired Harry Levitt, James M. Pickett, and Robert A. Houde, editors IEEE Press John Wiley & Sons, Inc 1980

Signaling Devices for Hearing-Impaired People Diane L. Castle, Ph.D. A.G Bell Association, 4317 Volta Place, NW, Washington, DC 20007 Free This brochure provides information on commercially available products that perform signaling functions for the hearing-impaired person such as wake-up alarms, multi-purpose signaling devices and warning devices.

Special Devices for Hard of Hearing, Deaf, and Deaf-Blind Persons J. Hurvitz and R. Carmen Little Brown, and Company, Boston, MA 1981

Telephone Accessories You Can Build J.H. Guilder Hayden Book Co., Inc. Rochelle Park, NJ 1976 Has information on building your own signaling devices.

"What You Should Know About TDDs" Diane Castle, Ph.D. Public Information Office, National Technical Institute for the Deaf, Rochester Institute of Technology, One Lomb Memorial Drive, P.O. Box 9887, Rochester, NY 14623 free

#### Children's Hearing Aids

"All About Hearing Aids" Auditory Services Program, Montgomery County, Maryland, Public Schools Available from A.G Bell Association, 4317 Volta Place, NW, Washington, DC 20007 12 pages \$1.75 1975 Simple instructions for parents and teachers on the care of a child's hearing aid.

Hearing Loss, Hearing Aids and Your Child A Guide for Parents Alfred L. Miller Charles C. Thomas, 2600 S. First Street, Springfield, IL 62717 97 pages, figures \$7.50 1980 A discussion of the various forms of hearing loss, procedures for evaluating hearing, descriptions of hearing aids, and provisions of speech and hearing therapy in regular schools.

Tim and His Hearing Aid Eleanor Ronner and Joan Porter A.G Bell Association, 4317 Volta Place, NW, Washington, DC 20007 48 pages \$3.50 1965 An easy-to-read book for elementary school children about a young boy learning to use a hearing aid. Illustrated.

#### Audiovisuals

Communication Aids for the Hearing Handicapped R.L. Hughes, Ph.D., M.E. Glasscock III, MD Distributed by House Ear Institute, Audio Visual Services, 256 South Lake Street, Los Angeles, CA 90057 16mm and video 15 minutes 1970 There are many devices other than hearing aids that the hearing impaired person may be able to use. The electronic stethoscope, television and telephone aids, and various light signals are presented in simulated situations to illustrate such devices.

OUT Organization for the Use of the Telephone WBAL-TV, Baltimore Distributed by the Organization for Use of the Telephone, Inc., P.O. Box 175, Owings Mills, MD 21117 3/4" videocassette, color 30 seconds 1981 Information to assist hearing-impaired people with hearing aids in the use of the telephone.

Silent Walls United States Social Rehabilitation Services Distributed by National Audiovisual Center, National Archives and Records Service, General Services Administration, Order Section/RT, Washington DC 20409 Examines deafness and the many problems of deaf people who must adjust to a silent world. Shows the training of deaf people.

## **CONTROL, COMMUNICATION AND SENSORY AIDS**

to communicate, to find employment, and to bridge the gap of isolation and alienation. Demonstrates new office equipment designed especially for the deaf by deaf persons.

### **ORGANIZATIONS**

National organizations that can provide more information

Alexander Graham Bell Association for the Deaf  
4317 Volta Place, NW  
Washington, DC 20007  
202/337-5220 (Voice or TTY)

Gallaudet College  
800 Florida NE  
Washington, DC

National Association of the Deaf (NAD)  
814 Thayer Avenue  
Silver Spring, Maryland 20910  
301/587-1788 (Voice or TTY)

National Technical Institute for the Deaf  
Rochester Institute of Technology  
One Lomb Memorial Drive  
PO Box 9887  
Rochester, New York 14623

Organizations for Use of the Telephone, Inc  
PO Box 175  
Owings Mill, Maryland 21117  
301/655-1827

SHHH/AD  
4848 Battery Lane  
Suite 100  
Bethesda, Maryland 20814

#### **Programs Funded by National Institute for Handicapped Research**

Rehabilitation Engineering Center for the Deaf and Hearing Impaired  
Gallaudet Research Institute  
Gallaudet College  
800 Florida Avenue, NE  
Washington, DC  
202/651-5440  
Raymond Trybus, Ph.D., Project Director

Rehabilitation Engineering Center on the New Generation hearing Aids  
The Lexington Center, Inc  
30th Avenue and 75th Street  
Jackson Heights, New York 11370  
Alan Lerman, Ph.D., Project Director

Rehabilitation Engineering Center on Sensory Aids for Blind and Deaf  
Smith-Kettlewell Institute of Visual Sciences  
2232 Webster Street  
San Francisco, California 94115  
Dr. Arthur Jampolsky, Dr. John Brabyn, Project Directors

University of Arkansas  
Board of Trustees  
Fayetteville Campus  
Fayetteville, Arkansas 72701  
Douglas Watson, Ph.D., Project Director  
Core Area Improving Vocational Rehabilitation in Postsecondary Education Programs for Deaf Individuals

University of Arkansas College of Education  
Fayetteville, Arkansas 72701  
501/371-1654, TTY 501/371-1656  
Douglas Watson, Ph.D., Project Director  
Core Area Vocational Rehabilitation of Individuals with Deafness/Hearing Impairments

## TELECOMMUNICATION DEVICES FOR THE DEAF (TDDs)

Telecommunication Devices for the Deaf (TDDs) are growing in popularity daily. A TDD lets a deaf person make a telephone call directly to another person having similar equipment, without the need for an interpreter, since the conversation is typed through one machine to another machine instead of being spoken.

**Some Sources for TDDs**

American Communication Corp  
180 Roberts Street  
East Hartford, Connecticut 06108  
Voice and TDD 203/289-3491

C-Phone, Inc.  
553 Wolfner Drive  
Fenton, MI 63026  
Voice and TDD 314/343-5883

CYBERTECH, Inc  
P O Box 543  
Thornhill, Ontario  
CANADA L3T 4AZ  
Canadian TDD

Krown Research, Inc  
6300 Arizona Circle  
Los Angeles, California 90045  
Voice and TDD 213/641-4306

Northern Telecom, Inc  
Advanced Telephone Products Division  
640 Massman Drive  
Nashville, Tennessee 37210  
Voice 615/883-9220  
TDD 615/889-1627

Phone-TTY Incorporated  
202 Lexington Avenue  
Hackensack, New Jersey 07410  
Voice and TDD 201/489-7889

Plantronics  
345 Encinal Street  
Santa Cruz, California 95060  
Voice and TDD 408/462-5606

Specialized Systems, Inc  
11339 Sorrento Valley Road  
Dept TBJ  
San Diego, California 92121  
Voice 714/481-6000  
TDD 714/481-6060

Ultratec, Inc  
P O Box 4062  
Madison, WI  
Voice and TDD 608/273-0707

Weitbrecht Communications, Inc  
655 Skyway, Suite 230  
San Carlos, California 94070  
Voice 415/592-1622  
TDD 415/592-1623

For more information on TDDs, contact Telecommunications for the Deaf, Inc (TDI), 814 Thayer Ave,  
Silver Spring, MD 20910, 301/589-3006 (voice/TDD)

**A Service for TDD Users**

Even if the other person doesn't have a TDD, you can still communicate using your TDD. There are several new services around the country which help make the connection. TDD users call the service which connects (on a second line) by voice to the called party. Both lines are kept open simultaneously, so that a complete two-way conversation may take place quickly and easily. The service operator reads the calling party's typing on a TDD unit, the called party then hears the service operator's voice reading and responds in speech, which the service operator then types on a TDD for the calling party to read. The same service, in reverse order, may also apply for persons calling someone who uses a TDD device. Most services are operated by voluntary organizations and do not charge a fee. The only costs are the regular telephone charges between the TDD user and the service, and between the service and called party. However, in some areas, these services are run on a monthly fee-for-service basis.

**Assessment of TDD Technol**

Applied Concepts Corporation has been awarded a research contract by the US Architectural and Transportation Barriers Compliance Board to help the Board complete its minimum guidelines for TDD use in federal facilities. One of the purposes of the study is to provide the Board with an assessment of present and future technologies for use in TDDs. A report should be available in the fall of 1984. For more information on the project, contact Sally Free, Office of Technical Services, Architectural and Transportation Barriers Compliance Board, 330 C Street, SW, Washington, DC 20202, 202/472-2700 (voice or TDD).

Also see **COMMUNICATION** and **EDUCATION & VOCATIONAL TECHNOLOGY**

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# Microcomputer Applications

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## MICROCOMPUTER APPLICATIONS

### INTRODUCTION

"A group of statisticians once rated the efficiency of various species in motion. They used the criterion 'Which one can get from point A to point B with the least amount of energy exerted?'"

"The condor won. The human being came in about a third of the way down the list."

"Then the scientists re-rated each species, but this time put the human on a bicycle. Suddenly we humans were twice as efficient as the condor."

"Personal computers can work the same way as the bicycle -- as amplifiers of human ability."

"There are an estimated 20 million people in the United States with some disabling physical handicap. Of that number, 7.9 million are severely disabled. The numbers are great, but each disability is unique -- because each person is unique."

"Although an ideal computer system for the disabled doesn't exist, the pieces, and the knowledge necessary to assemble a computer system to meet specific needs do exist."

"By improving the applications that exist today, we can develop the personal computer into a more powerful tool for everyone."

From the Introduction to Personal Computers and the Disabled, A Resource Guide, Apple Computer, Inc., Cupertino, CA 95014

In the not too distant future, it will be strange to look on this section called Microcomputer Applications and wonder why a separate section was pulled out of the other function-oriented areas in this book. It will probably look as peculiar as if there had been a section on the use of books, or applications of paper and pencil. In 1984, however, we are not yet ready to position information on computers solely within their functional application areas, e.g., environmental control, education, worksite. The field is too new, the potentials not fully understood, and we are still learning -- how, when, where, why -- to use this new tool effectively. These tools may even make our traditional functionally separate categories obsolete (home, work, play, etc.) More likely, though, computers will slip into the background and become like the motor vehicle, a part of every aspect of our lives.

We are all influenced by this new technology. Whether we are enthusiastic, intimidated, or just confused, the computer is here to stay.

Even if you are diligently trying to ignore them, it is becoming increasingly difficult to avoid the references to computer applications for just about everyone and everything.

Disabled people, special education and rehabilitation are obvious areas which can benefit from microcomputer applications. There has been an

explosion in the number of workshops, conferences, publications, hardware and software developed and targeted at the disability market. Even so, the need is far from satisfied.

The potential and range of applications is mind boggling! For example, at a recent conference in California, "Software for the Handicapped and Vocational Rehabilitation," the range of presentations included:

- Single Switch Training and Software for the School Age Population
- A Computer Assisted Communication System for Aphasic Adults
- Vocational Considerations for Application to Computer Technology
- Environmental Control Systems
- Software Applications for Multiply Handicapped School Age Children -- Group Problem Solving and Social Interaction
- Robotics
- Computer Access by Voice Recognition
- Software for Traumatic Head Injury

### GENERAL GUIDELINES FOR SELECTION OF COMPUTERS

"When trying to select a computer for a given application, there are a number of considerations. Actual purchase of the computer is generally the last rather than the first step in this process. The recommended procedure is as follows:

1. What do you want the computer to do?  
"Very carefully define exactly what it is that you want the computer to achieve. 'I want it to help him with his schoolwork', 'I want it to help him write', 'I want it to help him communicate', are not sufficient definitions of need. These are general goals or wishes, but not specific functions that you wish the computer to achieve. 'I would like the computer to provide him with some mechanism for printing out messages' or 'I would like it to provide a mechanism for him to write out his homework, making corrections, both at home and at school', or 'I would like it to provide my blind son with the ability to write out work and be able to detect and correct his mistakes both at home and at school' are better definitions of needs. In making your description of the needs, use as many paragraphs as necessary, and be as absolutely explicit as possible."

2. Is there a simpler alternative?  
"When exploring solutions to your problem, look at both computer-based and non-computer-based techniques or approaches to the solution. Also look at technology- and non-technology-based solutions. Often, a simple strategy or technique may be a more powerful and more flexible solution than the electronic or computer-based aid."

3. Is appropriate software available?  
"No computer is of any value without software. The next step should therefore be to identify whether software exists, for any computer, which will provide the functions desired. Carefully examine any software packages available to see

whether they provide all of the functions required, or whether they will need modification. Modification to software can be extremely expensive, or impossible, depending upon the complexity of the program, the language it's written in, and the availability of the source code. Writing a program from scratch can be very expensive. A program which could be purchased for \$50-\$100 may cost \$20,000-\$200,000 to write. Many of the more expensive programs may have cost \$500,000-\$1,000,000 to develop and perfect.

**4. Do the software really do what you want it to?**

"Get hold of the software packages (or hardware modifications) and try them out. Many pieces of software sound good when described, but fail to deliver much when actually tried. Also, it is very easy to have over-optimistic expectations of the value of computers in carrying out various tasks. A good demonstration of the software in use can reduce many of these problems, and help to identify truly useful software packages or hardware modifications/modules.

**5. Which hardware does it run on?**

"If the software is available for multiple computers, evaluate the various computers to determine which one would be the best for your particular application. The physical characteristics of the computer, its specific features and capabilities, the likelihood that additional software in this area will be developed for each computer, and the availability and maintenance of the computer locally are all factors which should be taken into account.

**6. How can I compare them?**

"If several computers appear to be equally good, some type of a scoring cross-comparison may be useful. The individual items discussed would be listed, along with a notation as to whether they were absolutely required, highly desirable, desirable, or optional. The various computers can then be compared. Any computer which fails to provide an absolutely required item would be automatically disqualified. Points could then be scored for the other items, and the systems compared against each other in this manner.

**7. Is the solution adequate?**

"Check to be sure that the solution is sufficient. Just because you have identified the best of the computer/software packages available does not guarantee that you have a package which is good enough to meet your particular needs or to justify the expenditure. In some cases, it is wiser to wait for additional developments than to move immediately and purchase something which in fact will not meet your needs.

**8. Have I got all the pieces?**

"Finally, when you have identified a package which is both optimal and sufficient, proceed to purchase all of the components required. When comparing different computers, be sure to compare the entire package price. Often, a computer will look to be less expensive, but its cost will rapidly rise as all of the various accessories and modules are secured to complete the system.

"Throughout the process, remember that a little extra legwork on the front end can prove invaluable

in the final selection. Also, if you do not see a piece of hardware or software that really meets your needs, do not be afraid to hold off and wait for developments. The field at this time is expanding very, very rapidly. New hardware and new computers are constantly being announced. New programs and special modifications are also being developed in the area of rehabilitation. Check summary documents such as the Trace Center International Software/Hardware Registry of Programs Written or Adapted for Handicapped Individuals to see what programs/modifications are available or under development in your area. A short note to some of the principal developers in the area to ask whether they are aware of any new research or aids may also be helpful in identifying new software packages or special hardware adaptations which are still in development stages and not yet documented."

Excerpted from Comparison of Apple, Epson, IBM Microcomputers for Applications in Rehabilitation Systems for Persons with Physical Handicaps 1984, Trace Research & Development Center, University of Wisconsin-Madison, \$8.50

The complete document also includes the following information:

- a) an overview of considerations regarding the use of microcomputers with/by handicapped individuals
- b) a cross-comparison of computers and their features
- c) a cross-comparison of different sized system configurations for each computer
- d) a discussion of the different computers in terms of the considerations discussed under (a) above
- e) a comparison sheet for evaluation of your own needs

**COMPUTER SHOPPING FOR THE BLIND CONSUMER**

Know what you want to do

"What are your intended applications? There are no universal solutions. Your choices in software, assistive aids, and the computer, all depend absolutely on the intended application. Don't shop the computer first and then look for something it can do.

Talk to blind users

"If you know what you want to do, talk to blind users doing the same thing. This is the hard part. Unless you have a blind friend who uses computers, you'll probably need help. To start, call manufacturers and distributors of software and aids specifically designed for blind users and ask for names of their customers. Local and national organizations that work with visually impaired people, many VA hospitals, and even some computer user groups can prove good resources.

"A number of newsletters regularly print detailed product comparisons, evaluations, and reviews of unusual computer applications for blind users. In addition to Update, some of the better ones are by David Holladay (717)523-6739, Joe Giovannelli (Blind Apple Users Group) (516) 333-0171, Vito

Proccia (415)365-8102 and CPH-2 (312)477-1813  
Two recent books on the subject have been published by the Carroll Center for the Blind (617)962-6200 and the National Braille Press (617)266-6160.

The local computer store

"Be wary of advice from the local computer store. They will rarely have any knowledge about software for blind users, or be able to answer questions on interfacing assistive aids with the computer. And if you haven't done your homework, many computer sales tyoes can easily overwhelm and confuse you with their technical jargon. The same advice is true for computer-literate, sighted friends. They will generally be interested in the latest state-of-the-art advances and consider obsolete the machine that may be best for your purposes.

First find the software:

"Software is the brain of the machine, it makes the computer do what you want. After talking to other blind users, you should know what your software choices are, as well as the available aids you may need and the computers they interface with.

"Here are some dangers to be aware of. Line-oriented displays software that displays information left-to-right on a line as opposed to full screen) often requires line-oriented computer aids (called serial). And sometimes software is protected\* so it will only read directly to the computer monitor, thus bypassing your voice output synthesizer or braille device. So make sure your software can be intelligibly read by your assistive aids and computer. In many cases you won't be able to use commercial software such as Visi-Calc, or word processing packages that have full screen editing features.

"Finally, equipment interfacing (connecting different pieces of hardware to the computer) is an onerous bogeyman that haunts all computer users. As in, as with software, make sure your assistive aids and peripheral devices all connect to the computer and each other.

Try before you buy

"This will be difficult, but before buying, arrange a demonstration of the system you've chosen, including all software and aids. This may mean traveling, but remember, you're considering an investment of \$3000 to perhaps more than \$20,000. Some organizations (see the November Update) are now, or will soon be, offering hands on demonstrations of computer access aids. Also contact vendors of special equipment for blind users, they can sometimes assemble a local demonstration not only of their device but of the other hardware you want to try.

Watch where you buy:

"Stay with reputable, known dealers. At the same time, of course, price is a very important consideration. Fortunately blind consumers today breathe a much more bracing, competitive air than in the past. There are many good software packages, voice output devices, braille printers, and modified computers offered by healthy, young firms that should be considered. Blind consumers are no longer hostages to a handful of high priced

manufacturers competing in a small marketplace.

"With that said, make sure your vendor offers support for its product. Ask for the names of several customers and investigate the firm. The support should include service assistance (local, factory and telephone hot-line), regular product updates, and a new product warranty, followed by a reasonably-priced service contract. For more information, see this issue's 'Buyer Beware' article."

Reprinted with permission from "Sensory Aids Technology Update", January, 1984.

\*Editor's note: I asked Gregg Vanderheiden to comment on the problem of protected software. His reply was:

"Protection of software itself does not usually cause this problem. Protection is only one of 6 or more possible causes for this, and is usually not the culprit. This problem is just as common in unprotected high speed software. Some causes are:

- 1) Software bypass of operating system to gain speed
- 2) New patch needed for program wipes out your patch
- 3) All memory is used leaving no room for your patch
- 4) Software just assumes empty computer and kills patch by accident
- 5) Software clears out computer to make sure other patches from old program are removed so user won't have trouble using this program
- 6) Software clears out other programs and patches to help protect this program from being copied."

Another somewhat longer article on computer selection for blind people, entitled "How to Select a Computer" by Harvey Lauer, appears in the CPH Bulletin Vol XIX, No 7, 1st Quarter 1984, Issue 50.

Also refer to the reference books in this section.

## AN ISSUE OF ACCESS

## IN CIRCUITS AND COMPUTERS: PROVIDING ACCESS TO COMPUTERS AND INFORMATION SYSTEMS FOR DISABLED INDIVIDUALS

Gregg Vanderheiden, Trace R&D Center, raises the disturbing issue of how computers could become the greatest new handicap that disabled people will ever face.

He points out that computers have the very great potential of creating new barriers and widening the gap between disabled and able-bodied people, rather than helping the disabled individual overcome these gaps.

"How does a computer become a barrier? First, we have to realize that the computer was not invented for the individual with a disability. We get so excited about all of the potential uses of the computer to carry out special activities for individuals who have disabilities that we forget that the reason computers were developed, and the reason the technology is racing ahead and the prices are dropping, is that they are very rapidly being applied and incorporated into the lives of non-handicapped individuals. They are extending the capabilities of able-bodied individuals, increasing their efficiency and effectiveness, and providing them with new capabilities. Computers are showing up at an ever-increasing rate in our educational system. Soon there will be computers in all classrooms, and they will be used as routinely as blackboards and pencils and paper are today. Similarly, employers are making more and more extensive use of computers in all aspects of employment. Even in daily life, we may soon be doing most of our ordering and bill-paying using computer terminals and the like from our homes. In all of these cases, however, the software is being written to be operated by individuals who have use of all senses and fingers. As such, they are for the most part unusable by individuals who have various types of physical disabilities. Thus while we are busy providing handicapped individuals with ways of using a computer to act like a typewriter, pencil and paper, or environment control system, to parallel the manual activities of non-handicapped individuals, the rest of society is busy moving on to the next generation where many of these activities will be carried out much more efficiently and effectively in totally different ways using computer technology. Moreover, these new ways are designed to make maximum use of all of the senses and movement patterns of able-bodied individuals, and may thus exclude many handicapped individuals.

"So, while the computer is advancing handicapped individuals two steps through the use of special programs designed for handicapped individuals, the computer is advancing everyone else in society five steps. Moreover, the five steps are being designed in such a way that the handicapped individual often can not take advantage of them, thereby leaving them actually three steps behind.

"For example, we now find bright physically handicapped individuals being placed in the classroom, where half of the classwork is being done on

computers. Although these handicapped individuals have the few special programs which have been written for them, and which they can operate with their limited physical abilities, they are unable to use the much larger (on the order of a hundred to a thousand times larger) body of standard software which is being used by the rest of their class, since they are physically unable to operate it. As a result, half of the classwork (and the educational system) is inaccessible to them.

"Other individuals, moving into the job market, find that companies are not interested in the fact that these handicapped individuals can use their own computer and their specially adapted programs. The employer is only interested in whether the disabled individual is able to operate the accounting program running on the company's computer. If not, then he can't carry out the job, and is unemployable, despite the fact that he has a computer and a program he can operate. Care must be taken to distinguish between having the ability to do something or operate a computer and the ability to operate the programs and computers that are required. This is roughly akin to being able to easily access your bathroom at home, which does you little or no good if you cannot use the facilities on the job. It's not enough that you can access a bathroom -- you have to be able to access the bathrooms that are in the environments where you need to operate.

"Even in the home, however, this problem can arise. As we move toward telecommunication systems where ordering and bill-paying is carried out through specialized communication links, it will become necessary for the handicapped individuals to operate the specific keypads or control panels on these automatic home communication systems. If standard computer terminals were used, then a specially adapted terminal for the handicapped might be usable. More likely, however, due to security and other considerations, very specialized systems will be used. Then, what could have been a very powerful capability for handicapped individuals (remote ordering and bill-paying) will instead be available only to non-disabled individuals.

"Thus, although custom software programs can provide a great number of very useful capabilities to handicapped individuals, custom software is not enough. Access must be provided to the world of standard computers and, most importantly, to the world of standard software, if computers are in fact to result in a net gain for handicapped individuals.

"The first method that comes to mind for providing access to standard software is to simply modify the software so that it can also be used by handicapped individuals. However, this is an extremely difficult proposition, even when support from the original software developer is available. Again, for security and commercial reasons, most standard software is a carefully guarded and protected commodity, making modification almost impossible. Moreover, the software programs are continuously updated and revised, making it impossible to keep



handicapped users supplied with a modified version. It should be remembered that modifying a single program can cost between \$8,000 and \$20,000, writing a program from scratch can cost anywhere from \$5,000 to \$2,000,000 and up

### Transparent Access

"The only real solution to the problem is therefore the ability to provide transparent access to computers. Transparent access refers to the ability of the handicapped individual to access the computer in such a way that the computer program cannot tell in any way that the input is not coming to it in the standard fashion. For example, if a program is written to accept input from the keyboard, the modification must be made in such a way that it is impossible for the program to tell that the input is not coming from the keyboard.

"One technique that can be used is a keyboard emulator. The keyboard emulator is a small module which is installed inside a computer between its normal keyboard and the rest of the computer. Once installed, it does not affect the operation of the computer in any way. The keyboard operates in exactly the same fashion as it did before. The emulator, however, provides a small port or plug point where individuals using specialized communication aids can connect. They can then use their specialized communication system (which they may operate using eye movements, head movements, or sip-and-puff, etc) to generate their 'keystrokes' which are then fed to the keyboard emulator. The keyboard emulator in turn feeds them into the computer in such a way that it looks as if they were actually typed on the computer's keyboard. With a keyboard emulator installed in a computer, a wide range of individuals having very different communication aids and input techniques would be able to use the computer and all of its software without requiring any modifications of any kind to any software.

"In a classroom, for example, there might be fifteen computers lined up along one wall on which the students carry out their written assignments, etc. Two of the computers might have keyboard emulators installed in them, and a small 'access' sticker similar to that found on restrooms placed on the computers' cases. Any individuals who are unable to use the standard input keyboard could then use these two computers and control them using their specialized communication or writing systems. When not being used by handicapped individuals, these two computers could be used by anyone else. The situation would in fact look very much like a bathroom, where one or two stalls have been modified for use by handicapped individuals. The difference here would be that the non-handicapped individual would not be able to distinguish in any way (except, perhaps, by seeing the access sticker) that any type of modifications had been made to the system.

"For visually impaired individuals who cannot use the CRT display, substitute displays using tactile and voice output are under discussion and development. One proposed system uses a pad about the size of a pad of paper, which the blind individual touches. Wherever he touches the pad, the con-

tents of the CRT screen corresponding to that portion of the pad are read vocally to him. This system can therefore be used by individuals who are blinded later in life as well as those who are congenitally blind, since it does not require any learning of special skills, such as Braille, etc.

"The problem, however, is not solved yet. While we are now coming up with solid solution strategies to deal with transparent access to keyboards, the computer designers are busy inventing non-keyboard methods for input to computers. Most of these input methods take increased advantage of the many physical abilities of the non-handicapped individual, as a result, they are even more difficult for handicapped individuals to operate than the keyboard. These input techniques include 'mice', voice inputs, and body tracking techniques. In addition, more complex video displays are being used, with heavy use of graphics and visual-spatial representation, which will make the task of providing alternate displays for visually impaired individuals even more difficult. The development of new strategies to deal with these problems, as well as the raising of the awareness level of computer designers to these problems, is therefore very important, and needs to be one of our highest priorities.

"So, where do the curb cuts come in? Let's imagine for a moment a town where there are only roads, and no sidewalks of any kind. Individuals in wheelchairs are not allowed on the road, and are therefore trundling their chairs across the grass. This of course is a very difficult activity, so they greet with great anticipation and joy discussions about putting little concrete runways along the side of all the roads, on which people can walk. Although it's clear that these walkways aren't being put in for the specific benefit of handicapped individuals, it also appears that it will be a tremendous boon to them. In all the celebration, though, people don't notice that along with the sidewalks come curbs. Thus, when the whole system is installed, the handicapped individuals find that they are now able to move very swiftly around on their own block, but for the most part are unable to access these nice pathways that have been laid throughout the society. Moreover, putting in the paths increased everybody else's ability to get around, thus making the difference between their mobility that much greater. They could put ramps on the sidewalks near their homes, or in the places that they go to a lot, but they really need to be able to access all of the little pathways if they are to be able to get around and about.

"Today, we find ourselves in exactly the same situation with regard to the area of computers and information systems. Very rapidly, our society is moving toward electronic assisted everything. In the process, electronic pathways are being laid throughout our society -- pathways which could tremendously increase the functional mobility and capabilities of individuals with physical and sensory disabilities. All of these electronic information pathways will be of little use, however, if unrestricted access is not available. Patching one or two access points is not sufficient, in the same manner that providing curb ramps or curb cuts for some of the sidewalks is

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not sufficient

"My message to you today is, let's not wait until all of the sidewalks have been laid and the curbs poured before we begin talking about curb cuts. It's incredibly expensive to go back and tear everything up to install the curb cuts later. Let's identify the problem and move now so that we can pour the curb cuts and provide unrestricted transparent access while we are laying these electronic pathways.

"It is certainly a bright, shiny and dynamic field. The potentials are enormous. But as it races ahead -- and continues to evolve -- it will be a continuing challenge to make sure that we maintain open channels of access -- unlimited unhandicapped access -- to these systems and all of their software. This applies not just to computers, but to the information systems they are going to generate. As we go through our society developing and creating these wonderful computer systems and information highways, let's make sure we don't forget to build the means to access them at the same time."

Gregg C. Vanderheiden, Trace R&D Center on Communication, Control, and Computer Access for Handicapped Individuals, University of Wisconsin-Madison

Excerpted from a Keynote Speech at the Indiana Governor's Conference on the Handicapped, October 13, 1983

**COMPUTER-RELATED INFORMATION FROM THE TRACE CENTER**

The Trace Center has a 10-page listing of publications related to communication and computer access. These publications, available from the Trace Center, are:

Access Problems with Computer-Based Services EJ Desautels. October 1983. Published by the University of Wisconsin, Department of Computer Sciences, Technical Report #516. 16 pages. Automated library services which students interrogate through computer terminals are becoming commonplace. This report examines the situation at the University of Wisconsin-Madison campus, and analyzes the general computer access problem in libraries as it impacts upon severely handicapped students.

Blissapple Description \$15 (one copy free). This is a brief descriptive overview of the Blissapple program, including a listing of the hardware necessary to implement the program, the capabilities of the program, and some applications.

Blissapple Program \$35.00 (Manual only -- \$20.00). This program allows a standard Apple microcomputer to function as a Blissymbol writing device. The program is on a 5" floppy disk. The price includes the program, a special "fix" disk to allow the program to be double-booted, and a 2 1/2-page manual.

Comparison of Apple, Epson, IBM, Microcomputers for Applications in Rehabilitation Systems for Persons with Physical Handicap. Revision D, 1984.

GC Vanderheiden. This report provides a framework and discussion for comparing microcomputers as they relate to applications in rehabilitation. The report is structured in such a way that it can comparatively evaluate the systems in terms of costs and functions, and is formatted so that it can be used to profile and compare other computer systems. Information on the IBM PC, Apple IIe, TRS-80 Model 3 and 100, Epson HX 20, Sharp 1500/Radio Shack PC2, and HP75 are provided as examples.

Considerations and Approaches to Modifying and Designing Terminals to Allow Access by Handicapped Individuals to Data Processing Information Retrieval Systems. GC Vanderheiden. 1981. \$2.00. This paper discusses some of the potentials and problems involved in making computer terminals and data processing systems available to handicapped individuals.

International Software/Hardware Registry. GC Vanderheiden and L. Walstead. \$15.00. Program and adaptations for microcomputers to facilitate their use by handicapped individuals. Section 1 of the registry and listing provides a one-page description and a cross-reference listing of programs which have been written or adapted for use by individuals with handicaps. Each one-page entry includes a description of the program, the computer used, memory required, language used, accessories required, and current status and availability. Section 2 contains selected software that is not written for use by handicapped individuals, but which is particularly useful in offsetting their special needs. Section 3 provides a one-page categorical listing of special hardware modules and adaptors to facilitate use of microcomputers by handicapped individuals. Section 4 provides additional notes on adaptations and tips on the use of microcomputers by handicapped individuals. However, if you are looking for information on controls, switches, mounting, accessible accessories, etc., you won't find them in the Registry, please refer to the Non-Vocal Communication Resource Book from the Trace Center, the Rehab Sourcebook, or the Guide to Controls from Children's Hospital at Stanford, and to the sections on **CONTROLS, COMMUNICATION, and ENVIRONMENTAL CONTROL** for references on these topics.

Practical Application of Microcomputers to Aid the Handicapped. GC Vanderheiden. January 1981. \$1.00. Microcomputers are providing rehabilitation engineers with powerful tools for designing cost-effective assistive devices. Potentials, approaches, and current shortcomings are discussed.

These publications are available from Report Service, Trace Center, 314 Waisman Center, 1500 Highland Avenue, Madison, WI 53705. Prepaid, US dollars only, payable to "University of Wisconsin--Madison."

## USING A COMPUTER WHEN YOU CANNOT USE ITS STANDARD KEYBOARD

The Trace Center provided the answer to the following question. If you are still a little naive about computers and don't understand all the jargon, please refer to the glossary in any of the mass market "intro to computer" books

**How can I use a computer if I can't use its standard keyboard?**

At the present time, there are four basic approaches for using a microcomputer or large computer, even if you have difficulty with the standard keyboard

### 1) Custom Software

There are a number of custom software programs which have been written or adapted for use by handicapped individuals. Some of these programs require as little as one switch to operate. These programs generally run on the standard computer with little or no modification. They allow the handicapped individual to use the computer for these programs, but, since the computer can only run one program at a time, it is not possible to use these programs to control other standard computer programs

Some of the new operating systems, however, are allowing options which allow you to specify you want the "keyboard" input to come from in such a way that it does not affect the operation of the rest of the computer or the use of the computer's screen for the display. If a serial input port is specified as the "keyboard" in this fashion, it provides the equivalent of a "keyboard emulator", as described below. This emulator, however, will only work with software designed to run on these operating systems

### 2) Modification to the System Software

This approach involves changing the firmware (fixed software) which other programs use to read the keyboard, etc. One could modify the BIOS in a CP/M system, for example. Any software used in the CP/M system thereafter could end up getting its input from a special interface whenever it asked for the input from the keyboard. This approach would theoretically allow the handicapped individual to use any standard software written for the microcomputer and operating system. Unfortunately, there are many pieces of software which use tricks of various kinds to increase their speed or flexibility. These tricks often rely on an unmodified operating system or circumvent the operating system (or monitor routines). As a result, these software system modifications provide only a partial solution, and work with only an unpredictable subset of the software for any given microcomputer. At the present time, no good patches or modified software systems have been identified. As they are identified, they will be listed in the Software/Hardware Registry

### 3) Keyboard Emulators

About the only way to guarantee that a handicapped individual will be able to use standard software

is if it is impossible through any software means to tell the difference between the handicapped individual using the keyboard and using his special interface. To accomplish this, a keyboard emulator could be used. This emulator would plug into the computer between the keyboard and the computer, and would look electrically identical to the keyboard. The handicapped individual would use whatever communication aid or interface was most appropriate. The output of the aid would be fed into the keyboard emulator, which would then feed it into the computer as if it had been typed on the keyboard. By using a keyboard emulator, therefore, an individual on a scanning aid, for example, would be able to use any standard software written to be operated by the keyboard of that computer. (Programs which used game paddles or push buttons would require game paddle or push button emulator capability as well.) Because the individual would be able to do anything from his "keyboard" that anyone else could do from the normal keyboard, he/she would be able to write programs for the computer as well as run existing programs

Use of a keyboard emulator does not affect the normal uses of the computer in any way. The normal computer keyboard remains active and functional at all times, whether the keyboard emulator is being used or not. Thus, installation of a keyboard emulator in a computer allows access to the computer by handicapped individuals using special aids, but does not in any way degrade the function of the computer for non-handicapped users

### Commercially Available Keyboard Emulators

Several keyboard emulators are currently available. Prentiss Romich Company (PRC) makes one which is designed to work with their Express communication aids. This keyboard emulator uses a two-wire serial ASCII input on a 1/4" phone jack. Although designed to work with the Express aids, this emulator can also be used by other serial output communication aids. No "busy" line is provided, the sending aid must therefore be careful to not send characters faster than the computer is expecting them, or they will be lost. This emulator has a switch which allows it to be used with aids having standard RS-232 output as well as with the Express aids. PRC currently has keyboard emulators available for the Apple II, Apple IIe, Atari, and IBM.

ZYGO also has an Apple keyboard emulator. It can also be used on the Franklin Ace. This emulator works only with the ZYGO communication aids, and has a special connector which interfaces directly to the connector on the side of the ZYGO aids. Since the ZYGO is not normally able to put out full words, the keyboard emulator has been designed to handle or provide some full-word commands in addition to single characters (e.g., "CATALOG", "RUN", etc.). ZYGO also has the TETRA-SCAN aid, which is a special scanning computer interface which includes its own keyboard emulator. Other related products are also in the works.



The Trace Center is currently working on a series of keyboard emulators. The emulators are being designed to allow access to a broad range of commonly used computers and terminals. Wherever possible, these modules will support a "busy" line to allow communication aids to send out complex command strings to computers. These emulators will then meter the commands to the computer as it is ready to receive each successive command or keystroke.

The interface card by Paul Schwejda (see below) also has a keyboard emulating capability in addition to its other input modes.

Johns Hopkins University has also developed a Morse code interface which has a built-in keyboard emulator. This unit is now being marketed by Medical Equipment Distributors in Chicago. It is designed to be used with the Apple II Plus computer.

For further information on these and other keyboard emulators, see the International Software/Hardware Registry.

4) Parasitic, Transparent Systems with Integral Keypcard Emulators

The previous section described the use of keyboard emulators with independent communication aids. They could also be independent interface systems which are physically built into the same box as the computer, but which have their own intelligence, display, etc. This is the most straightforward and fool-proof method to provide the handicapped individual with a means for controlling the computer in a way that will still allow the use of standard, unmodified software.

There are ways of accomplishing the same basic objective, however, without using fully independent systems. These techniques, however, in order to carry out their task of being compatible with all software, must exist within the computer without a) taking up any memory space, without b) altering the state of any portion of the computer, and without c) using up any CPU time. Since it is impossible to do all three of these things, none of the techniques in this category will work with all software. The amount of software with which they will work is purely dependent upon how cleverly they are implemented. In general, they are not as good a solution as using a keyboard emulator and having the second computer or a communication aid do the actual interfacing with the handicapped individual. Techniques in this category can, however, be less expensive than having a second independent computer/aid.

Two different efforts in this area should serve as examples. One effort is the Adaptive Firmware Card by Paul Schwejda, in Seattle, Washington. The second is a project under development at the Trace Center.

Paul Schwejda's Adaptive Firmware Card is designed to be used with the Apple microcomputer. It provides several different input modalities, including 1) assisted keyboard (for one-finger or mouthstick operation), 2) various types of scanning (for single-switch input), and 3) morse code

(for multi-switch encoding). The card plugs into slot 7 in the microcomputer, where it is the first to be scanned at start-up. The card has a keyboard emulator built into it which allows it to control standard software. The card also has an interface box which mounts to the side of the Apple and allows users to connect special keyboards, switches, etc., to the firmware card, and use them for input.

The firmware card has all of its programs stored in ROM on the card itself. Thus, it uses no space in the computer for its programs. In addition, it has sufficient RAM on-board to be able to run its programs completely independently from the Apple system RAM. Because the card is almost completely transparent (i.e., cannot be "seen" by the computer), and does not use or alter the main memory, the card can be used with most software without modification to the software.

It does use some CPU time, however, and could throw off programs with critical timing loops. (One interesting use of the ability to interrupt the CPU would be to slow the program down by simply stealing a significant portion of the CPU time. Through this mechanism, the firmware card allows users to slow programs down from their ordinary speed, which is occasionally faster than the handicapped individual would desire.)

PLEASE NOTE that there are two different versions of the Paul Schwejda Adaptive Firmware Card, one for the Apple II Plus and one for the Apple IIe.

Software Approach

The second example involves a purely software approach to the problem, although a software-hardware implementation could evolve. This work involves the modification of the operating system to implement other input routines besides the keyboard. This pure software approach is possible due to the design and structure of the operating system. Unfortunately, many programs currently go around the operating system in the computers. Thus, the modifications we make for computer access would be ignored, and many programs would not be accessible. Also, frequent updates to the operating systems by the computer companies could make "patches" obsolete. Work is continuing in this area in coordination with the software/computer companies themselves to see if solutions can be developed.

Summary

There are several ways to interface Apples and other computers to handicapped individuals. Some of these involve modification of the actual software. Others involve modification of the hardware. The best approaches are the one which allow the computer systems to use standard software. These approaches open up a much wider spectrum of materials and opportunity to the handicapped individual. They also allow the individual to actually program the computer himself.

The best overall approach to the problem is the use of a well-designed keyboard emulator. Such an emulator would in fact be transparent (invisible to the computer), and would allow the use of all

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standard software and hardware accessories which are developed for the given computer. The keyboard emulator can be fed from another communication aid or from another microcomputer. For example, a small (inexpensive) microcomputer with a custom program written specifically for that individual (or that individual's type of handicap) could be used with a keyboard emulator in order to allow the individual to access any standard software on a second microcomputer. To do this, the two computers would not necessarily have to be the same make or model of computer, nor even from the same manufacturer. One computer could therefore be chosen to provide the characteristics and capabilities to best match the user's interface needs and abilities at an optimum price. The second computer would be chosen to have the capabilities and characteristics necessary to run the types of programs or utilize the types of standard software that the individual is most interested in using.

For more information on this topic area, see "Computers Can Play A Dual Role," available from the Trace Center Reprint Service or from the September 1982 issue of BYTE Magazine.

The best way to keep up with the latest developments in this area would be to check the Hardware section of the **International Software/Hardware Registry**. This Registry lists special interface programs and hardware modules as they become available.

#### Addresses of organizations cited in this article

Medical Equipment Distributors  
1701 South 1st Avenue  
Maywood, IL  
312/681-2828

Prentke Romich Company  
8769 Township Road 513  
Shreve, OH 44676  
216/567-2906

Paul Schwajda  
Adaptive Peripherals  
4529 Bagley Avenue North  
Seattle, WA 98103

Trace R&D Center  
1500 Highland Avenue  
314 Waisman Center  
Madison, WI 53705

ZYGO Industries  
P.O. Box 1008  
Portland, OR 97207  
503/297-1724

According to the editor of "Network News,"

"The more often a company is asked how to modify their brand of microcomputer for specific populations and uses, the more likely that company will be to incorporate transparent access into the design of their machines. Additional effort on the part of physically disabled individuals and those professionals working with them may be required to keep the interests of physically disabled individuals and other disabled persons in the awareness of microcomputer manufacturers and software producers. Computer manufacturers can be contacted by writing

"APPLE COMPUTER INC., Education Division, 20525 Mariani Drive, Cupertino CA 95014, (408)996-1010

"ATARI, INC., Home Computer Division, P.O. Box 61657, Sunnyvale, CA 94086, (800)538-8547

"IBM/IBM-PC/IBM PC JR., Educational Marketing, P.O. Box 1328, Boca Raton, FL 33432, (404)238-2208

"COMMODORE BUSINESS MACHINES, INC., 1200 Wilson Drive, West Chester, PA 19380, (215)431-9100

"RADIO SHACK, P.O. Box 2625, Fort Worth, TX 76113, (817)390-3700"

"Network News" is a newsletter published by the Technical Assistance and Dissemination Network Illinois Special Needs Population, Turner Hall 205, Illinois State University, Normal, Illinois 61761, Volume 6, #3, Special Edition 1984

SOURCES FOR MORE INFORMATION ON MICROCOMPUTER APPLICATIONS FOR DISABLED PEOPLE

Just because an information source has "computer" and "a word related to disability" in the title does not mean that it will meet your needs.

Computer applications for the disability field seem to fall into 12 major areas. These are best represented in a generic model (below) of computer applications for handicapped persons from Computer Applications for the Handicapped in Special Education and Rehabilitation. A Resource Guide

It has become increasingly important to understand the potential of computers in our lives. But before investing your time and money in books or courses on Computers and the Disabled, make sure you are going to gain the type of knowledge you are seeking, e.g., if you are looking for special hardware and software useful in the classroom for a child with a high spinal cord injury, you are unlikely to find it in a book that gives wonderful references to computer assisted instruction (CAI) materials for learning disabled kids. In your enthusiasm to plug into the world of high tech, be advised to be more selective than this writer was -- or you, too, will have a shelf of useful books that are mostly useless to you. (Editor)

The publications listed below could help guide you through this wealth of information, and help point to the knowledge you seek

An Annotated Bibliography on Computers and the Physically Handicapped, 1981-1983. Available from ACM Special Interest Group on Computers and the Physically Handicapped, Association for Computing Machinery, 11 West 42nd Street, New York, NY 10036

A Beginner's Guide to Personal Computers for the Blind and Visually Impaired. National Braille Press, 88 St. Stephen Street, Boston, MA 02115. 100 pages. \$12.00. This book is written for people who don't know anything about computers. It offers guidelines for buying software, definitions of computer terminology and jargon, a review of six talking microcomputers and a chapter listing information on manufacturers, computer clubs and other useful resources for personal computer shoppers.

Computer Technology for the Handicapped in Special Education and Rehabilitation. A Resource Guide

Nave, G., Browning, P., & Carter, J. Eugene, Oregon: University of Oregon, International Council for Computers in Education, 135 Education, 97403, January, 1983. 190 pages, \$7.00 prepaid. This manuscript provides a means for interested persons to become informed about the newly emerging computer technology and its potential for improving the lives of physically and developmentally disabled individuals. It is a comprehensive bibliography comprised of 191 annotated references on computers for handicapped persons. The references, over half of which have been published since 1980, were drawn from more than 60 different periodicals, books, monographs, reports, and conference proceedings. A detailed descriptive narrative is provided for each reference. As reflected in the subject index, the materials cover a wide range of topical areas, e.g., Computer Assisted Instruction, Functional Aids, Microcomputer Application, Service Delivery, Management, and Research. These and other major content headings are further subdivided. For example, subsumed under the Disability/Handicap heading are the subcategories of autism, cerebral palsy, deaf, developmentally disabled, emotionally handicapped, learning disabled, minimally brain damaged, mentally retarded, nonvocal, physical/general, quadriplegic, and severely disabled.

Consumer Reports has an excellent series of articles on computer selection for the general public. They are usually available at your local library. (The Library of Congress publishes Consumer Reports on sound sheets.)

Microcomputer Resource Book for Special Education. Dolores Hagen. 1984. 224 pp. \$15.95. Almost one third of the book is devoted to a series of appendices which provide information about more than two hundred publishers of software products. Products are grouped by disability area and detailed information is provided about each program's use. Management programs, information on hardware including adaptive devices, and resources on LOGO are also included. Highly readable for parents and teachers.

A Generic Model of Computer Applications for Handicapped Persons

	Education		Rehabilitation		
	Instruction		Management	Functional Aids	
	Student/Client	Teacher/Service Provider		Communication	Independent Living
Physical Disability					
Developmental Disability					

from "Computer Technology for the Handicapped in Special Education and Rehabilitation: A Resource Guide"

Microcomputers in Special Education Selection and Decision Making Process Florence M. Taber

1983 112 pp \$7.95 Provides the kind of information and guidance school administrators and other decision makers need before committing themselves to a given microcomputer system. Considerations related to software evaluation, hardware, and inservice education are covered, including rating forms and questionnaires

Personal Computers and the Disabled, A Resource Guide. Apple Computer, Inc. has prepared this document as a public service to stimulate research into personal computer applications for the disabled.

"This guide brings together a range of ideas and information to help people use personal computers in applications designed especially for the disabled. In it you'll find feature articles on how the computer is helping the disabled to overcome obstacles that once limited career opportunities and job performance. You'll also find articles on how the computer is helping individuals communicate even when motor and speech functions are severely impaired. Some are using personal computers to tap their creativity in art, writing, and computer programming.

"If you are a software developer, original equipment manufacturer, or computer dealer, this guide will introduce you to specific personal computer products and applications for the disabled. If you're already working on applications for the handicapped, this guide provides a way for you to let others know what you are doing."

This booklet has an excellent resource directory listing people and organizations active in the area of personal computers for the disabled. A free copy of the Resource Guide is available from your local Apple computer dealer, or contact Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014

Personal Computers and Special Needs Dr. Frank Bowe. In bookstores and computer stores, or available from Sybex Computer Books, 2344 Sixth Street, Berkeley, CA 94710, 800/277-2346 \$9.95 June 1984

Personal Computers Serving People: A Guide to Human Service Applications, by Robert Lavine Hawkins and Associates, Inc., Washington, DC, 1980. Includes an overview of hardware and software and chapters dealing with personal computers in rehabilitation, education, creative art, and recreation and leisure, selection of a personal computer, recommended readings, other information sources, and a directory of manufacturers.

Signs for Computing Technology National Association of the Deaf Book Store, 814 Thayer Avenue, Silver Spring, MD 20910 \$10.95 plus \$1.50 for postage and handling. This book lists signs for more than 600 computing terms. The book will assist deaf people working in the computer industry, as well as managers and co-workers who want to facilitate technical communication with their deaf peers. The book will also be helpful for data processing instructors teaching deaf students.

Also see the Trace Center Publications which have already appeared in this section

## CLE. RINGHOUSES AND CATALOGS

The Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091, 703/620-3660

A Directory of Microcomputer Software for the Disabled, Timothy Field, Editor. Elliot & Fitzpatrick, Inc., P.O. Box 1054, Athens, GA 30603 1983

HHDB Online Courseware Directory Handi-House CAI, 69 Winchester Avenue, Spruce Grove, Alberta T0E 2C0, Canada 403/962-3933. Handi-House CAI is a division of DSS Decision Support Systems Limited, and was formed in 1982 as a computer software clearing house for individuals experiencing handicaps. The clearinghouse responds to a need for centralized information, consulting, evaluation, and registration of suppliers of computer-aided instruction programs matched to users.

Handi-House offers an inquiry answering service by which clients are provided with a list of software and suppliers matched to individual needs and equipment. Information requests are maintained for one year, during which new updates will be sent to clients as additional software becomes available. Additionally, its software customizing service includes the provisioning and modification of software on a time and materials cost basis.

Data sources include other clearing houses, authors, personal computer suppliers, libraries, data bases, government agencies, research centers, and educators.

The Handicapped's Source, A division of Computability Corp. JA Reston Corporation, 60 Page Road, Clifton, NJ 07012, 800/631-7277, 201/777-2700. This catalog offers descriptions of personal computers, hardware, software, peripherals, and the services available to the disabled individual and those who assist them through rehabilitation and care services.

The MECC Educational Computing Catalog Minnesota Educational Computing Consortium, 3490 Lexington Avenue North, St. Paul, MN 55112 612/638-0627. Contains a complete listing of courseware developed by MECC for the Apple II personal computer and the Atari home computer. Containing a wide range of sections, it includes one on special education which describes several programs particularly suited to handicapped students.

Trace Center International Software/Hardware Registry, Gregg Vanderharden & Lottie Walstead, eds. Trace R&D Center, University of Wisconsin-Madison, 1500 Highland Avenue, Madison, WI 53705 608/262-6966 \$15.00 plus \$2.78 postage & handling. 1983. Updated second edition, July 1984.

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**NEWSLETTERS**

**BAUD** is the newsletter of the Blind Apple Users Group. It is available from Joe Giovanelli, 1158 Stewart Avenue, Bethpage, NY 11714, phone 516/433-0171

**The Bulletin of Science and Technology for the Handicapped**, American Association for the Advancement of Science, 1776 Massachusetts Ave., Washington, DC 20036 No charge

**The Catalyst** Western Center for Microcomputers in Special Education, 1259 El Camino Real, Suite 275, Menlo Park, CA 94025, 415/326-6997 Subscriptions Organizations \$20.00, Individuals \$12.00

**Communication Outlook** is an international publication which provides a forum for individuals interested in the application of techniques and aids for people who experience communication handicaps due to neurological or neuromuscular conditions. It is a cross-disciplinary information source and regularly has articles related to microcomputer applications. Subscriptions cost \$12 (\$15 outside North America), are available from Artificial Language Laboratory, Michigan State University, East Lansing, MI 48824

**Closing the Gap** is a bimonthly newsletter aimed specifically at the use of computers for handicapped persons. The newsletter covers hardware, software reviews and articles on computers as they affect handicapped people in education, independent living and employment. Subscriptions are \$15.00 per year in the U.S., \$22.00 per year in Canada and Mexico, and \$33.00 per year in all other countries. Write to Closing the Gap, Route 2, Box 39, Henderson MN 56044 Phone (612)665-6573

**Link and Go** is published by the Committee on Personal Computers and the Handicapped (COPH-2), a part of the Illinois Congress of Organizations of the Physically Handicapped (COPH). Its purpose is to search out, evaluate, and share information about personal computer systems as relevant to the person with disabilities in its membership. A major stance of its founders is that COPH-2 is a mainstreaming effort which will enable persons with disabilities to use the same computer technologies with the same attitudes as the public-at-large. The newsletter is an excellent information resource. Quarterly, \$8.00, which includes membership dues. Available from COPH-2, 2030 West Irving Park Road, Chicago IL 60618

**Raised Dot Computing Newsletter**: This monthly newsletter focuses on personal computer applications for the blind. It includes information on the use of low-cost Braille devices, voice synthesizers, paperless Braille, and the use of microcomputers in Braille translation. In addition, the newsletter supplies technical notes and information on the use of software and hardware products that extend the performance of Braille-Edit, a product of Raised Dot Computing. Print or audio subscriptions are available from Raised Dot Computing, attn David Kolladay, 310 S 7th Street, Lewisburg, PA 17837 717/523-6739

**Re Able** is a bi-monthly newsletter on computer-assisted living published for the professional community and the disabled. Re Able explores the newest in computer equipment and new technology. Each issue details advances in equipment and applications, with emphasis on the usefulness to the disabled. Evaluations of hardware and software, products, books, and resources provide the professional with information vital to serving the disabled. Subscriptions are \$18 per year (\$21 overseas). Send to Re Able, P.O. Box 384, Bellflower, California 90706

**Sensory Aids Technology Update** is a monthly newsletter on technology and employment issues concerning disabled people. This new publication is a rich source of information on technology applications. It is particularly valuable to people looking for information on sensory aids (hearing and vision), but is also useful for other types of technology. It has features on new products, special employment, education and training programs, unusual applications of technology, and new developments in research. New publications and interesting audiovisual programs are regularly reviewed, and each month the product comparison section profiles similar devices. It includes news from overseas. The articles are concise, and include references to guide you to further information. A typical issue includes Accessing dedicated word processors, Financing adaptive aids, Project Partnership; Equipment demo centers for hearing impaired, Apple software customized for speech output (December, 1983). A one-year subscription to Update is \$30.00, available from Sensory Aids Foundation, 399 Sherman Avenue, Suite 12, Palo Alto, CA 94306.

**SIGCAPH Newsletter** A quarterly publication of the ACM Special Interest Group on Computers and the Physically Handicapped, print and tape cassette versions. Association for Computing Machinery, 11 West 42nd Street, New York, NY 10036

**MASS MARKET COMPUTER MAGAZINES**

**BYTE**, Volume 7, No 9, September, 1982. BYTE Publications, Inc., P.O. Box 328, Hancock, NH 03449 \$3.70. The theme in the September 1982 issue is "Computers and the Disabled". Gregg Vanderheiden discusses how "Computers Can Play a Dual Role for the Disabled," and with co-author Paul Schwejda demonstrates how to make an "Adaptive Firmware Card for the Apple II"; David Stoffel reviews talking terminals for the blind and William L. Rush evaluates the Abilityphone, a device for nonvocal communication, Patrick Dernasco and Richard Foulds show how the Panasonic Hand-Held Computer can be used as a communication device in "A New Horizon for Nonvocal Communication Devices"; Steve Garcia brings you his latest speech-synthesis system in "Build the Microvox Text-to-Speech Synthesizer Part 1 -- The Hardware"; Dr. William Murray reviews The Cognivox VI-1003, a speech-recognition system, Bruce Baker discusses his highly original Minspeak associative memory system for portable speech synthesis and Alfred Fant, Jr. shows you how to use a line printer to produce Braille. In case you're thinking of marketing your own computerized aid, see **BYTE's** overview of the FDA's regulations con-



cerning medical devices

Computer, Volume 14, No 1, January, 1981 IEEE Computer Society, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720, 714/821-8380 This issue carried the overall title "Computing and the Handicapped" Articles included "Computing and the Handicapped Guest Editor's Introduction," Paul Hazan, "Computing and the Handicapped A Promising Alliance," Margaret J Giannini, "Computing and the Handicapped. The Challenge in Education," Henry J Blaszczyk, "Intelligent Prosthetic Devices," M.A. Rahimi, "Communication Devices for the Nonvocal Disabled," Andrew Thomas, "A Computer-Aided Robotic Arm/Workable System for the High-Level Quadriplegic," Wolfer Schneider, Gerhard Schmeisser, and Woodrow Seamone, "Rehabilitation and the Handicapped Programmer," Robert J Leneway and Billy R Montgomery, and "Practical Application of Microcomputers to Aid the Handicapped," Gregg C Vanderheiden

### CONFERENCE PROCEEDINGS

Computers for the Disabled Conference Papers Edited by Janet E Roehl, Ph.D Available from Materials Development Center, Stout Vocational Rehabilitation Institute, School of Education and Human Services, University Wisconsin-Stout, Menomonie, Wisconsin 54751 1984

"This conference provided teachers, administrators, counselors, government personnel, researchers, purveyors of computer technology, and persons with disabilities an excellent opportunity to learn about the advances made in computer technology that are impacting special education and vocational rehabilitation today

"The conference was held September 12-14, 1983 in Minneapolis, Minnesota. There were over 500 participants, 60 presentations, 40 exhibitors, and three keynote addresses

"The Conference Papers offer an abundance of new ideas, research findings, and innovations that were presented at Discovery '83 Part I includes the three keynote addresses They were given by Dr Douglas A Fenderson, Director, National Institute of Handicapped Research, United States Department of Education, Dr Gregg Vanderheiden, Director, Trace Research and Development Center for the Severely Communicatively Handicapped University of Wisconsin-Madison, and Mr Thomas Shworles, Chairperson, Committee on Personal Computers and the Handicapped (COPH-2), Illinois Council of Organizations of Physically Handicapped These addresses are printed in order of appearance

"Part II is the papers presented during the three day conference These include reports of research activity in computer usage, papers detailing the modification of hardware and software, as well as designing of new products The general interest areas were deaf and hearing impaired, blind and vision impaired, physically handicapped, learning disabled, and EMT-TMH"

Computers and the Handicapped Tutorial, Canadian Medical and Biological Engineering, Society Secre-

ariat, 1142 Elmlea Drive, Glouster, Ontario Canada K1J 6V9 613/993-0475 An overview of new programs, accessories and communication aids that work with the Apple II and other personal computers to help the physically disabled The articles were presented in June, 1982, in Ontario, Canada, at a Tutorial sponsored by the Biomedical Engineering Research Program A sampling of the 16 articles contained in the guide include "Interfaces for Physically Handicapped Persons" by J.R Charbonneau, "The Handicapped Typewriter" by Simon Cox and Bill Smith, and "The Application of the Apple Microcomputer as an Augmentative Communication Aid for the Non-Vocal Physically Handicapped" by Penny Parnes and Kathy Lee

Computers and the Handicapped Workshop, Canadian Medical and Biological Engineering, Society Secretariat, 1142 Elmlea Drive, Glouster, Ontario Canada K1J 6V9 613/993-0475 This publication compiles the results of the Workshop on Computers and the Handicapped held in June, 1982, in Ontario, Canada The purpose of the Workshop was to present new developments in the use of personal computers for the handicapped, and to address many of the problems and limitations in this field A sampling of the 17 articles that appear in the guide includes "Choosing a Dedicated Communication Device vs a Personal Computer What Are the Differences and What Difference Does It Make?" by Shirley McNaughton, "Technical and Social Implications of Computer Use by the Handicapped Consumer" by Patricia and John Israel, and "Impact of Low-Cost Microcomputer Technology for the Blind" by Ian Lowrie

Proceedings of The Johns Hopkins First National Search for Applications of Personal Computing to Aid the Handicapped, October 31, 1981, The Institute of Electrical and Electronics Engineers, Inc (IEEE) Computer Society, New York, New York 30 pages 1981 Available from IEEE Computer Society, P O Box 80452, Worldway Postal Center, Los Angeles, CA 90080 A national search for applications of personal computing to aid the handicapped was carried out by the Johns Hopkins University Applied Physics Laboratory This one-year program was sponsored by grants from the National Science Foundation and Radio Shack, A Division of Tandy Corporation Professionals, amateurs, and students were invited to present their ideas and concepts, leading to ten winners being selected by a panel of judges in each of ten Federal Regions of the United States, as well as ten prizes awarded on a national level One important output from this contest was the increased awareness by technical computer personnel of the problems and needs of the handicapped

The sources of the hardware and software resulting from this contest are difficult to locate The Trace Center International Hardware/Software Registry now includes all hardware and software that was reported in this document and is known to be currently available

The Institute of Electrical & Electronic Engineering (IEEE) Computing Society has committed itself to furthering the use of computer technology for aids for the handicapped by creating a Technical Committee (TC) on Computing and the

## MICROCOMPUTER APPLICATIONS

Handicapped, and by supporting such activities as the Johns Hopkins National Search Workshops have been held annually, and proceedings are available

Proceedings of the IEEE Computer Society Workshop on Computing to Aid the Handicapped, November 4-5, 1982, Charlottesville, Virginia Available from IEEE Computer Society, P.O. Box 80452, Worldway Postal Center, Los Angeles, CA 90080

Proceedings of the IEEE Computer Society Workshop on Computers in the Education and Employment of the Handicapped, November 3-4, 1983, Minneapolis, Minnesota Sponsored by the IEEE Computer Society TC on Computing and the Handicapped, ACM-SIGCAPH, and IEEE TC on Computers in Education, in cooperation with Control Data Corporation, Minneapolis, Minnesota Purchase from Everett L. Johnson, Chairman, TC Electrical Engineering Department, Wichita State University, Wichita, Kansas 67208

For information on the 1984 conference, which is scheduled for November 8-9, 1984, in Wichita, Kansas, contact Dr. Elmer Hoyer, Wichita State University, University Box 44, Wichita, Kansas 67208.

This conference will provide a forum for interaction between those involved in the use of computers in special education and those designing the hardware and courseware. Proceedings are also expected to be available from this meeting.

Proceedings of the National Conference on the Use of Microcomputers in Special Education, Hartford, Connecticut, March 1983. Michael M. Behrmann, Editor, Liz Lahm, Assistant Editor 1984 Approx. 200 pp. \$20.00. The Proceedings from CEC's First National Conference on the Use of Microcomputers in Special Education was undertaken to provide state of the art information on the application of microcomputer technology to special educators. Presentations are grouped thematically in five major sections. Section I is an overview and includes the two keynote presentations, the material from the special continuing education training, and other presentations of general interest. Section II, on Management, includes computer assisted management and computer managed instruction. Section III, the teacher training section, is directed specially toward teacher literacy in the use of microcomputers. Section IV includes material on training children in computer literacy and presents some instructional uses with exceptional children. Section V, Computers as Tools, presents papers that show how computers can be used as tools by handicapped individuals. Information about commercial resources gathered from conference exhibitors is also included.



## ELECTRONIC INFORMATION EXCHANGE NETWORKS

A newsletter for those involved in electronic mail systems is Handi-Communications. Quarterly newsletter for Working Group 65 (Computer Message Systems) of IFIP (International Federation for Information Processing), Julian Davies, Editor. Published at the Department of Computer Science, University of Western Ontario, London, Ontario, Canada N6A 5B7. 519/679-3569 or 519/679-6016. Annual subscription \$5.00 Canadian in Canada, \$5.00 US elsewhere. Single issues \$1.50. This newsletter is devoted to the topic of computer communication systems and their use by or for handicapped people. It is published for those concerned that the needs of the handicapped be met in the design and provision of computer message systems. The main focus for Handi-Communications is in Computer Based Message Systems (commonly known as "electronic mail"). They will cover other aspects of telecommunications for handicapped people that have a bearing on message systems, such as terminal design. A hard-copy distribution is the only medium available initially, but proposals to arrange distribution in other forms are welcome. In particular, the text can be made available in computer-readable form, and could be distributed electronically.

## Large Networks

These large networks also provide a means of information exchange for disabled people.

CompuServe, 5000 Arlington Center Blvd., P.O. Box 20212, Columbus, OH 43220. 800/848-8199.

In addition to a wide range of general information, financial data, games, newspapers and a travel bureau, CompuServe offers a database especially designed for disabled computer users. This database includes addresses of organizations providing services to disabled people, information about adapted software, and articles describing various disabling conditions.

Source, Source Telecomputing Corporation, 1616 Anderson Road, McLean, VA 22102. 703/734-7500.

## National Networks Devoted to Disability

CONFER: See **INFORMATION RESOURCES** section, p. 14.

Handicapped Education Exchange (HEX): See **INFORMATION RESOURCES** section, p. 14.

Special Net: National Association of State Directors of Special Education, 1201 16th Street NW, Suite 404E, Washington, DC 20036. 202/822-7933. See **INFORMATION RESOURCES** section, p. 14.

DEAFNET: See **SENSORY AIDS** section, p. 219.

## Model Projects for Local Disability-Related Networks

CHIP Network, 222C View Street, Mountain View, CA 94041. 415/968-8798. The Community Health Information Project (CHIP) is developing a permanent microcomputer-based network called WellNet. This information exchange, based on Apple computers and Communitree electronic bulletin board software, will form the basis of a larger network that will link rehabilitation groups, health-service organizations, and disabled groups and individuals in the Santa Clara Valley and eventually the Bay Area. The network will include a transportation bulletin board (ride board), consumer evaluations of products and services, calendars, attendant referrals, international programs, health care aids, and services to buy, sell, or barter. WellNet currently involves four California-based organizations. CHIP in Mountain View, Physically Limited Services at DeAnza College in Cupertino, Center for Independence for the Disabled in Belmont, and United Cerebral Palsy in Palo Alto.

DEAFNET: See **SENSORY AIDS** section.

"Land of Ah's" Network, Topeka Independent Living Resource Center, 427 Southeast Winfield, Topeka, KS 66607. 913/233-6323. The "Land of Ah's" Network is currently under development by four agencies in the state of Kansas. This Apple-computer-based network will allow the disabled throughout the state of Kansas to share information, resources, and technical assistance on independent living. In addition, disabled volunteers will be trained to operate and maintain the information network, enabling them to become knowledgeable in areas of computer technology. It will also increase their potential for employment. Agencies developing the network include the Topeka Independent Living Resource Center, Independence Living Resource Center, in Lawrence, Operation LINK in Hays, and Kansas Rehabilitation Services in Topeka.

**CONSUMER-RUN INFORMATION EXCHANGE NETWORKS**

Blind Apple Users Group Contact Joe Giovanelli, 1158 Stewart Ave, Bethpage, NY 11714, 516/433-0171

Committee on Personal Computers and the Handicapped (COPH-2), 2030 West Irving Park Road, Chicago, IL 60618 312/477-1813 COPH-2 is a consumer-based organization which provides members with technical assistance, personal computer loans, use of a resource library, and networking opportunities. The organization also designs and produces keyguards to prevent inadvertent striking of keys, publishes a quarterly newsletter, and conducts public education meetings.

Quadriplegics Communications Group Inc., 407-333 Strarbrook, Winnipeg, Manitoba R3L 0J5, CANADA

**Children's Computer User Groups**

Disabled Children's Computer Group, c/o Lawrence Hall of Science, University of California, Berkeley, CA 94720. The Disabled Children's Computer Group was formed in November, 1983 by a group of parents of disabled children. Among the members of the group are parents, teachers and professionals in the field of education, social services and computer technology. The DCCG provides a forum for the sharing of information and experiences about computer applications for disabled children (visually impaired, hearing impaired, physically disabled, learning disabled and developmentally disabled).

DCCG activities include general meetings where presenters demonstrate uses of hardware and software (held every other month at the Lawrence Hall of Science, UC-Berkeley), weekend workshops on specific topics, maintaining a collection of reference materials, housed in the LHS science and math library, and demonstrations and presentations at local community conferences and meetings. DCCG, working with the Lawrence Hall of Science, is seeking support to establish a "lending library" of computer hardware for disabled children, which would provide parents the chance to try out a system before investing in it, a demonstration center featuring computers for disabled children, serving as a focal point for hardware modification and software development, and for parent, teacher and student training, and a local computer network to share resources and needs, in part via an electronic bulletin board.

Kansas Handicapped Children's Computer Cooperative, HCC, 7938 Chestnut Street, Kansas City, MO 64132. Newsletter \$4.00/year

**SPECIAL INTEREST GROUPS**

Handicapped Special Interest Group (SIG), International Apple Core, P.O. Box 261, Lincoln, MA 01773 617/666-1581. Handicapped SIG is one of 30 special interest groups under the organizational umbrella of the International Apple Core (IAC), a group of Apple computer users. The group currently functions as a clearinghouse of resources and information for Apple users, and potential users, who are handicapped.

Occupational Therapy Microcomputer Club Marilyn Sidler, president P.O. Box 158, La Mesa, CA 98041. Occupational therapists who now have or plan to acquire a microcomputer have formed a special interest group. A newsletter is available.

SIGCAPH Special Interest Group on Computers and the Physically Handicapped, Association for Computing Machinery, 11 West 42nd Street, New York, NY 10036. Open to all computer professionals and others with serious interest, not just their disabled colleagues, SIGCAPH was founded in 1970 with the following aims: promoting the professional interests of computing personnel with physical disabilities, promoting the application of computing and information technology toward solutions of disability problems, promoting public education in support of computing careers for suitably-trained blind, deaf, and motor-impaired individuals. Publishes quarterly SIGCAPH Newsletter in cassette "talking" edition as well as print version.

## RESOURCES FOR SPECIAL APPLICATIONS

**INFORMATION ON COMPUTER APPLICATIONS IN SPECIAL EDUCATION**

The Council for Exceptional Children (CEC) was founded in 1922 to serve those who serve the educational needs of exceptional children. It has 989 local chapters, 46 student associations, 58 federations and 12 special education divisions.

The following publications and resources on Microcomputers in Special Education are available from CEC, Department 5512, 1920 Association Drive, Reston, Virginia 22091-1584.

**Microcomputer Resource Book for Special Education** Dolores Hagen 1984 224 pp \$15.95 This book provides an understanding of the microcomputer as a life competency tool. The full spectrum of software and adaptive devices are described. Material is supplied on learning disabled, hearing impaired, visually impaired, mentally retarded, and physically handicapped. Computer needs of each disability group are examined. The advantages and disadvantages of each type of program are weighed. Descriptions of real children's experiences with computers are included. Appendices provide information about more than two hundred publishers of software products. Products are grouped by disability area, detailed information is provided about each program's use. Management programs, information on hardware including adaptive devices, and resources on LOGO are included. Shows how computers can work for children at home and in the classroom.

**Microcomputers in Special Education: Selection and Decision Making Process**, Florence M. Taber 1983 112 pp \$7.95 Provides the kind of information and guidance school administrators and other decision makers need before committing themselves to a given microcomputer system. Considerations related to software evaluation, hardware, and inservice education are covered, including rating forms and questionnaires. Includes chapters on effective uses of the microcomputer for instructional and administrative purposes, elementary programming, and special education applications. Useful to the individual engaged in the selection and decision making process. Also appropriate as an inservice or supplementary text for regular and special educators.

**Microcomputers in Special Education** Special issue of *Exceptional Children*, October, 1982

**Proceedings of the National Conference on the Use of Microcomputers in Special Education** Hartford, CT, March 1983 M.M. Berhmann, Editor, L. Lahm, Assistant Editor 700 pp \$20.00 Description listed in *Conference Proceedings* section, p. 240

**Special Ware Directory** LINC Resources, Inc. 1983 97 pp \$13.95 A resource on microcomputer software for special educators. It lists and describes commercially produced software which is useful in special education programs. Included in the directory are three categories of software: (1) software designed specifically for special education use, (2) software applicable to special

education, and (3) software which may be modified for special education use.

Computer Search Reprints

Computer search reprints are bibliographies with abstracts from the ERIC and ECER databases. Topics that continue to be popular are updated twice a year. Computer search reprints are \$10.00 each.

- 506 Computer Assisted Instruction for Handicapped Children and Youth (100 abstracts)
- 509 Use of Computers in Regular and Special Education Teacher Education (100 abstracts)
- 528 Computers and Gifted Students (50 abstracts)
- 532 Computer Managed Instruction for Handicapped Students (50 abstracts)

**Technology and Media (TAM) A New CEC Division** TAM was recently organized to be an international association of special education professionals interested in technology and media, and its impact upon the diagnosis, treatment and educational habilitation of exceptional persons. It works toward promoting a closer professional relationship among educators and others concerned with the uses of technology and media with exceptional children, encouraging development and dissemination of new applications, technologies, and media, initiating and working cooperatively with education agencies, government, and business and industry in research, demonstration, and validation efforts, and advancing standards for technology and media to be used with exceptional individuals. For more details on TAM, contact membership committee chairperson Dr. Charles MacArthur, P.O. Box 417, Vienna, Virginia 22180, 301/454-5427.

**Project RETOOL**, CEC Training Project on Microcomputer Applications in Special Education for Teacher Educators, Elizabeth McClellan, EdD, Coordinator, 1920 Association Drive, Reston, VA 22091, 703/620-3660. The RETOOL Center is in the process of forming a network of teacher educators who are interested in microcomputers. The purpose of the network is to provide a means of communication for microcomputer users who want to request information on a particular topic or to share information and resources. The network will be using the SpecialNet system of communication. Any TED members who are interested in technology and who have access to SpecialNet are encouraged to join. A bibliography, "Microcomputers in Special Education," is available from the RETOOL Center.

To get more information on CEC's initiatives in technology, write Future CEC Training and Technical Assistance in Special Education Technology, CEC Department of Field Services, 703/620-3660.

**Division of Physically Handicapped (DPH)** CEC has one division supporting the interest/needs of educators of physically handicapped children. If you are member of CEC and not DPH, please consider joining this division.

The Catalyst S Swaezy, editor Western Center for Microcomputers in Special Education 1259 El Camino Real, Suite 275, Menlo Park, CA 94025 415/326-6997.

ers The future is here" Exceptional Education 13, June 1983, pages 7-43 Among the articles in this issue, which is almost exclusively on computers, are explanations of computer terms, discussions on properly matching the best suited systems with special needs of disabled children, descriptions of available devices, personal narratives about computer experience, and resources for parents

1984 Directory of Resources for Technology in Education D Lloyd-Kolkin et al Available from Far West Laboratory for Educational Research and Development, 1855 Folsom Street, San Francisco, CA 94103 \$12.95 softbound, \$19.95 hardbound 1984 The references are for regular education, not special education

Special Technology for Special Children E Paul Goldenberg University Park Press, Baltimore, MD 1979

"Technological Advances in Special Education" Exceptional Education Quarterly, Winter 1984 Available from PRO-ED, 5341 Industrial Oaks Blvd, Austin, TX 78735

"The Use of Microcomputers in the Cognitive Rehabilitation of Brain Injured Persons" Kurlychek, R.T., and Glang, A.E. Using Computers in Clinical Practice -- Psychotherapy and Mental Health Applications M.D. Schwartz Editor Haworth Press, New York, 1984

**Model Training Projects for Blind Children**

Twenty-two San Francisco Bay Area blind children, ages eight to eleven, will be taught by Sensory Aids Foundation (SAF) to use educational software on Apple computers. The new program, funded by a \$50,000 grant from the U.S. Department of Education, hopes to demonstrate the practical and commercial feasibility of modifying off-the-shelf software for use by blind students. For more information, contact Susan Phillips, Sensory Aids Foundation, 399 Sherman Avenue, Suite 12, Palo Alto, CA 94306 415/329-0430

U.C. Berkeley's Center for Multi-Sensory Learning recently received a grant from the U.S. Department of Education to evaluate the educational potential of microcomputers in teaching visually impaired students from junior high school through college. For more information, contact Linda DeLucchi, Center for Multi-Sensory Learning, Lawrence Hall of Science, U.C. Berkeley, Berkeley, CA 94720 415/842-3679

**INFORMATION ON COMPUTER APPLICATIONS IN COGNITIVE REHABILITATION**

Cognitive Rehabilitation  
Odie L. Bracey, Editor

"This magazine is intended for those therapists doing the day-to-day therapy with brain injured patients. It publishes articles on special techniques used in therapy, observations on working in rehabilitation, information on how programs are set up and what seems to work and what does not. At least one complete and hopefully useful computer program will be listed in each issue. These programs will provide statistical routines, data analysis programs, record keeping programs and computerized data collection techniques. In addition, utility programs for drawing and designing screen displays, graphing and plotting will be provided. This publication provides support for sharing information about the Psychological Software Service (PSS) cognitive rehabilitation computer programs."

Published bi-monthly by B&B Publishing Co., P.O. Box 29344, Indianapolis, IN 46229. Subscription rate is \$25 per volume.

Computer Treatment of Speech/Language/Cognition Disorders

This workshop presents a system for microcomputer-assisted treatment of patients with speech, language and cognitive impairments, and can accommodate up to 5 participants at a time. It is held at Beaumont Hospital, so participants can observe patients using clinical software programs as part of their treatment on Beaumont Hospital's Rehabilitation Unit, in the hospital's Outpatient Aphasia Program and during Cognitive Rehabilitation activities and interact with staff members using the microcomputer with brain-damaged patients at various levels of communicative impairment. For more information, contact Michael I. Rolnick, Ph.D., Director, Speech and Language Pathology, William Beaumont Hospital, 3601 W. 13 Mile Road, Royal Oak, MI 48072 313/288-8085

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## VOICE INPUT / VOICE OUTPUT / BLIND ACCESS

## SOME SOURCES OF INFORMATION: VOICE INPUT

Maryland Computer Services, Inc  
(Various voice input hardware and software)  
2010 Rock Spring Rd  
Forest Hill, MD 21050  
(301) 879-3366

Motor Handicapped Support System (\$399.00-\$499.00)  
(Voice recognition microcomputer access program)  
ARTRA Inc  
P O Box 653  
Arlington, VA 22216

Shadow/Vet \$495.00  
(Voice entry terminal)  
Scott Instruments  
1111 Willow Spring Drive  
Denton, TX 76201  
817/387-9514

Talk Typer  
(Voice-operated word processor)  
G E Rushakoff  
Department of Speech, Box 3W  
University of New Mexico  
Las Cruces, NM 88003  
(505) 646-2801

Vocalization Trainer (\$50.00)  
(Visual feedback program for hearing impaired)  
Ken Macurik  
SVTC Box 4110  
Petersburg, VA 22803  
(804) 861-7274

Voice Connection  
formerly Voice Machine Communications, Inc  
17835 Skypark Circle #C  
Irvine, CA 92714  
714/261-2366

Voice Recognition Systems  
(Voice Input Module for Apple II+, IIe, and IBM  
PC \$995-1395)  
550 Battery Road, Suite 1716  
San Francisco, CA 94111  
(415) 798-2007

## SOME SOURCES OF INFORMATION: VOICE OUTPUT

BAYSIK Speech  
(SAYIT program\* for TRS-80 Model I or III - \$125)  
1259 El Camino Real, Suite 289  
Menlo Park, CA 94025  
(415) 854-1772

Art Gaylord  
(Message Writer\* program for Apple II+ - \$75)  
2208 Country Squire Dr  
Urbana, IL 61801  
(217) 333-1728

Carl Geigner  
(Say It\* program for Apple II+ - \$30)  
Schneider Communication Unit, Cerebral Palsy Center  
1603 Court Street  
Syracuse, NY 13208

Dr. Michael Hillinger  
(Syntax 1\* program for Apple II)  
RFD, Sharon, VT 05635  
(802) 448-3838

Intelligent Software Systems  
(SpeakEasy\* program for Apple II+ - \$500)  
P O Box 621  
Amherst, MA 01002  
(412) 549-0474

IOR Enterprises  
(Various voice output programs)  
229 Harrison Avenue  
Highland Park, NJ 08904  
(201) 846-5200

Maryland Computer Services  
(Talking computer terminal - \$5995)  
2010 Rock Spring Road  
Forest Hill, MD 21050  
(301) 879-3366

Raised Dot Computing  
(Braille-Edit\* program for visually impaired,  
Apple II+)  
310 S 7th St  
Lewisburg, PA 12837  
(717) 523-6739

G Evan Rushakoff  
(Talk II\* program for Apple II+ - \$90)  
Box 3W  
Department of Speech  
University of New Mexico  
Las Cruces, NM 88003  
(505) 646-2801

James S Schaefer  
(Basic Interpreter for the Blind\* program for TRS-  
80 Model II - \$15)  
33 Jackson Rd  
Berlin, NJ 03009  
(609) 767-2751

Street Electronics  
(speech synthesizers & related software)  
1140 Park Avenue  
Carpinteria, CA 93103  
(805) 684-4593

Trace R&D Center  
(Talking BlissApple Program for Apple II - \$35)  
314 Waisman Center, 1500 Highland Avenue  
Madison, WI 53705  
(608) 262-6966

Votrax Division of Federal Screwworks  
(speech synthesizer)  
500 Stephenson Hwy  
Troy, MI 48084  
(800) 521-1350

\* These programs require a separate commercially available speech synthesizer

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**Audiovisuals**

**Voice Input and Voice Output Technology Computers That Talk and Computers That Listen** Division of Computer Research and Technology Available from DCRT Information Office, Building 12-A, Room 3027, National Institutes of Health, 9000 Rockville Pike, Bethesda, MD 20205 3/4" videocassette, color, 22 minutes 1980 Demonstrates two kinds of computer systems operated by disabled persons One computer system has a voice box and speaks, and is operated by a blind programmer The other computer system listens -- a quadriplegic programmer talks to it

**SOME SOURCES OF INFORMATION  
COMPUTER ACCESS FOR BLIND PEOPLE**

The Carroll Center for the Blind  
770 Center Street  
Newton, MA 02158  
(617) 969-6200  
Publishes Aids and Appliances Review

Computer Aids  
4528 S. Lafayette St  
Fort Wayne, IN 46806  
(219) 456-2148

COPH 2 (Committee on Personal Computers and the Handicapped)  
5225 N Kenmore  
Chicago, IL 60640  
(312) 728-9879  
Publishes Link and Go newsletter (print/tape), \$8.00, quarterly

Dialogue Magazine  
"Technology" column  
3100 South Oakpark Avenue  
Berwyn Heights, IL 60402

Mr. Joe Giovanelli  
Audio-Tech Laboratories,  
1158 Stewart Avenue  
Bethpage, NY 11714  
516/433-0171  
Editor of BAUD (Blind Apple Users Group)

Harvey Lauer  
2010 S 7th Avenue  
Maywood, IL 60153  
(312)343-7959

Maryland Computer Services  
Ted Hentar  
2010 Rock Spring Road  
Forest Hill, MD 20150  
(301) 879-3366  
voice output

National Braille Press, Inc  
88 St Stephen Street  
Boston, MA 02115  
617/266-6160  
Published a Beginner's Guide to Personal Computers for the Blind, avail tape/print/braille, \$12.00  
Also publishes Braille Research Newsletter

**National Library Services**

Regional libraries provide recorded material for people with any handicap, and Braille and large print material for blind persons. There are many books on computers available, mostly at the beginning level. "The Blind Data Processor" is a Braille magazine which provides good articles on the computer field, some of them quite advanced. Magazines such as Popular Mechanics and Science Digest also carry timely information on computers and software and are available from NLS.

Raised Dot Computing  
David Holladay and Caryn Navy  
310 S 7th St  
Lewisburg PA 17837  
(717) 523-6739

Braille, newsletter available. Source of BRAILLE EDIT (word processor/braille translator program), Cramner Modified Braille, and various interface guides, cables, and cards

Sensory Aids Foundation  
399 Sherman Avenue  
Suite 12  
Palo Alto, CA  
415/329-0430

Publishes a very informative newsletter, Sensory Aids Technology Update. Published monthly, available in print or cassette \$30.00/year

Smith-Kettlewell Institute of Visual Sciences  
Rehabilitation Engineering Center  
2232 Webster Street  
San Francisco, CA 94115  
(415) 563-2323

Solutions by Example, Inc  
375 Concord Avenue  
Belmont, MA 02178  
Source of PC Speak program, provides software interface between IBM PC and Votrax Type 'n' Talk, Votrax Personal Speech System, ECHO PC, or Intex Talker. Also source of Junior Speak, a program that interfaces the synthesizers with PCjr.

Utmost Electronics  
1144 Mark Avenue  
Carpinteria, CA 93013  
(805) 684-4593  
Source of the Echo II for the Apple II+ and IIe computers, and of the Echo PC for the IBM PC

Telesensory Systems, Inc  
455 North Bernardo Avenue  
P.O. Box 7455  
Mountain View, CA 94943  
415/960-0920  
Manufactures and sells Optacon, VersaBraille, TeleBraille, SonicGuide, etc

Triformation Systems, Inc  
3132 SE Jay Street  
Stuart, FL 33497  
305/283-4817  
LED-120 Braille Printer, MicroBrailier paperless Braille device, Braille transcription services  
Offers leases on its products

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TRACE CENTER INTERNATIONAL SOFTWARE/HARDWARE REGISTRY

The registry provides a common reference point to help handicapped computer users determine what software and hardware adaptations are available, and where additional information can be found. If you have any programs or hardware adaptations that will benefit handicapped computer users, please fill out this form (for software), or the form on the next page (for hardware), and send it to the Trace Center, Registry Coordinator 314 Waisman Center, 1500 Highland Avenue, Madison WI 53705. For more information, call the Registry Coordinator at 608/262-6966.

TRACE CENTER INTERNATIONAL SOFTWARE/HARDWARE REGISTRY. PROGRAMS FOR HANDICAPPED INDIVIDUALS

SOFTWARE ENTRY FORM

PROGRAM NAME \_\_\_\_\_

HARDWARE REQUIREMENTS (Standard, modified, or custom boards, accessories.) \_\_\_\_\_

GENERIC NAME \_\_\_\_\_

SORT CODES \_\_\_\_\_  
(see code explanation, next page)

PROGRAM DESCRIPTION \_\_\_\_\_

OTHER NOTES (or continuations from items above):

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\_\_\_\_\_  
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\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COMPUTER: \_\_\_\_\_

DEVELOPER \_\_\_\_\_

MEMORY REQ'D: \_\_\_\_\_

LANGUAGE: \_\_\_\_\_

PHONE \_\_\_\_\_

ON DISK? \_\_\_\_\_ TAPE? \_\_\_\_\_

VENDOR \_\_\_\_\_

COST: \_\_\_\_\_

MANUAL SIZE (PAGES) \_\_\_\_\_

AVAIL W/O PROG? (Y/N) \_\_\_\_\_

PHONE \_\_\_\_\_

COST: \_\_\_\_\_ REFUNDABLE W/PURCHASE? (Y/N) \_\_\_\_\_

SOURCE CODE AVAIL? (Y/N) \_\_\_\_\_ COST. \_\_\_\_\_

DATE WRITTEN \_\_\_\_\_

MACHINE READABLE MANUAL AVAIL? (Y/N & FORM) \_\_\_\_\_

PLANS FOR UPDATING? (Y/N) \_\_\_\_\_

OTHER SOFTWARE REQUIRED (DOS, operating system, standard programs, etc)

If possible, we ask that you provide a copy of your program, and/or documentation, with your completed entry form. Thank you.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



TRACE CENTER INTERNATIONAL SOFTWARE/HARDWARE  
REGISTRY: HARDWARE ADAPTATIONS FOR HANDICAPPED  
INDIVIDUALS

HARDWARE ENTRY FORM

HARDWARE NAME \_\_\_\_\_

GENERIC NAME \_\_\_\_\_

**SORT CODES** \_\_\_\_\_

(see code explanation below)

HARDWARE DESCRIPTION \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

COMPUTER REQ'D \_\_\_\_\_

MEMORY REQ'D \_\_\_\_\_

SOURCE CODE AVAIL? (Y/N) \_\_\_\_\_ COST \_\_\_\_\_

COST OF ADAPTATION \_\_\_\_\_

MANUAL SIZE (PAGES) \_\_\_\_\_

AVAIL W/O HARDWARE? (Y/N) \_\_\_\_\_ COST \_\_\_\_\_

REFUNDABLE WITH PURCHASE? (Y/N) \_\_\_\_\_

MACHINE READABLE MANUAL AVAIL? (Y/N & FORM) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

HARDWARE REQUIREMENTS (Standard, modified, or  
custom boards, accessories )

\_\_\_\_\_

\_\_\_\_\_

SOFTWARE PROVIDED OR REQUIRED (DOS, operating  
system, standard program, etc )

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

OTHER NOTES (or continuations from items above):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

DEVELOPER \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PHONE \_\_\_\_\_

DESIGNER \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PHONE \_\_\_\_\_

DATE DEVELOPED \_\_\_\_\_

PLANS FOR UPDATING?: (Y/N) \_\_\_\_\_

**SORT CODE EXPLANATION**

- A Alarm, Alarm/Call, and monitoring systems (including monitoring systems)
- B Business Systems (other than writing/editing -- see W)
- C Control Aids (including phone, self-care, environment control)
- D Drawing Aids
- E Evaluation/Testing
- G Games (for handicapped individuals)
- H Hearing Impaired
- I Computer Aided Instruction (CAI)
- J Vocational Placement
- K Keyboard Modifications, Alternate Keyboards, and Non-Keyboard Input
- M Mobility
- P Portable Aids (battery operated, and less than 25 lbs [12 kg] including battery)
- Q Cognitive Disabilities & Retraining
- R Robots & Manipulators
- S Speech Output (NOTE Z = speech input/recognition)
- T Telephone Communication
- V Visually Impaired
- W Writing/Editing
- Z Speech Input/Recognition

Send to Registry Coordinator, Trace R&D Center,  
314 Waisman Center, 1500 Highland Avenue, Madison,  
WI 53705 For more information, call the  
Registry Coordinator at 608/262-6966

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**Funding, Models,  
Policy, Statistics**

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## A FUNDING RESOURCE NETWORK?

" But the problem of payment for unique or adaptive devices remains

"In seeking an answer to the cost question, I discovered from Dr. Justus Lehmann, University of Washington, Seattle, that they have solved the problem in their setting. They have on staff a person skilled at securing needed resources. This person tries every conceivable source -- public and private -- insurance, voluntary health organizations, service clubs, community organizations, churches. Dr. Lehmann reports that no truly needed device has been denied for lack of a sponsor. If you think this sounds too good to be true, some of you with this problem may want to write to Dr. Lehmann for advice."

Douglas Fenderson, Ph.D.

In "High Tech/High Touch", a keynote address, Discovery '83: Computers for the Disabled Conference Papers, edited by Janet Roehl. Available from Materials Development Center, Stout Vocational Rehab Institute, University of Wisconsin-Stout, Menominee, WI.

There are several people around the country who are particularly good at locating the resources to pay for hard-to-find equipment. Unfortunately, there is as yet no good mechanism for them to share information. RESNA has a subcommittee on Funding within the Service Delivery Committee. This Funding subcommittee could become the nucleus for a broader network of people. If you are interested in participating in a funding resource network, please contact RESNA.

## FUNDING FOR DEVICES

Funding issues are generally the bottom line in providing technology for disabled people. We can research, develop, transfer to private sector, utilize, build and adapt, but if money is not available the device -- be it simple or sophisticated -- will not reach the intended user, the disabled individual.

In the US Congress Office of Technology Assessment's Report Technology and Handicapped People (May 1982), the major conclusion was that "despite the existence of numerous important problems related to developing technologies, the more serious questions are social ones -- of financing, of conflicting and ill-defined goals, of hesitancy over the demands of distributive justice, and of isolated and uncoordinated programs."

If devices are to reach persons who need them, the issues surrounding funding must begin to surface so they can be dealt with. In this area of health and social welfare many, if not most, people are very uncomfortable putting the obvious needs of disabled individuals onto the same ledger line with money. But until the world is a more ideal place, we must live with these realities. To balance them in your favor, you need to know where to find funding and how to ask for it, what to do if it is denied, and the alternatives to direct funding.

## Identifying Funding Sources and Resources

Knowing where to seek funds begins with a thorough exploration of the consumer's personal resources and his/her current or potential program eligibility. It is valuable to encourage the involvement of the individual and the family in determining and effectively using funding sources.

Potential funding sources include

- o Personal or family income, including extended family and friends
- o Loans, savings accounts, inheritances, trust funds, etc.
- o Private health insurance
- o Government programs, e.g., Medicare, Medicaid, veterans' programs, crippled children's services, vocational rehabilitation programs, developmentally disabled programs, etc.
- o Voluntary health organizations such as United Cerebral Palsy Association, Easter Seal Society, Muscular Dystrophy Association
- o Employer of consumer or family
- o Labor union of consumer or family
- o Workers' Compensation benefits
- o School, as part of an Individual Education Plan
- o Alumni associations
- o Church group of consumer or family
- o Civic and other community service organizations such as Elks, Sertoma Clubs, Quota Clubs, Lions Clubs, Kiwanis, Rotary Clubs
- o Major corporation/corporate giving programs
- o Private philanthropic foundation grants
- o "Earmarked gifts" sponsored through health organizations or medical facilities
- o Special-event fund raising

Funding time can be reduced by choosing the most likely resource(s), coordinating the efforts of client, family, and involved professionals, and including the durable medical equipment supplier in the process.

## Writing for Results

Miracles do happen! Good-hearted neighbors might raise \$1,000 over a weekend on the strength of hearing of a family need. People do give for people they care for. However, few public or private agencies, companies, or service organizations can work that way, they need paper.

The most effective way to prepare paperwork is to understand who is the intended receiver of the written document. The key is to know and understand your "audience" and the definitions and regulations they follow so that supporting documentation can be prepared appropriately. Someone must make a decision: What information is needed for a favorable response? You are writing for results: give neither more nor less data than needed. Too much information costs you extra effort to collect and write up, providing too little usually results in a second round of paperwork and/or an unfavorable judgement (i.e., no money and no equipment).

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For "result-oriented writing" consider these factors

**Point of view** Know the audience you are writing for and ensure that all information can be understood from the reader's point of view. Who will read this report? What would you need to know if you sat behind his/her desk?

**Determination of need** Supporting evidence of consumer's need is usually required, but must be described appropriately. For example, Medicare requires "medical necessity", private insurance focuses on "improving the condition of the patient", and with Medicaid you may need to emphasize "restoration of the patient to his best functional level."

**Benefit to consumer** Never focus on the equipment and its features. Describe the benefits each feature will provide for the consumer.

**Credibility** You probably will be seeking funding again, this is not an exercise in creative writing.

Additionally, funding sources are interested in knowing what their return on investment will be. A financial statement of how money will be saved as a result of the requested service and device, including the dollar amount, will be helpful. For instance, if some equipment will result in less attendant time, this should be reflected in the request. However, the cost-effectiveness issue is not always appropriate. It is great to predict a cost saving as the result of a certain device or service, but sometimes there is no change (or actually an increase) in total care costs as a result of a service. For example, a person acquiring a communication aid may need continued speech therapy to learn how to use the system effectively. Quality of life is often the issue. There may be an increase in care costs because a person is more independent and is able to make more demands on the system. In this case, do not stress costs, emphasize independence or whatever concept the funding agency needs to hear to make a favorable funding decision.

**Following Through**

Once the process of seeking funding has been initiated, persevere and appeal denials. The appeal process is educational for the third-party payer, and successful appeals are precedent-setting for future requests. They force review of general policies by the third-party organization. However, care must be taken in selection of the first case to be presented and in specifying criteria for effective use of the device and other services that will be required as part of the process (i.e., additional therapy).

If frustrations with the process inspire you to write long, impassioned reports, it would be more effective to send them to people who can actually change policy -- state and federal legislators. You are generally wasting your time targeting pleas for policy change to bureaucrats who are only following the rules they are paid to follow.

**Alternatives to Direct Funding**

As funding becomes more difficult to obtain, we are being forced to look at more charitable funding possibilities. Rehabilitation engineering services should not be philanthropy and, ideally, should not have to depend on philanthropy for funding. But until we reach the ideal world referred to earlier, becoming a more sophisticated "beggar" may help fund more devices. There are many nonstandard philanthropic sources locally. Some have never been approached. ASK If the answer is "no" then ask "Do you know someone else I could ask?" Once you achieve a breakthrough, follow up with another request.

Other possibilities include reducing products costs and using tax provisions. The creative use of mass market products can bring some types of equipment into an affordable price range. "Do-it-yourself" construction is sometimes feasible. Rehabilitation engineering volunteer networks are developing in New Jersey and other places in the United States. Equipment can be purchased second hand or obtained on loan through clearinghouses and equipment loan closets. (editor)

**SOME IDEAS FOR REDUCING PRODUCT COSTS**

**Used Equipment**

A Used Equipment Referral Service has been established by the Metropolitan Center of Independent Living, Inc., in St. Paul. The service acts as a clearinghouse, matching disabled persons who need rehabilitative equipment with those who have used equipment available. All types of equipment are considered, including wheelchair, bathroom equipment, ramps, lifts, vehicles, hospital beds, walkers, prone standers, etc. The service does not warehouse the equipment, instead it provides telephone referrals to those persons who have the equipment available throughout the state. The service also provides information on funding, repair and maintenance resources. Anyone interested in buying, selling, or donating equipment, or anyone interested in setting up a similar program, can contact Gary Tegrootenhuis, MCIL, 1728 University Avenue, St. Paul, Minnesota 55104, 612/646-8342.

The ASSISTIVE DEVICE bulletin board on SpecialNet can be used to list used assistive devices for sale or purchase. For information on SpecialNet, see the Information Resources section.

Other sources for this type of exchange are

- ads in the local newspaper
- bulletin boards at Independent Living Centers and Disabled Students Programs
- ads in consumer publications such as Accent on Living and Mainstream
- electronic bulletin boards such as WellNet, Compuserve, and The Source. (See section on microcomputer applications for addresses)

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**Equipment Loan Programs**Easter Seals

Most local affiliates maintain an equipment loan program. Although details vary from one affiliate to another, a loan program usually maintains a supply of wheelchairs, crutches, canes and appliances for anyone who is in need. Upon acknowledgement by a physician or therapist, a chair or appliance can usually be loaned for the length of time it is required.

American Cancer Society

Local chapters frequently loan hospital beds for in-home use, and sometimes other equipment to people who have cancer.

**Tax Deductions**

Generally, any expenses incurred for medical care or equipment are deductible on an individual tax return and can be included with other medical expenses that would normally be deducted. Refer to IRS publications 502, Medical and Dental expenses, 503, Child and Disabled Dependent Care, 522, Disability and Payments, 552, Recordkeeping Requirements and a List of Tax Publications, and 907, Tax Information for Handicapped and Disabled Individuals. These are available at no charge from the Internal Revenue Office.

"151 Tax Deductions You Can Take" is a simple tax guide for the person with a disability; this monograph provides a listing of what is and what is not tax deductible. It is primarily a medical expense deduction guide and is therefore of particular value to persons with disabilities and their families. It includes information on the types of assistive devices that can be deductible. Written by Gregory Thomsen and Paul M. McNery, it is available from ACCENT Special Publications, P.O. Box 700, Bloomington, IL 61701 (20 pages, 1982).

**Do-It-Yourself**

An alternative to purchasing a piece of equipment is to make it yourself or hire someone else to construct it. There are references to D-I-Y material throughout this guide (e.g., the **TECHNOLOGY AT HOME** and **CONTROLS** sections).

Some of these references have been collected here; please refer to specific chapters for more information.

Aids and Adaptations The Arthritis Society, 920 Yonge Street, Suite 420, Toronto M4W 3J7, Canada. Instructions for aids to make yourself.

Application and Construction Notes for Laptrays and Adaptive Pointers 31 pages, \$3.00. A packet containing application notes describing the construction of various adaptive interfaces and communication charts. Includes Wobble Stick Toy Control (for battery-operated toys), Adaptive Pointers (for communication boards and keyboards), Slide-Away and Swing-Away Laptrays (for wheelchair mounting), and Folding Communication Board (light-weight and highly portable).

Design and Construction of a Laptray G.C. Vanderheiden. 30 pages; \$3.00. 1977. This report provides basic information on the construction of a wheelchair laptray which may be used as a communication board. Included in this report are all of the drawings and directions needed to construct a laptray communication board using materials readily available from local hardware and department stores. Simple directions and guidelines are provided.

Easy to Make Aids for Your Handicapped Child D. Caston. Souvenir Press, London. 1981.

Equipment for the Disabled (series) Oxford Regional Health Authority, 2 Foredown Drive, Postlade, Brighton BN4 2BB, England. 1984. Each volume in this series contains descriptions and illustrations of commercially available equipment for the disabled, as well as do-it-yourself ideas. Titles include Communication, Clothing and Dressing for Adults, Home Management, Outdoor Transport, Wheelchairs, Leisure and Gardening, Disabled Mother, Personal Care, Housing and Furniture, Hoists and Walking Aids, Disabled Child.

Handbook for the Disabled Ideas & Inventions for Easier Living Chapter 30 "Make It Yourself" Suzanne Lunz. Charles Scribner's Sons, New York.

Handling the Young Cerebral Palsied Child at Home N.R. Finnie. E.P. Dutton, New York. 1975.

Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children and More Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children Ms. Linda Burkhardt, 8315 Potomac Avenue, College Park, MD 20740.

Homemade Innovative Play Equipment Information and Research Utilization Center in Physical Education and Recreation for the Handicapped. American Alliance for Health, Physical Education, Recreation and Dance, 1900 Association Drive, Reston, VA 22091, 703/476-3400. May 1973. 105 pages.

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How to Build Special Furniture and Equipment for the Handicapped Child RB Hoffman Charles C Thomas Co, Springfield, IL 1970

How to Make It Cheap Manual Independence Factory, P.O. Box 597, Middletown, OH 45042  
 Volumes I and II, \$1 donation plus postage, volume III, \$2.75 Line drawings of aids you can make or have made, plus list of aids that can be ordered from this non-profit volunteer group

An Instructional Playground for the Handicapped Using Tires as Inexpensive Playground Equipment Activity and Construction Manual University of the State of New York, State Education Department, Division for Handicapped Children, Special Education Materials Center, Albany, NY 1975

Making Aids for Disabled Living SE Grainger Batsford, North Pomfret, VT 1981

Playgrounds for Free The Utilization of Used and Surplus Materials in Playground Construction MIT Press, Cambridge, MA 1974

Please Help Us Help Ourselves C Nathan United Cerebral Palsy of Central Indiana, Indianapolis, Indiana 1970

Rehabilitation Equipment and Devices Constructed in Wood Institute of Rehabilitation Medicine, Publication Office, New York University Medical Center, 400 East 34th Street, New York, NY 10016 1969 102 pages \$2.00 Illustrates complete directions for constructing many devices, including kitchen cutting board, kitchen lapboard, and sewing and embroidery frame

Strategies for Helping Severely and Multiply Handicapped Citizens G Greer, Robert M Anderson, and Sara J Odle (editors) University Park Press, Baltimore, Maryland 1982

"Teacher-Made Adaptive Devices for Archery, Badminton, and Table Tennis" J Cowart Practical Pointers, May 1978, (13), 1-16

Therapeutic Devices, 1956-1975 J Bellman, et al American Journal of Occupational Therapy, American Occupational Therapy Association, Inc, 6000 Executive Blvd, Rockville, MD 20852 112 pages 1977 Do-it-yourself instructions for devices which have appeared in AJOT, includes wheelchair trays, ADL devices, communication aids etc

Toy Modification Note Built-it-yourself Battery Insert G.C. Vanderheiden 18 pages, \$2.00 1982 Describes construction and operation of battery inserts to allow control of battery-operated devices by handicapped individuals without requiring modification of the toys themselves Full diagrams and operating instructions included

Vocational and Educational Aids L Brabyn Smith-Kettlewell Institute Rehabilitation Engineering Center, San Francisco, CA 1982

**Periodicals Featuring DIY Information**

Accent on Living magazine has a regular feature called HOW TO, which lists ideas on adapting your own equipment The Spring 1984 issue's HOW TO was entitled "Hanging in There" and presented solutions that two Accent subscribers have worked out for themselves, an electric lift and a hydraulic lift Accent on Living is a quarterly magazine, their address is P.O. Box 700, Bloomington, IN

Rehabilitation Gazette (Gazette International Networking Institute, 4502 Maryland Avenue, St Louis, MO) also has DIY ideas in its annual publication

Technical Aid to the Disabled Journal (Ryde New South Wales, Australia) is published by Technical Aid to the Disabled, an Australian voluntary organization dedicated to designing and making aids for people with disabilities when such aids are unavailable commercially The journal contains articles about the design, construction and use of aids, organizational news, and an information exchange

Do-it-yourself devices can quickly move into the realm of "fugitive literature" Some examples of the kind of information available are

Kit for Remote-Area Wheelchair An Australian biomedical engineer has designed an inexpensive wheelchair that may be made from a kit or ordered assembled The construction booklet is free to disabled individuals who wish to build a chair for their own use, but the chair is protected by patent from commercial production except where license to manufacture has been granted The kit and chair are described in a free brochure from the designer Robert Bosshard, Biomedical Engineer, Spinal Unit, Royal North Shore Hospital, St Leonards 2065, New South Wales, Australia

Plans for Making Mobility Devices for Children To obtain free blueprints of a child's wheelchair and tricycle, write to R.J. Reynolds Tobacco Company, Winston-Salem, NC 27102

Portable Rocking Bed Plans are available on loan from Rehabilitation Gazette, 4502 Maryland Avenue, St Louis, MO

This book does not help you make devices, it helps you install them It is generally available at a good bookstore

Home Security Time-Life Books, Alexandria, VA 1979 This self-help book on home security includes a section on accident proofing a house, which has 13 pages of directions and sketches for reducing dangerous conditions in bathrooms and on stairs Features instructions for installing grab bars, slip-resistant surfaces, stair rails, and outdoor access ramps

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**Publications with Information on Funding Devices**

"Financing Adaptive Aids" Sensory Aids Technology Update, December 1983, pages 2-3 Available from Sensory Aids Foundation, 399 Sherman Avenue #12, Palo Alto, CA 94306 Describes several programs that offer financial aid and/or low interest loans for the purchase of sensory aids for the blind

Funding Book The Many Faces of Funding Anna Hoffman Available from Phonic Ear, Inc 250 Camino Alto, Mill Valley, CA 94941 \$25 00 (includes the Monthly Newsletter, shipping and packaging) Although focused on funding strategies for communication devices, the information is also readily applicable to funding for other types of equipment

The book, a three-ring looseleaf notebook, is divided into five sections the Overview provides highlights of sources of funding on the federal, state, educational, insurance and private levels, Method of Procedure informs on how to package funding applications, Case Histories inspires ideas through "how to" stories, Legislation informs on any changes in federal, state or local laws, and the Monthly Newsletters provide the most current funding information, and keeps the book current and updated

"Funding Challenges" Myra Williams In Seeking for Children With Cerebral Palsy A Resource Manual, Elaine Trefler, editor Available from University of Tennessee, Rehabilitation Engineering Program, 632 Court Avenue, Memphis, TN 38163 \$20 00 1984

Funding of Mobility Equipment Current Issues and Strategies Virginia Ruggles Muscular Dystrophy Association, 810 7th Street, New York, NY 10019 September 1981

Funding of Non-Vocal Communication Aids Current Issues and Strategies Virginia Ruggles Muscular Dystrophy Association, 810 7th Street, New York, NY 10019 30 pages

Funding The Bottom Line S Enders, A Blote, and C Reed-Heumann Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego, 1983 Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

Guidelines for Seeking Funding for Communication Aids Donna DePape and Lavonne Krause Trace Center, Waisman Center, University of Wisconsin-Madison, Madison, WI 53705 44 pages Revised 1980

Health Insurance Benefits and Communication Disorders Steven White, PhD Director, reimbursement policy division, American Speech-Language Hearing Association In Shhh, November/December 1982, 4848 Battery Lane, Bethesda, Maryland 20814

Insurance Reimbursement Mechanisms for Rehabilitation Equipment and Environment Modifications M Mittleman and J Settelle Archives of Physical Medicine and Rehabilitation, 63 279-283, 1982

Report on the Advanced Topical Discussion Funding Strategies for the '80s, RESNA Suite 402, 4405 East-West Highway, Bethesda, MD 20814, August 1982

Selected Funding Issues in Rehabilitation Engineering Service Delivery Rick N Holte, MSc Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

These periodicals regularly provide information related to equipment funding strategies

Accent on Living  
Cheever Publications  
PO Box 700  
Bloomington, IN 61701

Bulletin on Science & Technology for the Handicapped  
AAAS  
1776 Massachusetts Avenue  
Washington, DC 20036

Communication Outlook  
Artificial Language Laboratory  
Computer Science Department  
Michigan State University  
East Lansing, MI 48824

Sensory Aids Technology Update  
Sensory Aids Foundation  
399 Sherman Avenue #12  
Palo Alto, CA 94306

These publications provide an overview of the financial aid programs and special services available to the disabled person, primarily on the federal and state levels Although not oriented specifically toward funding devices, each covers a broad range of programs which focus on such areas as basic living needs, education and employment Major programs are identified which exist throughout the nation, or could exist if a particular state or community elected to participate in a program

Financial Aid and Special Services, Chapter 15 Virginia M Gives In Disability and Rehabilitation Handbook, Robert Goldenson, editor McGraw-Hill, Inc 1978

Financial Resources for Disabled Individuals Institute for Information Studies, Falls Church, Virginia Available from NARIC, Catholic University, Washington, DC 75 pages \$11 00 1980

"How to Get Government Money, Home Care, Tax Breaks, and Other Help" Chapter 28 in A Handbook for the Disabled Ideas & Inventions for Easier Living Suzanne Lunt Charles Scribner's Sons, 597 Fifth Avenue, New York, NY 10017 276 pages \$17 95 1982

Most geographic areas have some type of Community Service Council, usually operational on a citywide

## FUNDING, MODELS, POLICY, STATISTICS

or countywide basis, which can be an additional and valuable resource in finding specific programs on a local level.

Information on new programs which could be used to pay for assistive devices can be found in publications such as Communication Outlook, and the monthly updates the The Many Faces of Funding. The following is from Communication Outlook, Winter, 1984, page 2.

"Public Service Community Development Block Grant Funds are awarded to cities by the federal government to both provide new services and increase the public services already available to individuals experiencing handicaps. Several years ago, the city of Fort Collins, Colorado began using these funds to provide nonverbal individuals with communication aids. The city carefully monitors the acquisition of these aids and for five years considers them the property of the city for depreciation purposes, although users maintain exclusive use of the devices.

"This project has also encouraged community advocacy, heightening public awareness of its citizens' needs. Most importantly, the new augmentative system user is able to communicate with city government and elected officials.

"Beginning in March 1984, Block Grant Funds will be set aside in each receiving city to operate a needs assessment for individuals experiencing handicaps. Funds will be allocated based upon proposals submitted to each city. Those interested should contact their city regarding the Public Service Community Development Block Grant Fund, Section 570.201, Circular A-102, Attachment 0."

If you want to learn more about funds available from the federal government, refer to

"The Who, What, When and How of the Federal Funding Process" Donald Barrett. In Programs for the Handicapped. Available from Clearinghouse on the Handicapped, Department of Education, Washington, DC. An overview of the federal funding process in the disability field, intended to direct first-time grant seekers to the proper source for information. Include a "Resources for Funding Information" section which lists a variety of organizations and publications which offer more detailed information on this subject.

To receive the current information on relevant federal funding programs, you might consider subscribing to

Education of the Handicapped. The Independent Weekly News Service on Federal Legislation, Programs and Funding for Special Education. Published every other Wednesday. \$157/year.

Federal Grants & Contracts Weekly. Selected Project Opportunities for the Education Community. Published every Tuesday. \$157/year.

Both are available from

Capitol Publications, Inc.  
1300 North 17th Street  
Arlington, VA 22209  
703/528-5400

Give notice that these are not inexpensive. If not available at your local library, you might see if the grants and contracts office of your nearest major university subscribers and would let you read them.

### A FINAL NOTE ON FUNDRAISING

If you and/or your agency are working on obtaining funding for devices, it is important to avoid being overwhelmed by the magnitude of the problem. If you find more and more of your worktime (and after work time) being consumed by funding problems, it may be time to reassess the situation.

IDENTIFY whose responsibility fundraising is

EVALUATE the input needed -- it can take considerable effort to get the ball rolling.

If you can't afford the time, DEVELOP a network of people who can do it or help you.

IDENTIFY the rewards -- what they are, and who gets them.

If all else fails, you might tack a note on the wall.

"TAKE THE 'D' OUT OF FUNDRAISING!"

and reapply the above guidelines. Good luck!

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## SERVICE DELIVERY MODELS

There probably are as many definitions of service delivery as there are agencies providing it. However, the following working definition is provided:

Service Delivery is a process/system which provides evaluative and/or advisory services, and/or technical devices to disabled persons to increase their independence and productivity.

These services are provided on a cost-effective basis with the eventual outcome the improvement of the quality of life.

Service delivery agencies are listed throughout this resource guide. Each has its own approach to providing technology to disabled people. For more specific information on their individual programs, please contact the organizations directly.

There are several frameworks for looking at service delivery. Some are listed in this section. Information on others can be found in the Prosthetics/Orthotics literature. The many Independent Living Programs (ILPs) across the country can provide help in selecting, obtaining and using assistive devices -- but most of them don't have a formal "equipment" service, so it's easy to overlook their model as a service delivery approach. Unfortunately, most of the ILP information relevant to this field is not written up, you will have to contact the programs directly.

## EXAMPLES OF SERVICE DELIVERY MODELS

### A MODEL PROGRAM FOR SERVICE DELIVERY

Project Threshold is a model program for delivery of rehabilitation engineering services in the State of California. It was designed to meet the unique needs of severely disabled clients who require specialized assistance in performing tasks of daily living, assistance with management of attendant time and activities, and/or performance of school and job related tasks. The client's needs are met by identifying problem areas and then working out solutions to the problems, thus increasing the client's level of independence. For more information on how this is done, see the section on EQUIPMENT SELECTION by Kathy Bowman, Project Threshold, in this Sourcebook.

One component of the Rehabilitation Engineering Center and Project Threshold is the Rehabilitation Equipment Demonstration Unit (REDU) established by the National Institute for Handicapped Research (NIHR) of the United States Department of Education. Selection of Rancho Los Amigos Hospital as a site for a REDU has been invaluable to Project Threshold. The purpose of the REDU is to assist disabled individuals with selection of appropriate equipment by providing product information and opportunities for equipment trial. The REDU at Rancho is housed in a building called the Model Home, which is stocked with numerous assistive devices and rehabilitation equipment. Project Threshold clients use the REDU equipment during evaluations; the Model Home setting provides a realistic environment for this equipment trial.

Project Threshold was funded initially through an I&E grant and later as a block-funded contract with the Department of Rehabilitation with the goal of providing direct services to disabled clients in the areas of independent living and independence with school and job related tasks.

Follow-up with clients and counselors indicates satisfaction with the program. Project Threshold has evolved into a model program which is being explored by other agencies nationwide who are interested in developing similar programs for the severely disabled.

Project Threshold is an example of a successful cooperative relationship between a rehabilitation engineering program and a state vocational rehabilitation agency.

For more information, contact Nancy Somerville, Project Threshold, 500 HUT, Rancho Los Amigos Hospital, Downey, CA.

### AN INFORMATION AND ASSISTANCE CENTRE

The PAM ASSISTANCE CENTRE provides information about assistive devices old and new -- what they are, what they cost, how they might be secured. The center has a reputation for being innovative and practical.

The Centre offers information from more than 1,500 companies, and more than 10,000 products. Sometimes a homemade device or the innovative use of some standard item is suggested. If the services of other persons, such as a rehabilitation engineer or an artificial language specialist, are required, the Centre acts as a linker. Additionally, the Centre displays provide hands-on experience with many assistive devices. The Centre has a trained ABLEDATA broker on staff.

Centre staff specialize in problem-solving, working with medical personnel, special educators, parents and directly with any person for whom special equipment may be of benefit. Any handicapped individual is eligible for Centre help.

without cost or "red tape"

PAM is a service for Michigan, although out-of-state requests also may be honored. A majority of requests for problem-solving are initiated by phone. All ages are eligible for service. The special education population (ages 0-25), rehabilitation clients, and older persons are included. Physically handicapped, deaf, blind, or multiply handicapped individuals often find the Centre helpful.

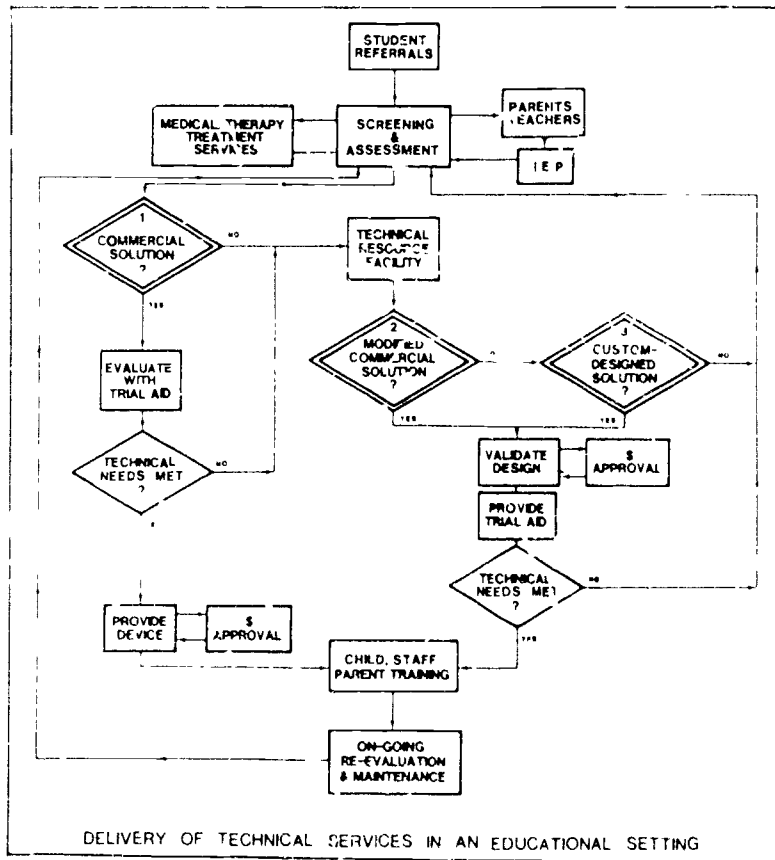
For more information, contact PAM Centre, 601 Maple, Lansing, MI, 517/371-5897

A PROJECT IN THE SCHOOL SYSTEM

In July, 1978, The Bureau of Education for the Handicapped awarded a three-year demonstration grant to the Memphis City Schools, Division of Special Education. One objective of this grant was to demonstrate that severely physically handicapped children could participate more meaningfully in their educational program with the assistance of technical aids in the areas of communication, seating, mobility, feeding, and toileting. Technical services were contracted from the University of Tennessee, Rehabilitation Engineering Center to provide and modify appropriate aids. The project developed a model for the delivery of technical aids in an education setting, and designed an instrument to aid in the prescription of technical aids.

The full report, Project TEACH: Technical Educational Aids for Children with Handicaps, A Model and Demonstration Project, may be ordered at \$5.00 each from the Division of Special Education, Memphis City Schools, 2597 Avery Avenue, Memphis, Tennessee 38112.

For a summary of some of the findings related to technology, see the **TECHNOLOGY IN THE CLASSROOM** section in this Resource Guide.



**AN INSTITUTION-BASED ADAPTIVE AID SERVICE**

The Commonwealth of Massachusetts Department of Mental Health supports six adaptive design services, one in each of the six state schools. The following is a description of the Region I Adaptive Design Service.

" The program was established in 1977 to help meet the needs of the most severely disabled residents of the Belchertown State School in cooperation with and complementing the existing therapeutic, medical and educational services. For the past three years, services have been extended to DMH clients outside the institution (including many former state school residents), and nearly half our time is now devoted to community projects. We have continued to focus on those needs of the most severely disabled which cannot be met through commercially available equipment. Our primary goal has been to design and build comfortable, stable, and safe positioning systems for these people, seeing good positioning as a prerequisite for any other skills. Most often we do this by modifying standard wheelchair chairs, sometimes quite drastically, to provide very specific and individualized support. We also design and build pieces of equipment to aid clients with self care activities like eating and dressing, communication, and school and work-related activities. Our environmental design services include custom design of wheelchair ramps, accessible bathrooms, work station modifications and recommendations for commercial equipment to increase a client's independence within his or her environment. Although the emphasis of the program has been on service delivery, the philosophy, and funding structure have allowed time for researching technical and clinical developments and availability of equipment on the commercial market."

**Adaptive Equipment Services**

Region I Adaptive Design Services, Belchertown State School, Box 42, Belchertown, MA 01007

Alternative Design, Wrentham State School, Box 144, Wrentham, MA 02093

Adaptive Design Services, Paul A. Deyer State School, Taunton, MA 02780

Therapeutic Equipment Clinic, Fernald State School, 200 Trapelo Road, Waltham, MA 02172

Adaptive Equipment Clinic, Hogan Regional Center, Hathorne, MA 01937

Adaptive Equipment Services, Monsori Developmental Center, Drawer "F", Palmer, MA 01069

A similar program exists in the state of California. For more information, contact Mobility Engineering, Sonoma State Hospital, Eldridge, CA 95431, 707/938 6445

To find out if your state has such a service, contact the agency responsible for Developmental Disabilities

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PUBLICATIONS ON SERVICE DELIVERY MODELS

Assistive Devices for Handicapped Students: A Model and Guide for a Statewide Delivery System  
 National Association of State Directors of Public Education, 1201 Sixteenth Street, NW, Washington, DC 20036, 202/844-4193 27 pages \$4.50 1980  
 This publication describes an ideal model for a comprehensive assistive device center that can provide a cost-effective, coordinated delivery system to assure that handicapped students who need adaptive aids and equipment have access to them and are trained in their most efficient use. The document includes a guide for implementation of the model and a comprehensive listing of available resources throughout the country.

"Delivery of Assistive Devices Through a Client Oriented Approach" AM Cook In Technology for Independent Living, VW Stern and MR Reddon, editors AAAS, 1776 Massachusetts Avenue, Washington, DC 20036 1982

"Models of Clinical Evaluation Centers for Communication Aids" AM Cook Proceedings of the 1982 Dutch Conference, The Spastics Society, London, England 1982

Project TEACH: Technical Educational Aids for Children with Handicaps, A Model and Demonstration Project, may be ordered at \$5.00 each from the Division of Special Education, Memphis City Schools, 2597 Avery Avenue, Memphis, Tennessee 38112 1981. Describes a project to direct rehabilitation engineering to the needs of children with severe neuromuscular and communication deficiencies. Aids and devices were designed or adapted to assist in communication, seating, mobility, feeding, and toileting. The program included a technology section, services to children and to parents. Includes case studies, project newsletters, forms, data sheets, and photographs. The project was conducted in cooperation with the University of Tennessee Rehabilitation Engineering Program.

"A Proposed Evaluation Methodology for Rehabilitation Engineering Decision-Making" P Platt and D.A. Hobson Proceedings of the International Conference on Rehabilitation Engineering, Toronto, Ontario 1980

"Selected Funding Issues in Rehabilitation Engineering Service Delivery" R Holte Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

"The Service Delivery Process" C Greg Shaw Chapter 13, in Seating for Children with Cerebral Palsy: A Resource Manual, Elaine Treffler, Editor University of Tennessee, Rehabilitation Engineering Program, 682 Court Avenue, Memphis, TN 38163 \$20.00 1984

"Towards a Theoretical Framework of Service Delivery" R Levy Proceedings of the Sixth Annual Conference on Rehabilitation Engineering, San Diego Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814 1983

Interagency Cooperation

These references do not deal specifically with device delivery, but could prove useful if the approach you develop involves developing inter-agency cooperative agreements, and/or gets involved with the home health care market.

Handbook on Developing Effective Linking Strategies: Vocational Education Models for Linking Agencies Serving the Handicapped Wisconsin Vocational Studies Center, University of Wisconsin-Madison, Madison, WI 53706 1982. Although this book is focused to vocational education models, the strategies they use could be useful to organizations or agencies trying to implement rehabilitation engineering services and/or interagency technical aids projects. The bibliography in this book lists reports on exemplary programs in several states.

Home Care/Health Care

How to Establish a Home Health Agency: Some Preliminary Considerations Publication 84-1 National Association for Homecare, Research Division, 519 C Street NE, Washington, DC 20002 \$12.00. The National Association for Home Care has published a booklet advising persons considering entry to the home care field of the steps necessary for establishing a home health agency. The goal of the publication is to ensure that persons or organizations considering entering home care know all the state and federal requirements and NAHC's code of ethics.

Planning for Home Health Services: A Resource Handbook US Department of Health and Human Services Available from National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. Specify Publication #HRP-0102001 Free. A guide for planners of home health care services. It can be a particularly useful tool for new agencies.

Software Catalog of Computer Programs for the Health Care Industries Moore Data Management Services, 1660 South Highway 100, Minneapolis, MN 55415, 612/540-1033 \$39.95

Sound Business Practices

Little has been written on the business operation aspects of specialized assistive device services. However, there is a considerable amount written about business practice and funding issues in the durable medical equipment (DME) trade magazines. If you are concerned with operating a service in the black, you might contact organizations such as National Association of Medical Equipment Suppliers (NAMES), and attend some of the DME/Home Care trade shows to learn more about the commercial perspective and what you can learn from it.



## POLICY-RELATED PUBLICATIONS ON TECHNOLOGY FOR DISABLED PEOPLE

The Application of Technological Developments to Physically Disabled People Joseph La Rocca and Jerry S. Turem. Publications Office, Urban Institute, 2100 M Street NW, Washington, DC 20047. 117 pages. \$3.50. 1978.

Application of Technology to Handicapped Individuals: Process, Problems, and Progress. US Government Printing Office, 60-3190, Washington, DC 20402. April, 1980. A joint report for the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, US House of Representatives, and the Subcommittee on Labor and of the Committee on Human Resources, US Senate, 96th Congress.

Health Technology Case Study Report #26. Prepared as a background paper for Technology and Handicapped People. Office of Technology Assessment, US Congress. 1982. One third of the report covers the area of "Information and Funding for the Speech Impaired". It provides an analysis of funding issues related to communication aids.

A Research Agenda on Science and Technology for the Handicapped. Janet Welsh Brown and Martha Redden. American Association for the Advancement of Science, 1776 Massachusetts Avenue NW, Washington, DC 20036. 54 pages. 1979.

Suggested Approach for Establishing a Rehabilitation Engineering Information Service for the State of California. Lo F. Christy, Gail Kelton-Fogg, Ruth Lizak and Cynthia Vahlkamp. SPI International, Menlo Park, California. 271 pages. 1978.

Technology and Handicapped People. US Congress. Office of Technology Assessment (OTA), 1982. Summary available from OTA, Congress of the U.S., Washington, DC 20510. Full report available from S/N 052-003-00874, Superintendent of Documents, Government Printing Office, Washington, DC 20402. \$7.00. This is an excellent analysis of the entire field of applied technology for disabled people.

The Use of Technology in the Care of the Elderly and the Disabled: Tools for Living. Jean Bray and Sheila Wright, editors. Greenwood Press, Westport, Connecticut. 1980. Based on papers at two symposia held in London and Berlin in 1979 under the sponsorship of the Commission of the European Communities. The main focus of this book is on ways and means of putting better products at the service of the elderly and the disabled. In presenting a collection of international papers by industrialists, government officials, financiers, experts from consumer protection services and charitable organizations, as well as those working daily in the field, this study sets out to provide a blueprint for understanding how the development of new and adapted products can most constructively be translated into practical help for the elderly and the handicapped.

These publications address the broader public policy issues related to disabled people. Each of these references includes references to technology use by physically disabled individuals.

Handicapping America: Barriers to Disabled People. Frank Bowe. Harper & Row, 10 E. 53rd Street, New York, NY 10022. 254 pages. \$14.95. Introduction to disability, attitudes, architectural and transportation barriers, and programs affecting handicapped Americans.

"Physical Disability and Public Policy." Gerben DeJong and Raymond Lifchez. Scientific American, Vol. 248, No. 6, pages 40-49, June, 1983. This article examines US policy with respect to citizens with disabilities. The authors summarize the existing knowledge of the dimensions of disability and the growth patterns over the past twenty years, discuss the extent to which disability laws have been implemented, and suggest necessary economic ingredients for a working disability policy in today's political and economic climate. A major focus of the article is the area of architectural accessibility. Complementing the article are charts and graphs illustrating the federal disability laws and the demographic information.

Rehabilitating America: Toward Independence for Disabled Americans. Frank Bowe. Harper & Row, 10 E. 53rd Street, New York, NY 10022. \$12.95. Discusses the economics of disability and age. This book has many useful statistics for demonstrating the effectiveness of rehabilitation.

The White House Conference on Handicapped Individuals, Awareness Papers, Vol. 1. George Washington University, School of Medicine, Washington, DC. 466 pages. 1977.

The Unexpected Minority: Handicapped Children in America. John Gledman and William Roth for the Carnegie Council on Children. Harcourt Brace Jovanovich, New York, NY. \$17.95. This fifth and final report from the Carnegie Council on Children comes to a stunning conclusion: no other minority group has its social and political oppression so thoroughly masked as the 10 million handicapped children and 30 million handicapped adults in America. This book is the first comprehensive study to apply a civil rights lens to the problems of both handicapped children and adults. As the authors make clear in this analysis, it is the social rather than the biological aspects of disability that doom so many handicapped children and adults to stunted and useless lives. The authors also propose a radically new approach to disability.



INFORMATION ON TECHNOLOGY COST/EFFECTIVENESS/AND BENEFIT

EMPLOYMENT-RELATED TECHNOLOGY FACTS & FIGURES

Accommodation Can Be Reasonable. A Study of Accommodations Provided to Handicapped Employees by Federal Contractors Berkeley Planning Associates, in collaboration with its subcontractor, Harold Russell Associates, produced the study for the Department of Labor (DOL). It is the first national survey concerning accommodation practices for disabled employees of private sector employers who contract with the Federal government.

Some of the findings of this study include:

An overall conclusion of the analysis is that for firms which have made efforts to hire workers with disabilities, accommodation is "no big deal." Rarely did an accommodation involve much cost, **51% of those reported cost nothing, an additional 30% cost less than \$500, and only 8% cost more than \$2,000.**

Accommodations for individual workers take many forms, including the following: training and transfers (14%), job modification and restructuring (23%), orientation of staff and supervisors (18%), special equipment and assistance (15%), work environment and location changes (21%), and other (9%). No particular type of accommodation dominates. Most workers receive more than one kind of accommodation.

The most expensive and extensive accommodations tended to be provided to the blind and those who use wheelchairs. Higher skilled workers were often provided environmental adaptations of the work place or special equipment than lower skilled workers. Lower skilled workers were more likely to receive job redesign accommodations, retraining, or selective placement.

Accommodation efforts are generally perceived as successful in allowing the worker to be effective on the job. Firms frequently reported that the accommodation would benefit the employee if promoted to a new job and also stated that often other nondisabled workers also benefited from the accommodation.

Availability of the report is limited at this time, but inquiries should be directed to:

Mr. Thomas Hodges, Development and Research, Employment Standards Administration, Dept. of Labor, Room C-3313, 200 Constitution Avenue NW, Washington, DC 20210, 202/523-9145.

Disability Management Today The bi-monthly publication covering business issues of employment of disabled persons. Michael Zullo, editor. Available from Mueller & Zullo Inc., 16 Hudson Street, New York, NY 10013 212/732-5557.

Succinct well-written articles contain information and statistics which could be useful in documenting the need and cost effectiveness for various technology-related services. For example, in Volume 1, Issue 3, "The Cost/Back/Reward

Center lists facts such as:

"After headaches, back pain is man's most common and intractable complaint.

"80-90% of all Americans will suffer significant back pain sometime in their lives.

"In the United States, there are an estimated 75 million people with back problems.

"There are 7 million new victims of back pain each year. Of these, 3 million are partially or temporarily disabled, and 2 million will be unable to work at all.

"Back pain ranks second only to upper respiratory infections in terms of work time lost due to illness.

"There are 93 million workdays lost each year due to back pain and \$5 million spent annually for diagnostic and treatment procedures.

"An estimated 200,000 Americans will have back surgery each year. A third of these will have additional surgery, usually fusion.

"Disc disorders occur more frequently in the prime of the worklife expectancy ages 30-40.

"Once an individual has had a back problem, he is 10 times more likely to suffer problems again."

and another article, "Disability Does Affect the Economy," states:

"Some of the causes of current high interest rates can be directly attributed to disability costs. In 1981, 40% of Social Security benefits went to medical payments or disability income. In addition, \$150 billion or 8% of the GNP was spent on transfer and medical payments. This money spent by government and industry should go to capital investment, which in turn would add to a healthy economy. Companies could reduce these staggering figures by both improving in-house disability management programs and employing qualified disabled individuals."

In "Engineering Aids Reduce Barriers to Employment for Severely Handicapped Clients," Rehab Brief, Volume 1, No. 8, August 1978. Available from National Institute of Handicapped Research, Department of Education, Washington, DC 20202.

"Making low-cost changes in work environments helped clients perform more job-related physical tasks. As a result, productivity of many of these clients equals or surpasses that of nondisabled employees doing the same tasks. State vocational rehabilitation agencies paid for purchased equipment and materials for custom-designed aids. The average cost per client was \$153, with the range from \$0 to \$1,806. The average time required to fabricate devices or install purchased devices was 21 hours, with the minimum 0 and the maximum 30 hours.

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**INDEPENDENT LIVING TECHNOLOGY: FACTS AND FIGURES SEATING & POSITION: G DEVICES. FACTS & FIGURES**

**Project Threshold has been described in other sections of this Resource Guide (EQUIPMENT SELECTION PROCESS, SERVICE DELIVERY MODELS)**

It is significant to note that despite the fact that all clients served by Project Threshold are severely disabled, in 77% of these cases the solution involved adaptive behavior and/or commercially available devices and resulted in lower average costs per client. Only when these more conservative methods had been exhausted did they turn to custom modification and fabrication of equipment for problem solution. This occurred in 23% of the cases. After developing and refining their systematized approach to service delivery, they have noted growth and changes in the program. Initially, the vast majority of solutions involved custom devices, now the majority of solutions are found in adaptive behavior and/or commercially available equipment.

Service Categories	Percentage of Cases
Problem identification and/or adaptive behavior recommendations	20%
Evaluation and recommendation of commercially available equipment	57%
Evaluation and modification of commercially available equipment	9%
Evaluation and custom design and fabrication of equipment	14%

Service Category Statistics for Project Threshold 1982-82 (Total=80 clients)

"Provision of Assistive Equipment for Handicapped Persons" J. Kohn, MD, S. Enders, OTR, J. Preston, Jr. MSW, W. Moltoch, CO. Archives of Physical Medicine and Rehabilitation, Vol 64, August 1983, pages 378-381. Data from the National Health Survey (1977), US Vital and Health Statistics, indicated that 645,000 persons require the use of a wheelchair. At the 1977 median cost of \$700 per wheelchair, the total expenditures in the United States totalled more than \$550 million. Data concerning costs, service delivery problems, and equipment life span were not available in the literature. The evaluation of these factors appears to be a major gap in measuring the success of rehabilitation engineering services and research. In this study, effectiveness and relative costs of mobility-postural seating were evaluated in 196 clients. Of the 196 to whom a questionnaire was sent 138 (70%) responded and 49 (25%) were selected for personal interview. Demographic data were comparable in the 3 groups. Eighty-eight percent were entirely nonambulatory, 54% received electric wheelchairs. In the 49 clients visited 79% of the devices were rated optimal or close to optimal in performance, 21% were rated limited or unsatisfactory. Fifty-two percent were being used currently. 23% had been outgrown and replaced, and 25% were not being used for other reasons. Of the devices in use, the average duration time was 25 months and the average time in use per day was 9 hours. For the devices which had been outgrown, the life span of the device was 30.9 months and the cost per day was about \$1.50. Implications of the findings are discussed and recommendations are made for better assessment, follow-up and evaluation of both the assistive devices and the service process.

The full report of the study in this paper is entitled Team Assessment of Device Effectiveness A Retrospective Study, by J. Kohn, MD, S. Enders, OTR, J. Preston, Jr., MSW, W. Moltoch, CO. It is available from Children's Hospital at Stanford, 520 Willow Road, Palo Alto, CA 94304.

LIFETIME COSTS

The following chart is reprinted with permission from "How Much Is Your Disability Worth?," Accent on Living, Summer 1981. The article discusses the use of a human factors analyst to determine the cost of a disability.

"The following is the summary of the goods and services needed by a 23-year-old who lost one hand and most of the other in a punch press machine accident. The figures are based on an ergonomics study done in 1978. The figures cover costs for him over his remaining life span to meet his disability-related needs. No amounts are allowed for extra medical expense, insurance coverage, or earning losses.

Major Categories	First-Year Costs	Total Life Span Costs (without inflation)
A Prosthetic Aids and Services	\$7,912	\$90,966
B Special Exercise Aids and Physical Therapy	\$840	\$8,820
C Dressing Aids and Clothing Modifications	\$4,031	\$75,273
D Special Home Aids, Furnishings, and Modifications	\$11,896	\$52,370
E Travel Aids and Special Automobile Features	\$4,833	\$36,679
F Special Vocational Aids and Counseling	\$7,202	\$34,773
G Special Recreative	\$2,030	\$6,270
H Assistance and Extra Services	\$4,321	\$185,803
<b>TOTALS</b>	<b>\$43,115</b>	<b>\$490,954</b>

"Application of Dimensional Analysis in Determining Cost/Benefit of Handicapped Devices" Brian R. Drufke, P.E., Selyn W. Becker, Ph.D. Proceedings of the Fourth Annual Conference on Rehabilitation Engineering, Washington, DC. Available from RESNA, Suite 402, 4405 East-West Highway, Bethesda, MD 20814. 1981. This paper presents a generalized method of performing cost/benefit analysis on aids and devices for the handicapped using dimensional analysis. The utility of the method presented is that both objective and subjective selection factors influencing the cost/benefit analysis can be considered simultaneously. Additionally, this analysis method allows dissimilar devices or aids designed to compensate for the same loss of function to be compared with each other or against a chosen benchmark.

IS COST EFFECTIVENESS THE ANSWER?

Before we get too caught up in looking at ways to produce evidence of cost effectiveness, it is important to look at the results of this OTA study.

The Implications of Cost-Effectiveness Analysis of Medical Technology, Office of Technology Assessment, Congress of the United States, Washington, DC 20510. August, 1980.

"The rapid and continuing growth of expenditures is a central issue in many policy decisions concerning the medical care system of the United States. Policymakers, health professionals, and consumers are seeking ways to control this growth while simultaneously improving the quality of health care. Increasingly, the use of cost effectiveness analysis/cost-benefit analysis (CEA/CBA) is being advocated as a possible means of making the medical care system more efficient. In particular, this technique is suggested for use in health care programs -- for example, by the Medicare program in its reimbursement coverage decisions. Nevertheless, a great deal of confusion and disagreement surrounds the implications and feasibility of applying CEA/CBA in health care. To aid in their decisions concerning the possible use of CEA/CBA in Federal health programs, the Senate Committees on Labor and Human Resources and on Finance asked OTA to explore the applicability of CEA/CBA to medical technology.

"The primary focus of the assessment is on the application of CEA/CBA to medical technology, i.e., the drugs, devices, medical and surgical procedures used in medical care, and the organizational and support systems within which such care is provided. The findings of this assessment, though, might very well apply to health care resource decisionmaking in general and with modification, to other policy areas such as education, the environment, and occupational safety and health.

"This OTA assessment finds that CEA/CBA could not serve as the sole or primary determinant of a health care decision. Decisionmaking could be improved, however, by the process of identifying and considering all the relevant costs and benefits of a decision. At present, using the approach or process of CEA/CBA in decisionmaking may be more helpful than the rigid and formal application of CEA/CBA study results in health care program decisions. It is unrealistic, moreover, to expect that CEA/CBA, in itself, would be an effective tool for reducing or controlling overall expenditures for medical care." from Summary and Policy Options.

## STATISTICAL INFORMATION RESOURCES

Whether you need demographic statistics for activities such as program planning, or for documentation of needs and impact statements in research and funding proposals, the references can be hard to find. Here are some sources of data.

**Statistics on Technology for Disabled People**

Technology and the Handicapped, Office of Technology Assessment, US Congress, Washington, DC. Analyzes the policies and problems related to current disability statistics.

Use of Special Aids in the United States in 1977, Series 10, Number 135. DHHS Publication No. (PHS) 81-1563. Available from US Department of Health and Human Services, Office of Health Research, Statistics and Technology, National Center for Health Statistics, Hyattsville, MD, 202/436-8500. October 1980. Statistics on the distribution and use of artificial limbs, braces, crutches, canes or walking sticks, special shoes, wheelchairs, walkers, and other special aids for getting around. Based on data collected in the National Health Interview Survey in 1977.

**Statistics About Disabled People**

The Physically Impaired Population of the United States. Firing & Associates, 4079C 24th Street, San Francisco, CA 94114. \$40.00. 1978. This report presents a statistical breakdown on the handicapped population of the US. Both published and unpublished survey data from the US National Center for Health Statistics served as the basic source of figures. The report covers physical conditions only, as opposed to mental. Six major categories are detailed: visual, hearing, speech, paralysis -- partial or complete, absence of extremities, and orthopedic. Each category is broken down further by degree. A unique feature of this report is a description of how the individuals themselves view their characteristics as a limitation of their ability to carry on daily living activities.

In addition and complementary to describing these conditions, several sections are devoted to demographic characteristics of the target population. Noteworthy are statistics on family income, age use of selected aids, and the costs of rehabilitation programs to the federal government.

Characteristics of the institutionalized population are described separately from those of the noninstitutionalized population. A final section provides information on geographic distribution, including state-by-state breakdowns for all categories and for the total incidence among the working age population.

Spinal Cord Injury Statistics. John S. Youn et al. Available from Good Samaritan Medical Center, Phoenix, AZ. 152 pages. \$25.00 prepaid. 1982. The National Spinal Cord Injury Data Research Center (NSCIDRC), established at Good Samaritan Medical Center in Phoenix, Arizona, has summarized their collection of data on spinal cord injuries in the publication Spinal Cord Statistics.

This publication provides a compendium of data describing the demography of the SCI population, the etiology of SCI, medical aspects of SCI management, SCI survival rates, and medical and social outcomes associated with SCI model systems care. As context for this data, Dr. J. Paul Thomas, director of medical and technical programs at the National Institute of Handicapped Research, provides an excellent historical perspective on SCI care.

Regarding technological involvement in SCI, it is noted in a general way, early in the book, that biomedical engineering is developing adaptive interfaces between "spinal man" and his environment. In the section on "Non-Medical Expenditure costs of environmental modification as a function of years following injury and level/extent of impairment," "Environmental modification" is defined to include a major portion of the adaptive equipment which may be prescribed for the SCI patient.

National Survey of Stroke, 1980. The National Head and Spinal Cord Injury Survey, 1980. Available from the National Institutes of Health, Washington, DC. The National Institute of Neurological and Communicative Disorders and Stroke has undertaken a series of surveys aimed at providing valid national statistics on incidence, prevalence, and cost.

The California Disability Survey. J. M. Shanks (UC-B) and H. E. Freeman (UCLA). Available from California Department of Rehabilitation, 830 K Street Mall, Sacramento, CA. 1980.

Digest of Data on Persons with Disabilities. Prepared under contract to the Congressional Research Service, Library of Congress by Rehab Group, Inc. Available from US Government Printing Office, Washington, DC 20402. Stock Number 017-090-00050-0. May 1979.

Labor Force Status and Other Characteristics of Persons with a Work Disability 1982. US Bureau of the Census, Current Population Reports, Series P-23, No. 127, US Government Printing Office. \$4.50. 1983.

Characteristics of Special Populations: Implications for Recreation Participation and Planning. Carol Ann Peterson and Peg Connolly Hawkins & Associates, Inc., 804 D Street NE, Washington, DC. 10/2/1978.

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FEBRUARY, 1985

ADDRESS CHANGES

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**INFORMATION SERVICES AND RESOURCES --  
DATABASES, CLEARINGHOUSES, NETWORKS**

**Assistive Device Database System (ADDS)** is now solely available from Assistive Device Center, California State University, Sacramento, CA 95819, phone 916/454-6422 Contact person Helen Woodal, Resource Coordinator

**TECHNOLOGY AT HOME**

An Accessible Entrance Ramps Design Coalition, Inc, 1201 Williamson Street, Madison WI 53705 1979 37 pages Text and clear graphics presents the basics of ramp evaluation, planning design, construction and materials

The Idea Machine Mary O'Donnell, RPT Little People of America Foundation 20 pages \$2.00 Available from the author at Johns Hopkins Hospital Baltimore MD 21206, or from local chapters of Little People of America A booklet of handy hints for short-statured people Mainly describes adaptive techniques, and creative use of mass market products, but also includes several DIY equipment ideas

Making Life More Livable Irving Dickman American Foundation for the Blind, 15 West 16th Street, New York NY 10011 1983 92 pages Describes simple, inexpensive adaptations for the home of blind and visually impaired older people The emphasis is on solutions that can be made by the person him/herself or by a relative, friend, or handy neighbor The information is very practical, and makes every effort to make do with what is on hand, e.g., a rubber band to identify which bottle is heart medicine

Resource Guide of Continence Aids and Services Summer, 1984 41 pages \$3.00 Available from Help for Incontinent People (HIP) P.O. Box 544 Union SC 29739

Xandria Collection Catalog Special Edition for Disabled People Lawrence Research Group, P.O. Box 31039, Department DP, San Francisco CA 94131 3rd edition (special) 1983. 35 pages Free This discreet catalog of commercially-available sexual aids has a section (pp 26-28) on homemade adaptations, modifications, etc., for vibrators written for people who find grasping a vibrator difficult

**EDUCATIONAL AND VOCATIONAL TECHNOLOGY**

Proceedings of the International Conference on Rural Rehabilitation Technologies October, 1984 285 pages \$30 plus \$2.54 postage Available from ICCRT Headquarters, Box 8103, University Station, Grand Forks ND 58202

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Microcomputers in the Schools -- Implementation in Special Education Tom Hanley SRA Technologies 301 S Highland Street Arlington VA 22204

Personal Computers and the Disabled Peter McWilliams October 1984 416 pages \$9.95 Quantum Press, Doubleday & Company, Garden City NY

**FUNDING -- FUNDING**

Health Technology Case Study 30 The Market for Wheelchairs -- Innovations and Federal Policy November 1984 68 pages Office of Technology Assessment, US Congress, Washington DC 20510

Policy Analysis Series Paper No. 22 Improving the Quality of Life for People With Disabilities Potential Uses of Technology April 1984 31 pages Available from Development Disabilities program, State Planning Agency, 201 Capitol Square Building, 550 Cedar Street, St. Paul MN 55101

**FUNDING -- DO-IT-YOURSELF**

Adaptive Equipment Inexpensive, Custom Designed, Do-It-Yourself Letor Davis, Sherrilyn Hawkins, and Laurie Raymond 1979 81 pages No charge Available from Educational Service Region, Cook County, 33 West Grand Avenue, Chicago, IL 60610

Patterns and plans for constructing therapy equipment, positioning devices, and other assistive devices from TRI-WALL cardboard

The Association for the Advancement of Rehabilitation Technology (RESNA) is an organization concerned with the application of science and technology in the rehabilitative process. RESNA brings together a diverse group of individuals with widely varying credentials, activities, and interests who are committed to designing, developing, evaluating, and providing devices that will put the benefits of technology to work for persons with disabilities. Its membership includes rehabilitation professionals, (from all disciplines), providers, and consumers. A goal of the organization is to facilitate the interaction between these groups so they can better meet the needs of those who can benefit from the application of technology in rehabilitation.