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Identifiers-SAEDC, Sensory Aids Evaluation and Development Center

The report lists the staff and states the activities of the Sensory Aids Evaluation and Development Center (SAEDC). Work accomplished is reviewed, including work on the following: compiled speech output for the DOTSYS Information System; monotype reader; braille embosser; folding canes; pathsounder; Perkins brailler; evaluation of braille; speeded hearing and experimental demonstration; the development of length concepts by blind children; and spectacles. The administrative structure of SAEDC is explained and national advisory and steering committee members are named. Activities detailed are conferences, the special summer session, publications and presentations, special conferences and activities, and consultation. Seven figures are provided of work completed at the Center. (JD)

ANNUAL REPORT

to

SOCIAL REHABILITATION ADMINISTRATION
DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Washington, D.C.

of work done under Contract SAV-1057-67
for the period
1 December 1966 through 30 November 1967

from

THE SENSORY AIDS EVALUATION AND DEVELOPMENT CENTER
Massachusetts Institute of Technology

292 Main Street
Cambridge, Massachusetts 02142

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PREFACE

John Kenneth Dupress's sudden death on December 29, 1967 summarily terminated the significant contributions he was making to the amelioration of blindness through the application of technology.

He had just completed 3 years as founding Director of the Center for Sensory Aids Evaluation and Development, a novel organization dedicated to testing the utility of sensory devices for the blind and, where warranted, improving their engineering and human factors aspects in order that they might become truly valuable to the blind. Beyond this evaluation and development, Mr. Dupress, through his wide and varied contacts across the spectrum of research, application, and rehabilitation, ceaselessly explored ways to exploit useful devices and systems.

Part of this annual report had been prepared by Mr. Dupress prior to his death. The numbing consequences of his passing, the immediate pressure to document the Proceedings of the just completed First Mobility Conference, the preparations for and subsequent documentation of the Braille Conference at the American Printing House, the maintenance of momentum of the Center's programs, and the difficult search for a successor for Mr. Dupress, just reaching completion, have all militated against the preparation of a detailed annual report comparable to its two predecessors.

We believe that this somewhat abbreviated document, together with the supplementary mobility and braille Conference proceedings represent an adequate report of last year's work. The program for the current year represents continuations and extensions of some aspects of the previous program. The new Director will shortly be interacting with the Center staff and with the members of the Steering and National Advisory Committees in charting a course for the Center which will capitalize on the firm foundation of John Kenneth Dupress's inaugural three years and which will identify the maximum potential directions of the future.

Robert W. Mann
Chairman, Steering Committee

I. INTRODUCTION

The Sensory Aids Evaluation and Development Center was established on September 1, 1964 under Contract SAV-1036-65 from the Vocational Rehabilitation Administration, now the Social Rehabilitation Administration, Department of Health, Education, and Welfare and continued during year 1966 and 1967 under Contracts SAV-1045-66, and SAV-1057-67.

During the fiscal year 1967 ending November 30, members of the staff included:

Mr. John K. Dupress, Managing Director
Mr. George F. Dalrymple, Electrical Engineer
Mr. Norman Berube, Mechanical Technician
Mr. Alexander Glimcher, Electrical Technician
Miss Sylvia Tufenkjian, Psychologist
Miss Lynn Lederer, Secretary

In addition to the regular staff members, the following persons performed work on specific projects (on a part-time basis) during the third contract year:

Mr. Murray Burnstine, Mechanical Engineer
Mr. Ernest Cataldo, Electrical Engineer
Mr. Peter Duran, Mathematician
Mr. Lindsay Russell, Electrical Engineer
Mr. and Mrs. Joseph Schack, Computer Programming

The Steering Committee and the National Advisory Committee provide necessary leadership and advice.

The scope of activities, as outlined in the initial contract, is as follows:

"The Center's activities consist of the following: (1) Evaluation of existing sensory aids and devices; (2) Locations of new and promising aids for evaluation; (3) To encourage others to develop new aids which then can be submitted for production engineering at the Center; (4) In conjunction with the above, but to a lesser degree, development of new sensory aids for the blind; (5) Development of training principles and techniques for blind users of the sensory aids: (6) Behavioral research with blind users under field conditions; and (7) Development of objective standards to evaluate such devices.

Basic research and development will not constitute a major activity of

the Center."

During the first contract year, the Center concentrated on staffing, facilities, laboratory equipment, arrangements with rehabilitation agencies and local manufacturers, and reliability engineering of prototypes.

During the second and third years, emphasis was placed on final field testing, production engineering, and negotiations with rehabilitation facilities for applications.

II. WORK ACCOMPLISHED

A. Compiled Speech Output for the DOTSYS Information System

Reference to previous SAEDC reports[1] describes the overall information processing system for the blind, DOTSYS, which has been designed to accommodate to the ultimate production of audio output to supplement its current braille output capability.

On November 27, 1967, members of the Center staff met with personnel of Haskins Laboratories and the Veterans Administration to discuss ways in which the SAEDC could assist in the evaluation of compiled speech generated by Haskins Laboratories. Along with a review of techniques used in the production of compiled speech, there was a discussion of progress to date and future plans. There are a few technical problems. The limiting factor for large scale evaluation, however, is the lack of sufficient input material in computer compatible media. No firm conclusions on a possible role of the Sensory Aids Center were reached. However, current and future activities of the SAEDC, such as the program to demonstrate the concurrent braille and ink-print publication of a new novel, see II G, will contribute to the creation of a store of computer compatible input media.

B. Monotype Reader

The integration of the Monotype reader into the incremental magnetic tape recorder and editing keyboard has been the responsibility of Professor Dwight M.D. Baumann and his graduate students in Mechanical Engineering Sensory Aids Group.

The role of the Reader-Recorder as well as other input-output terminal equipment is described in the Engineering Projects Laboratory Report #70249-1[2] which describes the overall blind information processing system (BIPS) of which DOTSYS is the computer program core.

C. Braille Embosser

A high-speed braille embossing system has been under development at the SAEDC and the Mechanical Engineering Department at M.I.T. since 1960. A detailed

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[1] FINAL REPORT to Vocational Rehabilitation Administration, Department of Health, Education and Welfare, Washington, D.C., 31 October 1965 and 3 April 1967.

[2] Baumann, D., Dupress, J., and Mann, R. Towards Making Braille As Accessible as Print, Engineering Projects Laboratory Report #70249-1, August 1967.

historical account including the disposition of assembled units can be found in previously published reports to the Vocational Rehabilitation Administration (Contracts SAV-1036-35 and SAV-1045-66).

A grant from the Hartford Foundation commencing July 1, 1967, and running through June 1970 is providing supplementary support for the Brailler development including re-design for enhanced reliability and maintenance, quieter operation and lower per unit production costs. The Hartford grant will cover the fabrication of 20 additional units of improved design and it will support the preparation of complete manufacturing drawings and specifications of the final design.

Braille embosser unit number 5 is presently installed at the Perkins School, Watertown, Massachusetts as a braille terminal in a cooperative Perkins-Mechanical Engineering Department-Computation Center braille translation program.[3]

Our present effort is directed towards utilizing commercial components not previously available in the re-design of the embosser. To date, the cycle clutch assembly, the selector bar tubular solenoids, and the paper advance mechanism have been replaced by "off the shelf" components. The engineering effort required to accommodate these standard components is necessary because the cost of machine shop services has increased approximately 35% since the first limited production run of brailler parts in 1964.

Based on laboratory and field tests, the following design changes have been utilized in order to increase the durability of the embosser.

1. The cam shaft driven platen has been replaced by a crank driven arrangement, thereby reducing the number of manufactured parts required, reducing the noise, vibration, and overthrow problems, and eliminating the wear and binding associated with the platen support clamps.
2. The new selector bar assemblies feature torsion tube stiffening members which reduce twisting of the selector bars. The old selector bar arrangement required frequent mechanical adjustment for reliable stroking.
3. Tubular spring stops have been added to the embossing head interposer pins to limit the interposer spring compression under

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[3] The braille-in-the-classroom experiment at Perkins was very well received as attested to by both a feature back-cover article and an editorial by Dr. Waterhouse in the March 1968 edition of The Lantern, the monthly publication for the Perkins School for the Blind.

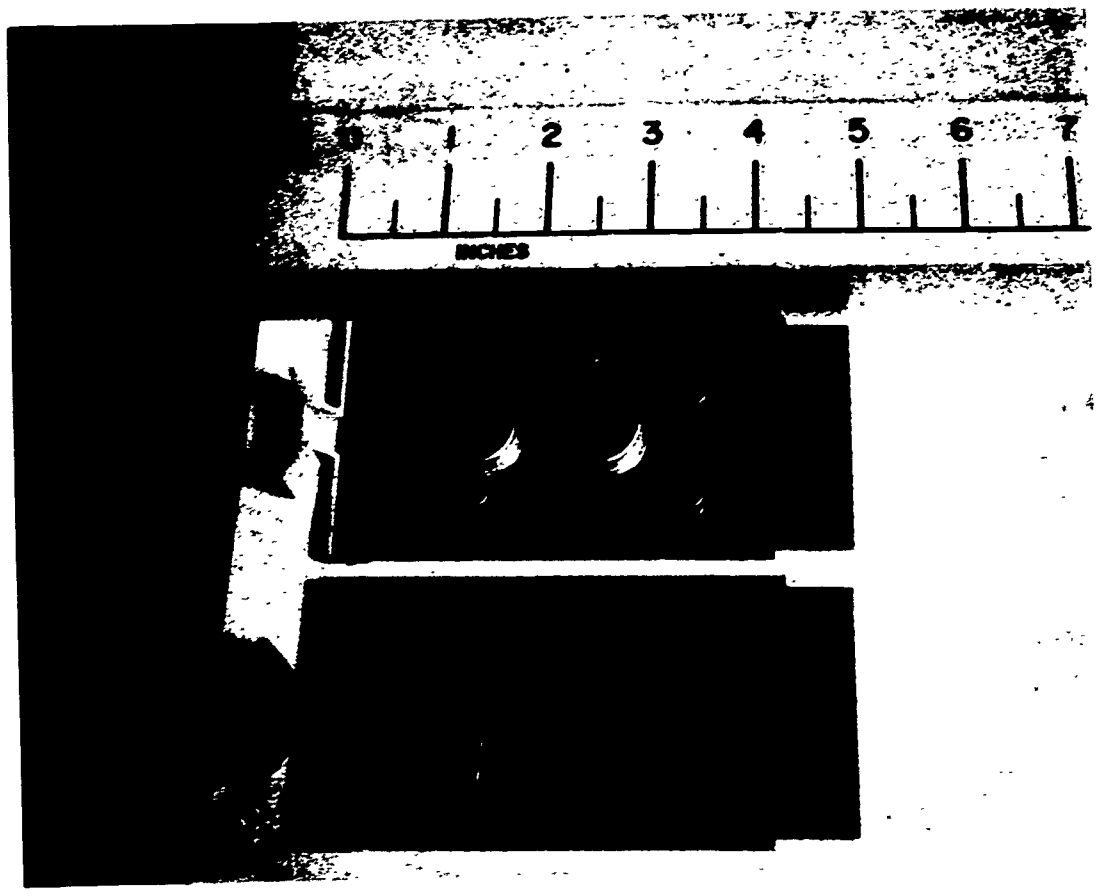

FIGURE 1.

TYPICAL D.E.C. CIRCUIT CARDS AS USED IN THE LATEST BRAILLER ELECTRONICS

dynamic loading conditions. No interposer spring failures have been reported with the new arrangement.

4. Several polyurethane materials have been evaluated as potential replacements for the machined steel platen die in an effort to reduce both the reciprocating mass and the cost of the 228 cavity die. To date, the resulting braille has been assessed as "marginal" by our braille readers.
5. The SAEDC developmental embosser is presently being driven by commercially available electronic circuit modules (D.E.C. cards) and power supplies.

D. Folding Canes

As a result of the warm response to the SAEDC folding cane expressed by participants at the 1967 Mobility Conference, the Center is currently assembling 100 aluminum swaged tube-central steel cable folding canes (Figure 2) for evaluation.

The development of a swaged tube magnesium section cane has been set aside because of technical problems encountered in attempting to swage the magnesium. Canvas reinforced plastic sections and fiberglass tube elements were assessed as inferior to metallic sections with respect to transmission of vibro-tactile displays. A sample length of boron reinforced epoxy tube is being evaluated using non-destructive test methods at the M.I.T. materials testing facility. The described composite material, while offering attractive strength to weight ratios, seems at present prohibitively expensive for realistic cane distribution.

A test fixture capable of measuring the torque required to maintain a cane at various angles with the horizon has been assembled. The purpose of this fixture is to assign a range of values which are more meaningful as design parameters than totally subjective appraisals i.e., "too heavy," "too much weight at end," "poor balance," etc. In a series of tests performed at the SAEDC, canes with lead weights installed in the bent handle were assessed by subjects as "lighter" than unweighted canes.

Cane users and peripatologists have urged the development of a straight handled folding cane. Subsequently, a working model was designed and assembled by SAEDC personnel. The handle section is comprised of a pivoted toggle (over-center) cable tensioning lever. All other features are identical with the design shown in Figure 2. The toggle cane is shown extended in Figure 3,

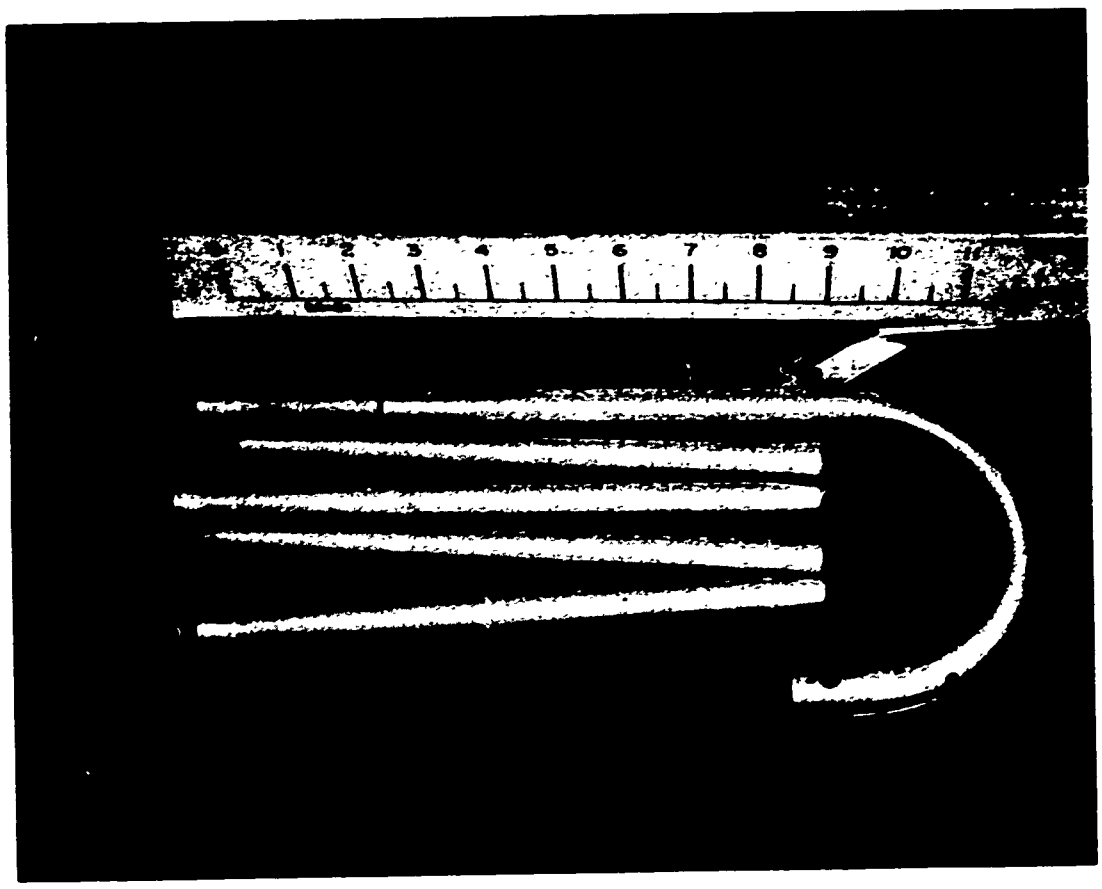

FIGURE 2.

SAEDC DESIGN CANE RELEASED FOR LIMITED PRODUCTION

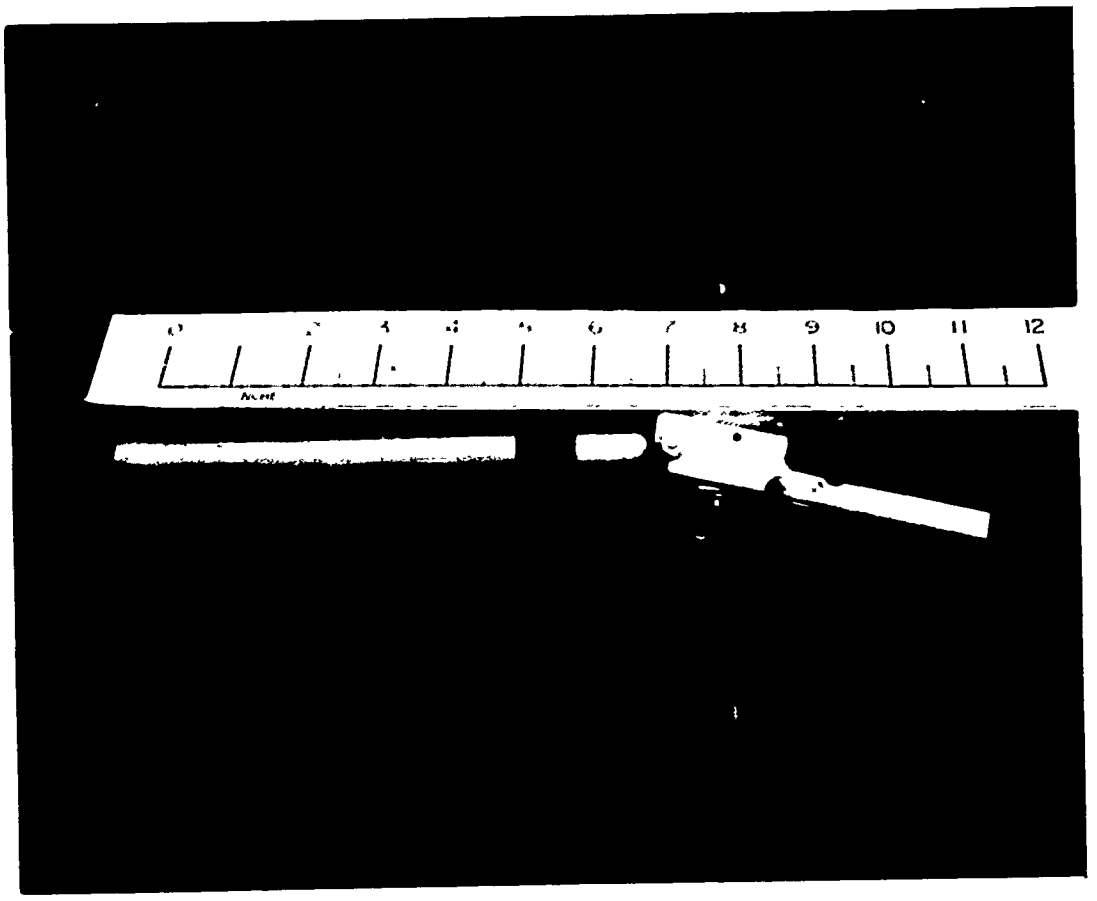

FIGURE 3.

PROTOTYPE STRAIGHT HANDLED FOLDING CANE SHOWN EXTENDED

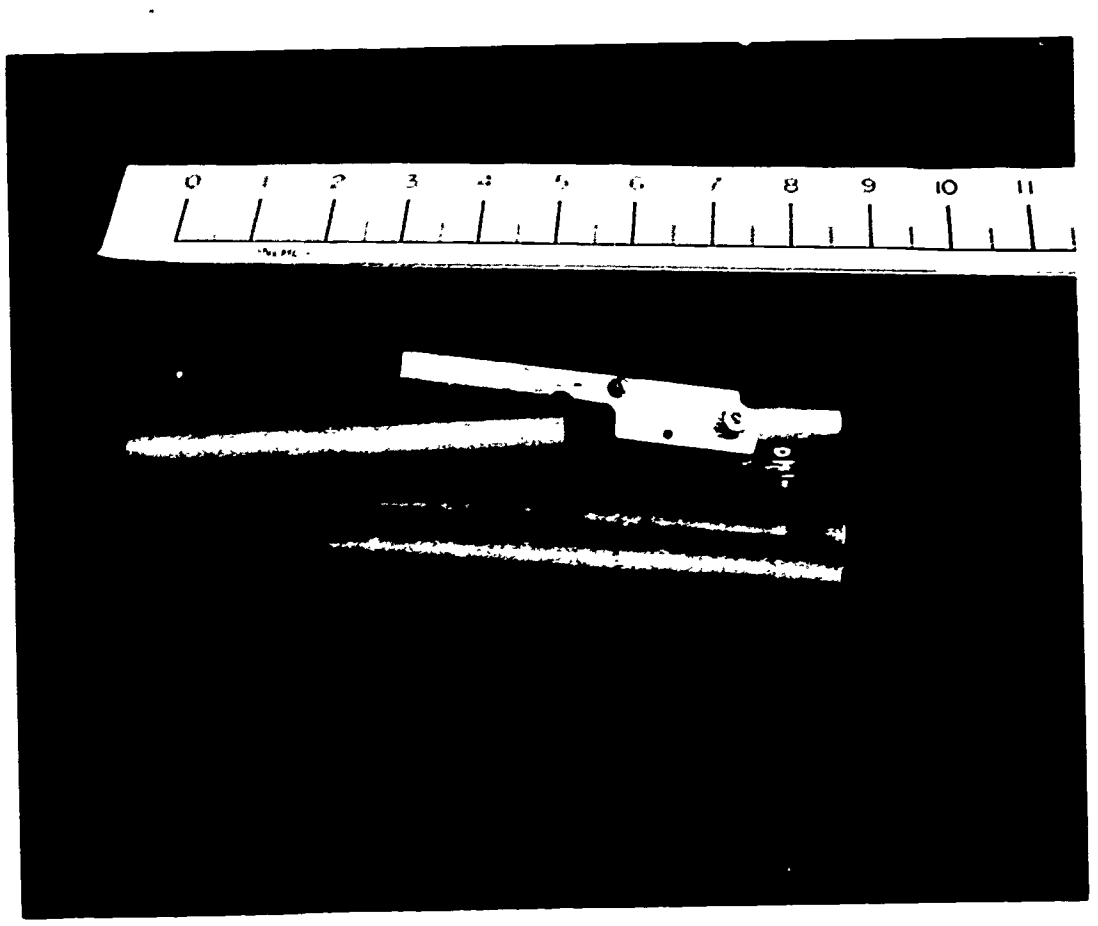

FIGURE 4.

PROTOTYPE STRAIGHT HANDLED FOLDING CANE SHOWN FOLDED

and folded in Figure 4. Our plans are to refine the mechanism after the 100 bent handle folding canes have been assembled and distributed.

E. Pathsounder

In December, 1966, two additional monaural "pathsounders" were delivered so that the Center now possesses three of these units.

This device (described in greater detail in the preceeding annual report) is a small battery-powered sonar intended for cane-travelers. Worn on the chest, it complements the cane by protecting the upper half of the body, giving audible warning when an object is within six feet in front of the traveler. In addition to the physical protection afforded, the early warning of the presence of other pedestrians makes it often possible to avoid bumping them or encountering them with the cane.

This year, for the first time, a systematic training program was designed for this aid. One student was given about forty hours of training, with encouraging results. The student, a totally blind college senior, began his training with very simple problems; e.g., to walk between two upright posts a yard apart, locating the opening with the aid. From drill of that sort, he proceeded to uncongested corridor travel and, finally, congested sidewalk travel. His most recent excursions with the aid were through shopping crowds in downtown Boston during the pre-Christmas rush.

Several design changes are indicated for the instrument, all of a fairly minor nature, but important, nonetheless, to minimize "human factors" snags.

Present thinking on the pathsounder project, based largely on this first training experience, is as follows:

First, the aid appears generally to do what is sought: protect the traveler from collisions that otherwise might occur.

Second, considerable technique must be learnt before the aid can be used effectively. This training cannot be done on a do-it-yourself-basis. An instructor is needed who has had formal instruction in Pathsounder technique.

Third, the time is approaching when closer liason will be desirable with teachers of cane travel so that the most sensible, integrated travel scheme can be worked out. The December 14, 15, 1967 Conference on Mobility at M.I.T. was a good initial step in this direction.

F. Perkins Brailler

SAEDC personnel are participating in a joint effort with the manufacturer of the Perkins brailler (Howe Press) to optimize the design of an "electric Perkins brailler." The primary design objective is to reduce the manual effort required at the keyboard. "Line space" and "carriage return" functions remain unassisted. The Howe Press modifications featured a directly switched, A.C. solenoid driven platen.

A more practical switching transistor solenoid driver was developed to overcome the following difficulties:

1. The life of the switch contacts was limited when used to interrupt an inductive circuit.
2. There was no "fail safe" provision if the switch was held closed by the operator.
3. The resultant package was "touch sensitive" i.e., the energy imparted to the platen was dependent on the dexterity of the operator.

The described driver circuit delivers a voltage pulse of controlled duration and constant amplitude for each switch closure. The circuit components cost approximately $110.00. Foam dampers were utilized to optimize the dynamics of the solenoid plunger and reduce the machine noise level. Approximately 250 pages of braille have been embossed at rates approaching 4 cells per second with no system failures.

A less expensive ($60.00) solenoid driver based on a SCR controlled capacitor discharge circuit was assembled. This combination resulted initially in a higher noise level machine, however the dynamics of the solenoid plunger have yet to be tailored to this driver.

G. Evaluation of Braille

With supplementary support from the Library of Congress plans are proceeding for the choice and then translation by computer into braille of a novel and a periodical. Discussions were held between Center personnel, Schack Associates, Computer Programming consultants to the Center, and ink-print type compositor firms including R. E. Donnelley and Poole Clarinda Co. Subsequent to the close of the fiscal year but before publication of this report, a decision on the novel was made with the cooperation of Little Brown & Co., publishers, and Poole Clarinda Co., the type compositor firm. The novel will be the EAST INDIAMAN by E. Meachem, a sea-saga in the tradition of the late C.S. Forrester. With the cooperation of the publishing and compositor

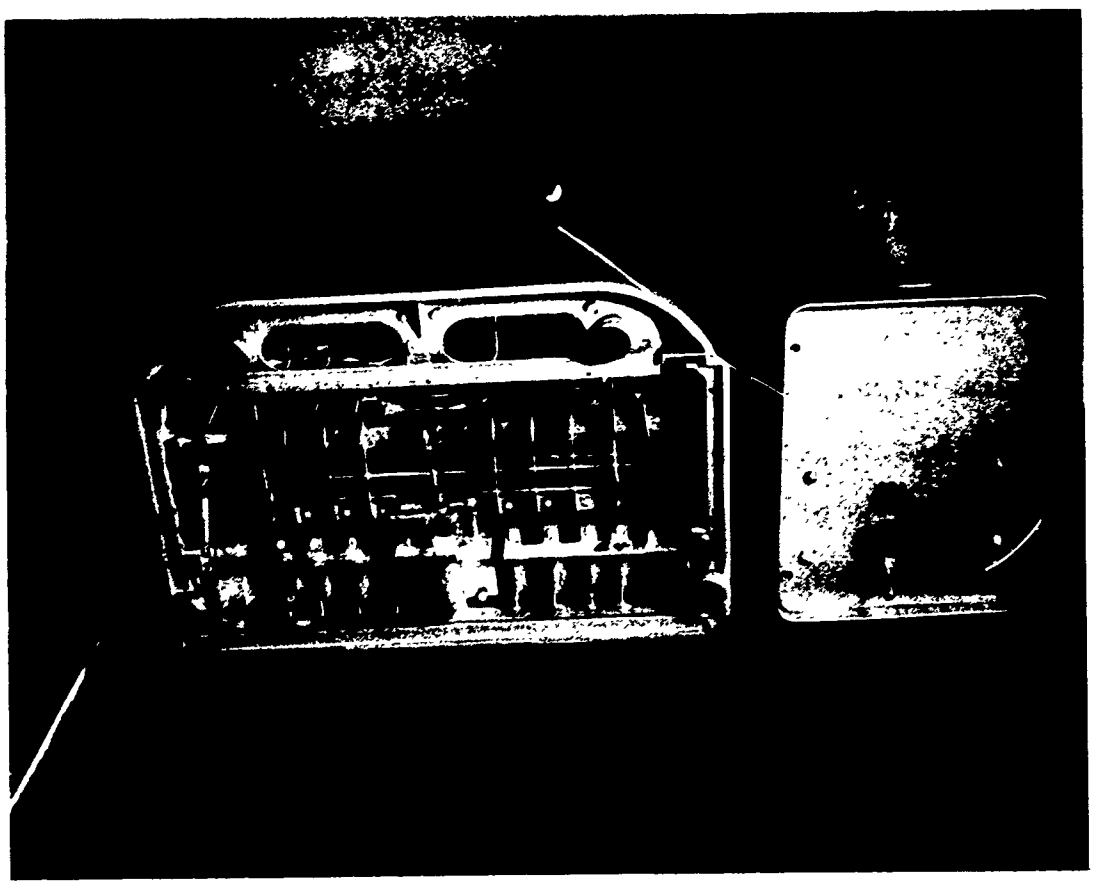

FIGURE 5.

ELECTRIC PERKINS BRAILLER SHOWING LOCATION
OF SOLENOID AND DRIVER PACKAGE

firms, who are furnishing the Center with the type compositor's tape used for ink-print preparation, and the American Printing House for the Blind, who will publish the braille edition, we plan to have the braille version concurrent with ink-print publication in September 1968.

The choice of the periodical to be published via type compositor's tapes is still undetermined.

H. Speeded Hearing and Experimental Demonstration

A blind person listening to a reader is limited to the reader's oral reading rate. This is typically 175 words per minute, though variable from reader to reader. A person listening to a reader via a tape recorder is restricted to the same reading rate used in recording. These word rates are far slower than those normally achieved by a sighted reader reading silently. To help blind persons who must have large amounts of information available, investigators have explored many means of increasing reading rates. Foulke[1] lists several techniques:

1. speaking rapidly,
2. the speed changing method, and
3. the sampling method.

The first method, speaking rapidly, is limited to the maximum rate a person can read and cannot be varied once recorded.

The second, speed changing, is quite easy to implement. There is, however, a multiplication of each frequency component that is proportional to the change in playback speed. This frequency distortion makes the resultant voice sound like "Donald Duck."

The sampling method can be accomplished in several ways. Garvey[2] actually cut out portions of tape and spliced the remaining sections together. This method is too cumbersome except for research purposes but specialized tape recorders, the Tempo-Regulator or Eltro Information Rate Changer, are available to perform the same function. Digital techniques can be used where either sections of equal length or pauses and redundant sounds are to be removed. These techniques produce the greatest increase in information rate for a

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[1]Foulke, Emerson and Sticht, Thomas, "A Review of Research on Time Compressed Speech," Proceedings of the Louisville Conference on Time Compressed Speech October 19-21, 1966, University of Louisville, Louisville, Kentucky. pp. 3-20.

[2]Garvey, W.D., "The Intelligibility of Speeded Speech," J. Exp. Psychology, 1953, 45. pp. 102-108.

threshold level of comprehension. Garvey investigated both the sampling and speed changing methods. He found that speed increases of 200% reduced the intelligibility to 65%. Using sampling techniques, he found that the information rate could be increased by 300% before the intelligibility dropped to 65%. Klumpp and Webster[3] have performed tests of the speed changing method with controls on the "signal to noise" ratio and had similar results.

The speed changing method is simple, e.g., capstan bushings or variable speed motors. Further, it shows promise of rate increases of 1.5 to 2.0 times normal rate. Therefore, a program was initiated at the SAEDC to explore the practical limits of this technique and to investigate corollary methods of increasing the information rate and comprehension.

Two subjects were used. One, a female, "S", is a high school senior at a private school. She has some light perception and is the only blind student in her class. The second subject, "C" is a male college senior. He has no residual vision. "S" has had very little contact with tape recorders while "C" is quite proficient in their use.

The basic equipment used was a Wollensak Model 547 tape recorder equipped with capstan bushings providing play back rates of 1.20, 1.30, 1.40, 1.60, and 1.65 times the recording rate. The American Foundation for the Blind Variable Frequency Power Supply was used to permit increases to 1.80. High quality headphones were used in all cases.

Several readers and several novels were used as listening material. Both students were thoroughly exposed to the technique before a systematic approach to a training program or learning schedule was adopted.

The students listened to one track of a reel of tape. At the end of the track, an objective test of seven or eight questions was given on the material just covered. When two tests were passed (65% score) in succession, the subject proceeded to the next higher speed available with the bushings. The initial rate was 1.20. Figure 6. lists the number of tests required by each subject at a given speed before proceeding to the next speed.

Both subjects have apparently reached their threshold performance with rates of 1.6 to 1.8 over regular playing speed. This was achieved in one

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[3]Klumpp, R.G. and Webster, J.C. "Intelligibility of Time Compressed Speech," J. Acoust. Soc. Amer., 1961, 33. pp. 265-267.

FIGURE 6.

NUMBER OF TESTS NECESSARY TO PASS TWO IN SUCCESSION:

Playback Rate	Subject	
	"S"	"C"
1.20	2	2
1.30	11*	2
1.40	3	2
1.60	2	2
1.65		4
1.70		2
1.75		2
1.80		2

* The subject was under great personal stress during this time.

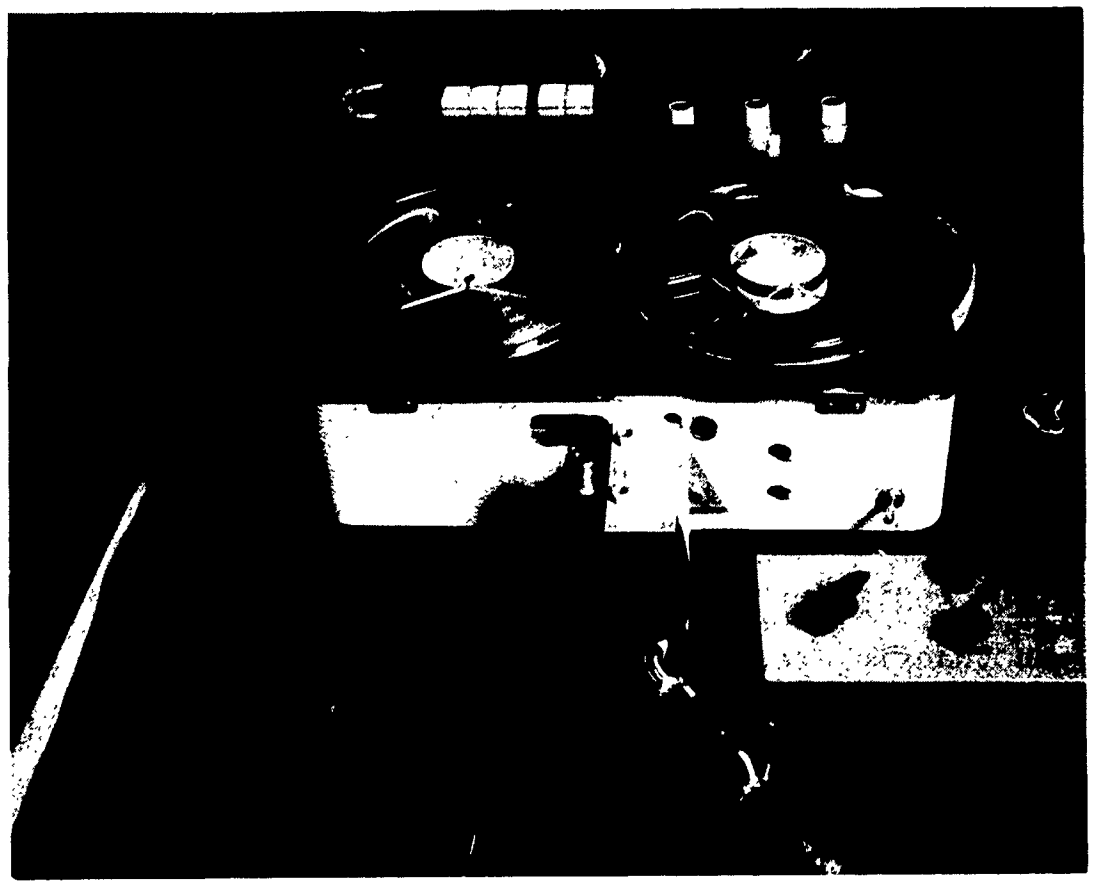

FIGURE 7.

VARIABLE SPEED MOTOR AND CONTROLLER
ADDITION TO NORELCO RECORDER FEATURES
STEPLESS SPEED CHANGE

month's time working approximately five hours per week. The maximum usable speed is determined by many factors, i.e., voice pitch of reader, difficulty of material, quality of recording, etc.

Several observations can be made:

1. The students prefer a faster speed — they don't become bored as easily.
2. The students prefer a male voice at faster speeds — they are able to go faster with a male reader. The lower resonant frequency of the male permits greater frequency increases.
3. Significant savings of time can be made by a student by using this technique in studying.
4. "C" developed such confidence in the technique that he came to the Center to study for his final examination in logic. He used speeds of 1.4 to 1.6 during this time. He has borrowed the equipment to study for his next set of final examinations.

This speed changing technique should have a place in the education of blind students as it can save study time. It can be implemented to suitable tape recorders for perhaps as little as thirty dollars.

The engineering staff at the Center will study the most effective and economical ways of converting commercially available tape recorders for easy conversion to speeded speech by blind listeners.

I. The Development of Length Concepts by Blind Children

A study of "The Measurement of Length by Congenitally Blind Children and a Quasi-formal Approach for Spatial Concepts" was undertaken. The major task was an analysis and description of the use of the haptic sense as it bears on the blind child's perception of length. The study endeavored to do two things: to present a quasi-formal approach and point of view for investigating spatial concepts; and to describe an experiment inculcating this point of view. In the quasi-formal approach the behavior of an organism or machine is differentiated into four parts: input, memory, logic, and display. This point of view is applicable to the sighted, blind, deaf, etc.

Congenitally blind children were chosen as Ss in order to isolate those perceptions derived through tactile learning. Ss were 20 female and 14 male congenitally blind students at Perkins School for the Blind in Watertown, Massachusetts. Ss ranged in age from five to 14 years. The I. Q. of the Ss ranged from 70 to 135 as measured by the Interim Hayes Binet

and the Weschler Intelligence Scale for Children. Only those students who were congenitally blind or blinded at the age of two years were chosen as Ss. There was no correlation between the age, sex, or I. Q. of the subject and his performance.

The experiment investigated the procedures and techniques congenitally blind children use in the estimation and comparison of lengths. Pairs of rods were presented to the subjects and they were asked to compare their lengths. The method used by the subjects to discriminate between rods of different lengths were observed and classified. The accuracy of the discrimination associated with these measurements was determined by using the method of constant stimuli.

The experiment has yielded several valuable conclusions concerning abilities of blind children, and the application of these conclusions to the teaching of blind children was discussed. The principal conclusions are:

(a) The physical size of the objects will determine the technique used for the measurement.

(b) As the physical length of the object increases, the corresponding DL increases independently of the technique used.

J. Spectacles

A brief exploratory test program was conducted on a set of ultrasonic "spectacles" developed by Peter Laakman of Los Angeles, California. The tests included a lot check for sensitivity and a few street tests with blind subjects. The following were the principal findings:

1. The sensitivity and output loudness were not sufficient to permit optimal use of the device outdoors in a fairly typical sidewalk situation.
2. The continual background swishing sound should be eliminated so that the instrument remains quiet in the absence of objects in front of the user.
3. Aside from these two attributes, the detector appeared to perform its required function.

III. ADMINISTRATIVE STRUCTURE

The Managing Director and staff of the Center are responsible to the Mechanical Engineering Department at M.I.T. In addition, all Center projects are submitted to its Steering Committee for approval.

Members of the Steering Committee participate in the day-to-day activities of the Center as consultants in their areas of individual specialization (Sensory Psychology, Mechanical Engineering, Electrical Engineering, Rehabilitation, Special Education, etc.) Also, this committee is divided into behavioral science and engineering task forces to assist staff members in designing and carrying out major projects.

The Advisory Committee to the Center maintains more effective contact for Center staff with research and rehabilitation facilities throughout the country. Their other main function is to join with the Steering Committee and Center staff to develop optimum planning.

Members of the Steering and Advisory Committees are listed below:

National Advisory Committee

Dr. R. A. Bottenberg, Air Force Personnel Lab., Lackland A.F.B., Texas
Dr. E. E. David, Jr., Bell Telephone Labs.
Prof. E. Foulke, Department of Psychology, University of Louisville
Prof. R.H. Gibson, Dept. of Psychology, University of Pittsburgh
Dr. H. Goldstein, Children's Bureau, H.E.W.
Dr. M. D. Graham, American Foundation for the Blind
Prof. J.G. Linvill, Electrical Engineering Department, Stanford University
Prof. I. F. Lukoff, School of Social Work, Columbia University
Dr. C. Y. Nolan, American Printing House for the Blind
Dr. R. A. Scott, Sociology Department, Princeton University
Dr. M. R. Rosenzweig, Psychology Department, University of California, Berkeley
Dr. W. P. Tanner, Jr. Sensory Intelligence Lab. University of Michigan
Dr. B. W. White, Psychology Department, San Francisco State College

Steering Committee

Mr. C. Davis, Perkins School for the Blind
Prof. R. Held, Psychology Department, M.I.T.
Prof. S. J. Mason, Electrical Engineering Department, M.I.T.
Prof. A.W. Mills, Psychology Department, Tufts University
Prof. R. B. Morant, Psychology Department, Brandeis University
Mr. J. F. Mungovan, Massachusetts Commission for the Blind
Dr. L. H. Riley, American Center for Research in Blindness and Rehabilitation
Dr. O. Selfridge, Lincoln Laboratories, M.I.T.
Prof. T. B. Sheridan, Mechanical Engineering Department, M.I.T.
Dr. M. L. Simmel, Psychology Department, Brandeis University
Prof. R. W. Mann (Chairman), Mechanical Engineering Department, M.I.T.

IV. ACTIVITIES

A. Conferences

1. On May 18 and 19, 1967, the Center jointly sponsored with Perkins School for the Blind and the Library of Congress a conference entitled "New Processes for Braille Manufacture." The minutes from this conference were compiled and edited by the Center staff with assistance from R. Bray, R. Gildea, and R. Mann. The proceedings were issued through the International Research Information Service of the American Foundation for the Blind.

2. The Center, during the fall of 1967, organized a conference for mobility trainers and technologists to be held December 14 and 15, 1967. The agenda is as follows:

Williams, R. Development of mobility and orientation training programs using the long cane.

Blasch, D. Mobility and orientation programs for children, youth, and the aged.

Suterko, S. Long cane training: advantages and problems.

Foulke, E. Data acquisition through the long cane.

Leonard, J.A. Evaluation of mobility capability.

Dalrymple, G. Lasers as mobility aids.

Russell, L. Human factors and the "pathsounder."

Benjamin, J.M. The laser and the long cane.

Dupress, J. Applications and field testing of three mobility aids.

3. The Center is jointly sponsoring with the American Printing House for the Blind in Louisville, Kentucky a braille research and development conference to be entitled "New Processes for Braille Manufacture." The conference will be held February 8 and 9, 1968 at the American Printing House. The agenda is as follows:

February 8th

9-9:50 a.m. Summary of ongoing activities at the American Printing House including services, research and development, and production. Robert Haynes, John Siems, Virgil Zickel.

9:50-10 a.m. Coffee break and informal discussion.

10-12 noon. Tour of the APH plant.

12 noon- 1:30 p.m. Lunch.

1:30-3:30 p.m. Panel on computer outputs and braille displays including the modified IBM electric typewriter, the M.I.T. embosser, the IBM converted printers, teletype embossing equipment, and other braille displays. T. Sterling (head), P. Blackman, W. Greiner, J. Pramuk.

3:30-3:45 p.m. Coffee break and informal discussion.

3:45-4 p.m. Braille program at the Instructional Materials Center, Chicago. R. Morrison.

4-4:20 p.m. Report by the Committee on Professional Activities of Blind Programmers of the Association for Computing Machinery. T. Sterling.

4:20-4:30 p.m. Higher computer language for braille translation. R. Gildea.

4:30-5 p.m. Report on progress and plans with math translation program. A. Schack.

<u>February 9th</u>

9-9:20 a.m. Braille as output for reading machines. K. Ingham.

9:20-9:30 a.m. Large computer braille translation at IBM. R. LaGrone.

9:30-9:50 a.m. Review of work in math translation. A. Nemeth.

9:50-10:05 a.m. Coffee break and informal discussion.

10:05-10:35 a.m. Methods used in working with the German blind community. G. Lamprecht.

10:35-11 a.m. Review of progress on project to produce one book and one magazine from compositors tapes. A. Schack.

11-12:30 p.m. Open panel on planning for computerized braille. R. Mann (head), P. Duke, R. Gildea, R. Haynes, K. Ingham, R. LaGrone, A. Nemeth, J. Schack.

4. During the ICEBY (International Conference for Educators of Blind Youth) Conference sponsored by the Perkins School, August 21-25, 1967, the Center and the Mechanical Engineering Sensory Aids Group held a special demonstration program on technology covering the following areas:

ultrasonic mobility aid, the "pathsounder",
conversion of print to speech,
"sound balls" for the play of blind children, and
braille-in-the-classroom via remote computer translation.

B. Special Summer Session

The summer session jointly sponsored with Columbia University's Teachers College, initiated in 1966, was held again from July 31-August 11, 1967. Participants were special education teachers from all over the United States.

The schedule of lectures and demonstrations was as follows:

Monday, July 31

1. A library machine for print to spelled speech conversion.
2. Predictions and time table for feasibility demonstrations of braille inputs, outputs, and computer processing.
3. Print to machine-generated-speech.
4. Predictions and time table for supplementary mobility aids and their incorporation into peripatology programs.
5. Lab: Interactive braille translation.

Tuesday, August 1

1. Lab: Demonstration of print-to-spoken-letters.
2. Computer braille transcription.
3. Braille in the classroom and other developments in the braille program at M.I.T.
4. Applications of braille instruction in special education programs.
5. Lab: Computer braille translation.

Wednesday, August 2

1. Mauch Labs letter recognition machine.
2. Battelle reader and British optophone.
3. High speed commercial print readers.
4. Lab:
   a. Group A Print-to-speech demonstration
   b. Group B Teletypesetter tape-to-spoken word demonstration
   c. Group C Remote braille.

Thursday, August 3

1. Print-to-spoken letters.
2. Predictions and time table for feasibility demonstrations of compositors tapes and print conversion to Grade II braille, machine generated speech and human speech machine retrieved.
3. Review of research on print-to-machine generated and human speech retrieved at Haskins Labs, Bell Labs, etc.
4. Lab: Groups switched, same as Wednesday.

Friday, August 4

1. Human echo location and the perception of ambient noise.
2. Length concepts in blind children.
3. Auditory localization.
4. Lab: Groups switched, same as Wednesday.

Monday, August 7

1. Pathsounder.
2. Laser cane.
3. Kay-Ultra aid.
4. Lab:
   a. Group A Time compressed speech
   b. Group B Mobility experiments
   c. Group C Reading machines.

Tuesday, August 8

1. The New British Tape Cassette System.
2. The program of educational recordings.
3. Adapting tape and record players for time compressed speech.
4. Lab: Groups switched, same as Monday.

Wednesday, August 9

1. Mobility aids, comments and questions.
2. Reading machines, comments and questions.
3. Braille research and development, comments and questions.
4. Lab: Groups switched, same as Monday.

Thursday, August 10

1. Nuffield project on teaching of science and mathematics.
2. Progress report on projects in teaching of science and mathematics in Great Britain.
3. Surface representation.
4. Lab: Surface representations.

Friday, August 11

1. Methods for speech time compression.
2. Behavioral studies of comprehension rates with various kinds of compressed speech.
3. Results of extensive field trials with time compressed speech.

Due to the success of the 1967 summer session, the Center began plans with San Francisco State College and Columbia University Teachers College to mutually sponsor a session to be held at San Francisco State College during the summer of 1968. It was found impossible, however, to meet an immediate proposal deadline.

C. Publications and Presentations

The following papers emanated from the Center:

"The Measurement of Length by Congenitally Blind Children and a Quasi-formal Approach for Spatial Concepts," Duran, Peter and Tufenkjian, Sylvia.

"New Processes for Braille Manufacture, May 18 and 19, 1967, Ramada Inn."

Mr. Dupress spoke before the following groups:

1. Teachers College, Columbia University (two lectures on January 17, 1967 and one lecture on February 16, 1967).
2. San Francisco State College, Department of Special Education (January, 1967 and May, 1967).
3. Summer session group at M.I.T.

D. Special Conferences and Activities

1. Mr. Dupress attended the following special conferences and meetings:
   a. ACM Conference on visual prothesis at the Endicott House, December 2-4, 1966.
   b. AIR Conference, Washington, D.C., March 3, 1967.
   c. National Academy of Sciences Conference, March 30, 31, 1967.
   d. AAWB Convention in Miami, Florida, July 10-13, 1967.

On June 26, 1967, Mr. Dupress participated in a documentary film on "BIONICS" produced by CBS in which he demonstrated the Russell "pathsounder."

2. During 1967, Mr. Dupress made two trips to Europe and visited the following research and rehabilitation facilities. It should be noted that both trips were made at personal expense since funds for foreign travel are not available from subject contract.

a. Bradford Institute of Technology
b. Worcester College for the Blind
c. Royal Normal College
d. Nottingham University
e. National Physical Laboratory
f. Cambridge University, Computer Laboratories
g. University of London
h. Oxford University, Institute for Experimental Psychology
i. St. Dunstans'
j. Royal National Institute for the Blind
k. Danish Society for the Blind
l. State Library for the Blind, Copenhagen
m. State Printing House for the Blind, Copenhagen
n. College of Technology, Copenhagen

3. Monthly Sensory Research Discussions, held for eight years, were discontinued as of 30 September 1967 as it became apparent that the original purpose of these meetings was fulfilled.

4. Mr. Dupress continued as a member of the Committee on Computers and the Blind, Association of Computing Machinery and was a member of the following committees:

Steering Committee, Center for Rate Controlled Recordings;
Planning Committee, National Academy of Sciences Subcommittee on Sensory Aids Research and Development for the Blind and Deaf-blind;
Chairman, Committee for the Standardization of Braille Keyboards.

E. Consultation

Data has been, and continues to be, exchanged with the following facilities throughout the United States:

Boston College, Mobility and Orientation Program
Washington University, Saint Louis, Missouri, Department of Computer Sciences
San Francisco State College, Department of Special Education
University of Louisville, Department of Psychology
Western Michigan University, Department of Special Education
California State College at Los Angeles, Department of Special Education
M.I.T., Psychology Department, Mechanical Engineering Department, Electrical Engineering Department, Research Laboratory of Electronics, Instrumentation Laboratory, and Lincoln Laboratory.

Columbia University Teachers College
UCLA, Physical Education Department, Perceptual, Motor Learning Laboratory
Stanford University, Department of Electrical Engineering
Harvard University, Graduate School of Education
The American Printing House for the Blind
The American Foundation for the Blind, International Research Information Service, and the Research Division
National Institute of Neurological Diseases and Blindness
Library of Congress, Division for the Blind and Physically Handicapped
Massachusetts Commission for the Blind
National Braille Press
Veterans Administration
Recordings for the Blind
Jewish Guild for the Blind
Industrial Home for the Blind
Clovernook Home and School for the Blind
Perkins School for the Blind
Oakland School District, Pontiac, Michigan
St. Paul's Rehabilitation Center
Braille Institute of America
RCA
IBM
Stanford Research Institute
Honeywell Corporation
Catholic Guild for all the Blind
George Peabody College for Teachers
Haskins Laboratories
New York Board of Education
Windings, Inc.
Center for Urban Education, New York City
State Department of Education, Atlanta, Georgia