MOBILITY AIDS FOR THE BLIND

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Most independent mobility of people who have no useful travel vision, especially when in unfamiliar territory, is achieved through use of some mobility aid. Mobility and mobility aids are rather inextricably tied together, so I shall recount some needs of the VA in mobility rather than only in the more limited field, mobility aids.

NEEDS OF THE VETERANS ADMINISTRATION

I hesitate to tell you, with appropriate adjustments for mobility, that we need improvements that could be classed as "Motherhood Apple-Pie" items, yet not to mention them could suggest they are being overlooked. With the aid of several colleagues in the sensory-aids field I have compiled the following list of needs of the VA in mobility for the blind:

1. Next to restoring vision, or a modicum of vision, an ideal mobility device is desired. It should be able to give the user data on his location, orientation, routes, compass courses, obstacles, etc.
2. Increase the awareness among consumers and professionals alike of the availability of new devices such as the Laser Typhlocane, Binaural Sensory Aid, and Lindsay Russell Pathsounder.
3. Improve public information and public relations activities regarding VA's blind rehabilitation programs.
4. Develop selection and prescription criteria to aid in reaching the best solution to the mobility problems of each blinded person.
5. Obtain a better understanding of the influences of other disabilities a blind person may have on the mobility means of choice, and the performance to be expected. It has been estimated that only 10 percent of blinded veterans are free of some other significant disability.
6. Increase the number of blinded veterans who receive orientation and mobility (O&M) training at a VA blind rehabilitation center (BRC) or equivalent activity.

7. Build up the cadre of instructors capable of training blind people to use the new mobility aids.
8. Provide followup contacts and counseling and offer periodic refresher training in mobility as blinded veterans go through life.
9. Provide improvements in reliability, ruggedness, and performance capabilities of devices.
10. Improve collapsible canes— more durable, longer lasting.
11. Provide a special evaluation and training model of the Laser Typhlocane with complete flexibility as to which channel(s) and display(s) are on or off.
12. Improve telemetry equipment for mobility devices, with capability of monitoring from more remote locations than at present. Provide transducers and telemetry system for recording human stress levels as subject performs a mobility task.
13. Do more work on image intensifier devices for use in mobility of the "night blind," with price reductions in these devices.
14. Reduce costs in device acquisition, client training, followup, and maintenance programs.
15. Improve understanding of the mobility-training requirements for low-vision persons and for the geriatric blind.
16. Provide greater understanding of the needs of the hearing-impaired blind person as related to his mobility and his hearing aid(s), if any.
17. Find solutions to the problems often engendered by the need for the blind trainee to be away from home, family, and job for a relatively long time during orientation and mobility training at a distant center.
18. Increase utilization of the "family program" where family members spend some time for orientation and learning, at VA's blind rehabilitation centers in the latter days of the veteran's stay.
19. Provide more data on the travel practices and environments of blinded veterans, and identification of those which encourage travel.
20. Improve and expand audio-visual informational vehicles, such as films about the many aspects of mobility maintained, developed, and distributed by an existing or new library.
21. Provide a national center for mobility research where new devices could be competently evaluated, where tests could be developed, where hardware and software could be considered, and where specifications and prescription criteria could be prepared.
22. Create a fourth blind rehabilitation center which is needed to accommodate the immense geographic distances in the United States.

CURRENT STATE OF THE ART

While current practices and devices allow a relatively small segment of the totally blind population to be spectacularly mobile, usually by employing commonplace methods, neither such methods nor the most sophisticated devices have yet made the bulk of blind people into travelers, able independently and with minimal stress to get around safely somewhat as a sighted person does.

Conventional mobility systems include the sighted guide, the cane (most effectively the long cane), and the dog guide. Several state-of-the-art systems will next be described.

The Laser Typhlocane has been developed by Bionic Instruments, Inc., of Bala Cynwyd, Pennsylvania, under a research contract funded by the VA. This electronic device in cane configuration embodies all the valuable capabilities of an ordinary cane; should its mechanism ever fail it can be used as an ordinary cane. It works using three very low-power gallium arsenide lasers which emit light in the infrared region at about 0.9 micron. One of the infrared beams is directed upward toward the space where the user's head will next pass as he walks forward. If there is an object which would strike the head, and sufficient energy is reflected from it to the optical mechanism of the cane, the cane will signal the user by emitting a high-pitched beep. The second beam is directed straight ahead. If an object is in this region, the cane, on receiving reflected energy from it, will signal the user before actual cane contact, either by a tactile stimulus on the finger, or by an optional medium-pitched sound coming from a small speaker in the crook of the cane. The third beam of infrared light is directed downward at the ground to a point about 3 ft. beyond the tip of the cane. If the ground is intact, there is no response from the cane. If, however, something interferes with the optical path of the transmitted, reflected, and received beam, a low-pitched tone will signal the user. Thus, if there is a curb 6 in. high or more, or a drop-off of this size or more, the beam will be interrupted in its path, and the user will receive early warning of the discontinuity in the terrain.

We hope that the improved models recently delivered to VA will be useful mobility tools for some of the blind. The new canes are expensive; they cost the Veterans Administration about $2,800 each in quantities of 35. Mr. J. M. Benjamin, Jr., president of Bionic Instruments, Inc., will give other details during his presentation at this meeting.

I should like to provide some data on the Binaural Sensory Aid for the Blind (Fig. 1), a product of Wormald-Vigilant, Ltd., of Christchurch, New Zealand. Many are aware of the mobility feats of blind bats, accomplished through the use of ultrasonic echo-ranging. This performance by bats suggests that similar means might be used by some blind men. We consider the Binaural Sensory Aid a supplement to cane or dog; when used alone it does not seem to provide the complete capability of a full mobility system. It is able to give its user early warning about things out ahead in the direction it faces. It gives an indication of the range and azimuth of such items, and sometimes even a clue as to their identity. It achieves this by sending out from a transmitting transducer in a conventionally worn spectacle frame a broad beam of ultrasonic energy. Energy reflected from objects in the space reached by the sound is returned to the two receiving transducers in the eyeglass frame, and then converted into a sound which is conveyed to the user's ears through vented earpieces. It is important not to block ambient sound cues. During the last few years, a number of these binaural sensory aids, in the Mark I version, have been under study throughout the world. The manufacturer has gone ahead with plans to produce an improved version, the Mark II. This newer model, believed to be better engineered than its predecessor, is expected to be available in limited quantities at training courses for mobility professionals scheduled for September 1974.

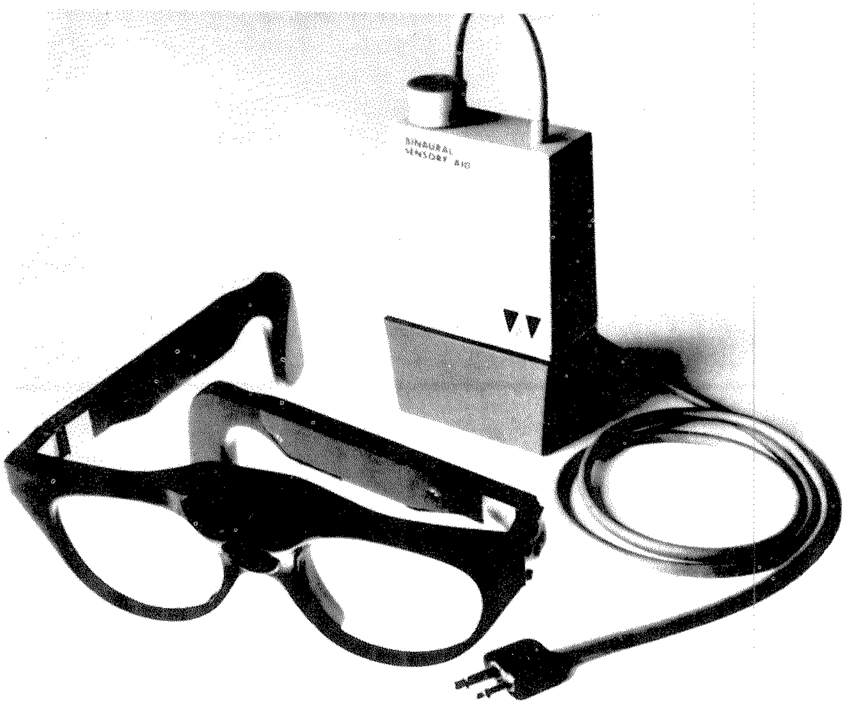

FIGURE 1.—Binaural Sensory Aid for the Blind, 1974.

In July of 1974 nine new model Lindsay Russell Pathsounders (Fig. 2) were received by VA for evaluative and clinical applications. The new units, generally similar to the original device, have several new features. The unsightly horns used to emit and receive the ultrasonic energy are no longer visible as projections from the unit. A two-signal tactile display now functions independently of or concurrently with the two-signal auditory display. This chest-worn device is silent until an obstacle comes to within about 6 ft. A beeping sound, or vibration of the whole case, or both, signal this occurrence to the user. At about a 3-ft. range to the obstacle, the beeping increases in pitch and the tactile signal shifts to a vibrator incorporated into the neck strap to stimulate the back of the neck. This obstacle detecting device is to be used as an adjunct to a cane (or possibly a dog), and in some special applications, such as for a blind person confined to a wheelchair who may be able to get around independently in a comparatively safe, reasonably familiar area.

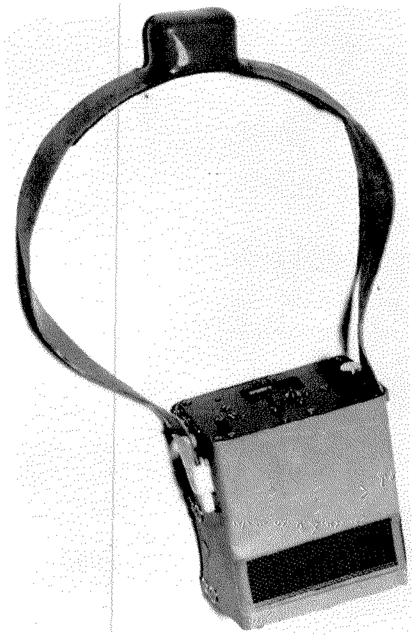

FIGURE 2.—The Lindsay Russell Pathsounder, 1974.

The Mowat Sonar Sensor (Fig. 3) conceived by Mr. Geoffrey Mowat of New Zealand, to be carried in the pocket until the user needs to probe the environment, gives an indication of range and azimuth to objects. It has a variable frequency vibration felt through the case, the frequency depending inversely on range. The direction in which it is pointed when echoes are received indicates azimuth.

The Mims Seeing Aid (Fig. 4) is another obstacle-detecting device which uses light emitting diodes to probe the environment in the direction of regard. If objects reflect some of this energy, the circuitry converts the return to audible form and signals the user through a small piece of plastic tubing placed loosely in the ear.

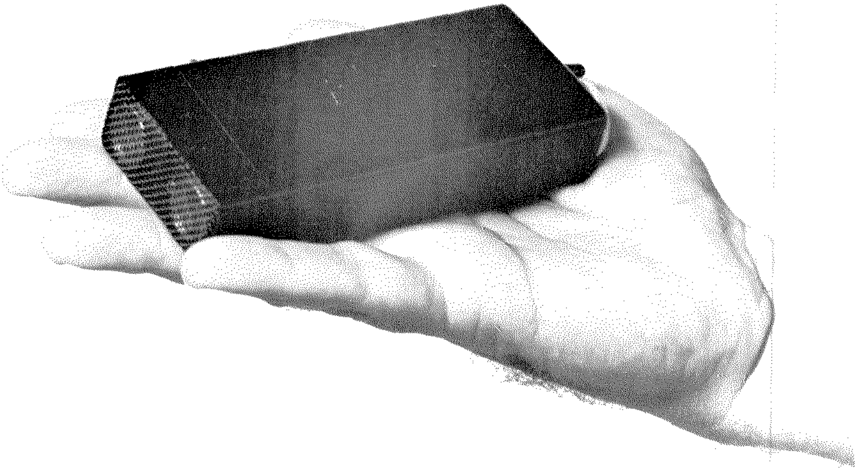

FIGURE 3.—Mowat Sonar Sensor, 1973.

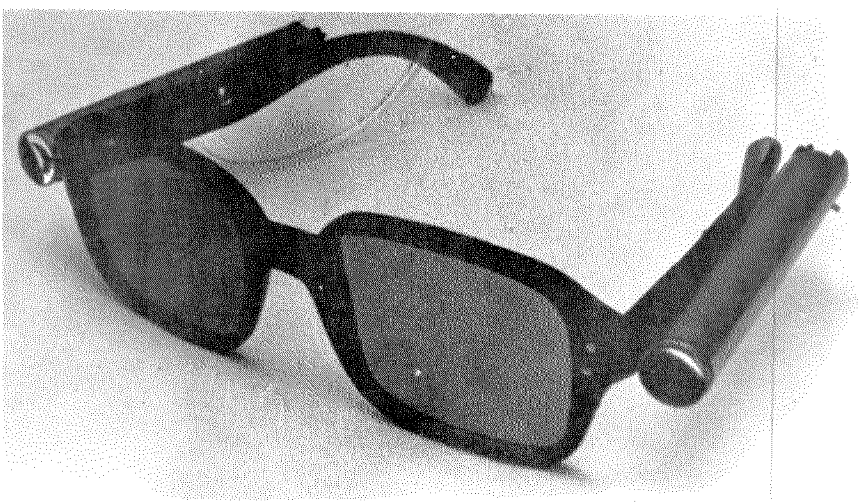

FIGURE 4.—The Mims E-2 Eyeglass Seeing Aid, 1972.

While there are other electronic mobility aids, the ones mentioned above are those thought to be farthest along in their development, and best known in the United States. At the time of this writing, July 1974, none of these electronic devices could be said to be in widespread use among the blind population.