USE OF VIDEO IN THE VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL

by

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The research reported here, because of its scope, did not fall within the purview of a particular advisory committee, but liaison was maintained with the committees to which the project was of interest. The research was supported by the Council administration.

SUMMARY

Described in this report is the video equipment recently acquired by the Council and how it has been used to date. Also discussed are the many other ways this equipment can and probably will be used in the future, not only at the Council, but in operating divisions of the Department as well.

It is to be noted that this study originated as part of the internal operation of the Council in connection with its conceptual research mission. At present, there is no research advisory committee in this area.

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INTRODUCTION

In research, the communication of findings is about as important as the research work itself. Even important discoveries, if left undisseminated, serve little purpose. Among communication mediums, video is an important new tool. In research, video can be used not only for communicating, but also for collecting and analyzing data as well. The power of television is widely known, and it is believed that this video technique can positively affect the quality and acceptance of research.

This report thus discusses how video has been and could be used at the Virginia Highway & Transportation Research Council. Use of video at the Council is part of a larger effort here to automate and modernize equipment, an effort that encompasses such other devices as automated telephones, word processors, microcomputers, and teleconferencing systems. Much of what is described is also applicable to operating divisions of the Virginia Department of Highways & Transportation and to transportation departments in other states. It is hoped that the examples given will encourage others dealing with transportation and transportation research to make use of this exciting, versatile, and relatively inexpensive new technology.

EQUIPMENT ACQUIRED

In 1983, as part of an experimental study, the Council acquired the following video related equipment.

1. Color video camera (Panasonic W X 3400/6X)
2. 1/2-inch tape portable VHS recorder (Panasonic NV8420)
3. Carrying case for camera (Panasonic WVCC25)
4. Tripod for camera (ITE T-20)
5. 5 in. portable color monitor (Panasonic CT-500V)

6. A.C. adaptor for portable recorder (Panasonic NV B58)

7. Battery pack for portable monitor (Panasonic TY 26A)

8. 25 in. color monitor (Quasar)

9. 3/4 in. tape recorder (Panasonic NV 9300A)

10. Metal stand on wheels for large monitor and recorder (Bretford)

11. Portable tape recorder (Sanyo M2213)

12. Directional microphone and stand (Realistic 33-992B)

13. 1/2 in. videocassette tapes (Scotch T-120)

14. 3/4 in. videocassette tapes (Scotch VCA 60C125)

15. Miscellaneous connecting cables, including a 50-ft. coaxial cable between camera and recorder, and a cable for the portable monitor to operate off a car cigarette lighter.

The basic equipment was ordered for use in accomplishing a variety of tasks, both in the field and in the Council offices and laboratories. Storage and work space was provided by converting a spare office that had the needed area.

CURRENT USES

Immediately after the equipment was received in July 1983, four people in various sections at the Council, including the writer, trained themselves in its operation. The manuals provided with the equipment were generally good, but some of the Council's special needs (as videotaping slide presentations) had to be worked out. With the limited basic equipment, procedures for editing also had to be experimented with.

Nevertheless, a number of projects were undertaken; some of an experimental nature and others intended for operational use. A log was kept of who used the equipment and for what purpose, and the following is a chronological description of how the video related equipment has been used to the present time.

1. In August 1983, a meeting of the Council of University

Transportation Centers was held at the Council, where national leaders from a variety of sectors spoke on and discussed critical transportation issues. Four hours of the session were videotaped with good visual and acoustic results, using only normal overhead, auditorium lighting and the standard microphone attached to the camera. Some panning and zooming were utilized to create visual interest. No editing was required.

2. To test the equipment for field use, powered only by batteries, one hour of hand-held videotaping of a bridge deck study on I-81 near New Market, Virginia, was undertaken. The quality of the pictures was good, but noise from passing vehicles often resulted in annoying background sounds, although conversations could still be understood. It was decided that for such situations, the tape should be edited to delete the objectionable ambient noises and then have the voice or other sounds dubbed in at an acceptable acoustic level. The available equipment is capable of doing this.

3. To test the equipment in an atmosphere of an operating materials laboratory, a short videotape was made in the Council's concrete laboratory under ordinary overhead lighting. In this case the camera was mounted on a tripod as all the action was at a fixed location at a workbench. Both the picture and sound were satisfactory, with the level of ambient sound being relatively low. Voice and music were dubbed in later in approximate sync with the tape, using the available equipment.

4. Using the three tapes described, a demonstration of the capabilities of the video equipment was held for the professional staff of the Council. Projection was shown on both the 5 inch color monitor and the 25 inch color monitor. The former is intended for field or office use, while the latter is for group reviewing. The demonstration resulted in numerous suggestions for future uses at the Council and for the Department.

5. In regard to use of videotapes at the Central Office and district levels, where mostly 3/4 inch format recorders are available, a procedure was worked out for transferring the signals from the 1/2-inch format portable recorder to the 3/4 inch tape cassettes. Although synchronization was not 100% perfect, the signals transferred were quite acceptable. Thus, for issuance of videotapes to other branches of the Department, 3/4 inch tape cassettes will be sent.

6. Personnel working in the bituminous area were interested in sending several of the districts an instructional videotape on the proper way to patch pavements. They had standard 35 mm colored slides of the operation, but wanted to incorporate narrative along with the stills, all on 3/4 inch videotape cassettes. Several video camera approaches were tried in order to get the video picture from the slides, and it was found that filming the slides as projected on a wall screen proved to be the best procedure, given the limited equipment on hand. Voice dubbing was added as required for explanation. A timed script was found to be very helpful in minimizing the difficult process of editing. Facilities for reproducing the edited 3/4 inch tape cassettes were not available at the Council, so reproduction was done at the University of Virginia Center for Continuing Education.

7. Two videotapes of a new highway barrier were sent to the Council for review from the International Barrier Corporation. The recorder and monitor enabled these tapes to be studied, which they could not have been otherwise.

8. A videotape regarding inspection of underwater bridge components was also received and reviewed on the Council's video equipment. It is to be noted that all of the Council's recorders operate only on standard speed. Tapes recorded at slower speeds have extreme sound distortion as well as slow-motion action when run at standard speed.

9. A videotape was needed to demonstrate a new way to sample freshly laid bituminous material on a roadway. This time instead of using slides, the camera and recorder were taken into the field on a road near Strasburg, Virginia, to tape the action directly. The tape was then taken back to the Council for voice dubbing and editing. Titles were also added onto the tape using a special feature of the camera. The edited 3/4-inch tape was to be used for showing at meetings and by various districts for personnel training.

   Because of the very limited editing capabilities of the existing equipment (done by transferring segments from 1/2-inch recorder to the 3/4-inch recorder), splices between segments are a bit irregular, but acceptable.

10. A request was made by the administration of the Council to videotape a special meeting held to explain some complex administrative procedures emanating from Richmond. With this recording, key people who could not attend the meeting could review the information on a monitor at their convenience.

11. Featured in public television out of Richmond was a series of telecasts on the use of personal computers. As these telecasts were in the evenings after normal working hours, the writer volunteered to tape them on his home video cassette recorder, and to then transfer them onto 3/4-inch videotape at the Council. Thus, a complete six hours of instruction on the use of personal computers is on hand for persons unable to see the program on public television (which in Charlottesville requires cable subscription).

From this summary of uses of the video equipment to date, it can be seen that at the Research Council it has already been put to a variety of uses. For comparison, in the state of Oklahoma, personnel in transportation research have been using video since 1975, and are firmly convinced of its value.* Basically, they have been using their equipment for documenting research, presenting research findings, making orientation and training tapes, and recording field operations. They have found, as we have, the advantages of video (as compared to conventional slide or movie film) to be the following:

1. No film developing costs
2. Immediate playback capabilities
3. Reusability of tapes
4. Inclusion of audio
5. Less cost (up to 2 hours of taping for less than $10 per tape at standard speed)

Much more is expected of video in the years to come, as discussed in the next section.

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*Oklahoma Department of Transportation, "Video Tape, A Research Implementation and Training Tool," Oklahoma City, Oklahoma, March 1983.

POSSIBLE FUTURE USES

Many of the future uses of the video equipment will be a continuation of current ones; however, a number of new uses are also possible and desirable. These are listed under the following 16 categories.

1. The recording of critical tests or experiments, either in the laboratory or in the field. As the test progresses, narrative can be added to help clarify the process. The tape can then be used for detailed analysis and for possible presentation at a meeting at a later date.

2. For the inspection of bridges where visual access is difficult. One agile, trained person with a portable video camera can be sent to "shoot" those parts of a structure of concern. At the same time, a monitor of what is being taped can be set up on the bridge deck for many others to view and/or direct. Underwater inspection of bridge foundations can be done in a similar way, although special underwater equipment not currently on hand must be obtained.

3. Low cost, long-term monitoring and recording of traffic and safety conditions at critical locations on the highway system. Video cameras operate on much lower light levels than do film cameras, allowing recording in poor light, as at dusk or in bad weather. Should portions of the tape not show the desired action, the videotape can be wiped out and reused (unlike movie film). Those tapes, when edited, can be sent to interested people in the Department for them to see the situation personally without them having to spend the time traveling to the site or sites.

4. Photologging of highways. In the past, such recording was done on expensive film. Videotapes are much less expensive than film and record at lower light levels. The same can be said of aerial surveys.

5. Videotaping of a particular construction or repair problem on a bridge or highway. The narrated tape can then be sent to concerned people in the Department for immediate viewing and evaluation. Such a procedure could eliminate the need for groups of high-level people to waste their time in traveling to the scene of the problem, which could be hundreds of miles away from them.

6. Use of videotapes to consultants. On special technical problems requiring the advice of consultants outside the Department, a videotape of the problem can be sent such

consultants in lieu of having them personally visit the source of the problem. This procedure will allow the use of consultants from any part of the world, as travel expenses would in most cases be eliminated.

7. Using videotape cassettes instead of drawings and letters. Many documents and information can be transmitted via videotape within the Department in place of using conventional drawings and letters, particularly when considerable explanation is necessary. For example, a person can draw a problem on paper with a felt pen or on a blackboard with chalk while verbally describing the problem. A tape made of this can then be transmitted to interested parties.

8. Orientation and training tapes. The production and use of video for instruction are expected to be its major application. Tapes made to orient new people, to upgrade the knowledge of personnel, and to disseminate the latest techniques should greatly increase efficiency and improve the quality of work. Instead of having to send people around the state delivering a lecture, a videotape of that lecture could be made and sent to the various places that lectures would be given.

9. Use of video in teleconferencing. Whereas most Departmental teleconferencing currently is done with two-way audio using telephone lines, the potential is there to use video as well, in various ways. One way is to videotape selected information in advance and send such cassettes to all parties involved in the teleconference, to be shown and discussed by two-way audio at the arranged time. A second way is to set up a two-way audio, one-way live video network through a number of facilities already existing within the state. A third method is to have two-way live video-audio connections. The last method is relatively expensive and at present is available only from a few locations within the state. However, in time the cost of such two-way video is expected to decrease and facilities will be available at more locations. Many of the larger motel chains are equipping their motels for such video conferences. The Department of Telecommunications in Virginia could be of great help in making arrangements for any sort of teleconferencing.

10. Use of pretaped videocassettes for use by the general public, as at public hearings and in schools. A well made videotape is an attractive medium that can easily be used by local TV stations to disseminate information regarding transportation matters of interest to the general public. Better public

relations between the Department and the taxpayers could thus be gained.

11. Recording historical structures and other transportation facilities for the archives. With the passage of time, many old bridges, canals, roads and the like are destroyed. Although many conventional methods are available to record such things before they become extinct, videotaping (possibly along with narrative by a historian) of such facilities could add much to the historical record at little cost.

12. Videotaping of interviews and meetings of people as vendors, consultants, and contractors. Quite often these meetings cannot be attended by everyone who would like to, so that a tape of these meetings could be reviewed by them at their convenience.

13. Monitoring of performance by contractors. Paper and pencil note taking of contractor performance is highly inadequate as compared to videotaping of operations. The result should be better and more complete records, and possibly a lessening of disputes between contractors and the Department.

14. Security of information and equipment. Video monitoring is commonplace in banks, stores, and factories to reduce crime and vandalism. Many applications also could be found in the Department as well, especially where there are temptations for theft.

15. Use of self-propelled video cameras in the future for bridge inspection. Large bridges are hard to inspect by human eye because of difficulty of access. However, if a network of guide rails is incorporated onto such bridges, a self-propelled, controlled video camera could be attached to make such visual inspections. Monitoring and guidance of the camera could be controlled by personnel on the bridge deck or on land nearby. Other sensors could also be sent along these guide rails, as for measuring temperatures or deleterious forces.

16. Monitoring and control of robots for construction in the future. In time, robots will be available that will perform many of the dangerous repetitive jobs now done by humans in construction and repair of transportation facilities. Video eyes on these robotic devices will allow them to do jobs now thought impossible.

Aside from these 16 particular uses, other general new developments should be noted.

1. Future video cameras and recorders will be smaller and lighter. A combined camera-recorder using 1/4-inch tape cassettes is already in production.

2. Being planned are other networks in Virginia to transmit video images directly and instantaneously. These include more ground microwave stations, fiber optic cables, and space satellites.

3. Developments are under way to convert broad-band video signals to narrow-band digital signals. The advantages include the ability to transmit such video signals more easily on existing telephone lines, enhance picture quality, store such signals in a computer, and to perform direct computer analysis. NASA is already making use of digitized signals from its space satellites.

CONCLUSIONS

The primary conclusion to this experimental portion of the study on uses of video at the Research Council is that the uses have proven worthwhile. In the future, even greater use is expected of this video equipment, particularly in regard to information transfer and training type tapes.

However, it must be noted that only the basic equipment has been acquired to date at a total cost of approximately $5,000. For professional quality video work (resembling that done by local commercial television stations) more specialized equipment, facilities, and personnel are required. A suggested list includes the following:

1. An automatic focusing lens for the present camera

2. A video camera and recorder for 3/4 inch tape

3. Special equipment for transferring slides and movie film to videotape

4. An editing machine for videotape

5. A special acoustical studio equipped for the production of training tapes

6. A staff specially trained in video work

As most of these suggested items are quite expensive, it may be desirable initially to have this equipment, facilities, and personnel in only one central location in the state, and for it to be directly controlled by the Department. An alternate solution would be to rent equipment or space from outside sources on an as-needed basis, assuming that sufficient in-house staff has been trained in the use of video.

It is clear that video, along with computers, is having an ever increasing impact on the operation of businesses and institutions in the country. It certainly behooves research organizations as the Council to keep abreast of developments in the field and to utilize those that have value. This we are attempting to do.

ACKNOWLEDGEMENTS

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