

2323

FINAL REPORT

APPLICATION OF TELECONFERENCING WITHIN THE VIRGINIA  
DEPARTMENT OF HIGHWAYS & TRANSPORTATION

by

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(The opinions, findings, and conclusions expressed in this  
report are those of the author and not necessarily those of  
the sponsoring agencies.)

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ABSTRACT

The report presents the findings of a study of the feasibility of using audio teleconferencing in administrative and technical functions of the Virginia Department of Highways and Transportation. The study was, for the most part, an evaluation of 26 audio teleconferences conducted over a one-year period. These teleconferences employed newly purchased teleconferencing equipment located in 11 Department offices throughout the state and involved 329 people. The largest teleconference had 55 participants and the smallest had 3. The most common uses of the teleconferences were for meetings between district and resident engineers and for the dissemination of information to the district offices.

The gross cost savings in travel and nonproductive salary realized from substituting the 26 teleconferences for meetings was estimated using a computer program and found to be \$18,000. Further, it was estimated that if more of the numerous meetings between field and Central Office personnel were held by teleconference, savings in excess of \$100,000 per year from the reduction in travel would not be uncommon.

Department staff overwhelmingly accepted teleconferencing as a communications tool. A questionnaire sent to the teleconference participants revealed that two-thirds of them believed their teleconferences had been as successful as face-to-face meetings, and 90% said teleconferencing would enhance communication within the Department, especially that between the Central Office and the field. It appears that meetings involving information exchange, policy formation, announcements, and statewide and districtwide briefings can and should be conducted by teleconference. Meetings at which considerable debate or argumentation is likely to take place are probably best held face to face.

Finally, it was concluded teleconferences are generally significantly shorter than face-to-face meetings, result in participation from persons who might not normally attend due to travel and time constraints, and facilitate quick decision making since the needed information exchange is immediate. On the negative side, open discussion and brainstorming are sometimes suppressed due to lack of visual contact, and deliberations tend to be more formal and less personal. Also, since some people may view travel as a fringe benefit, they may view a reduction in travel opportunities to be a disadvantage.



ACKNOWLEDGEMENTS

The author acknowledges the contributions of several persons. Thanks are certainly due to members of the Teleconferencing Task Group for their patience, belief, and guidance over the past two years -- especially to Al Coates, chairman of that group, for his continuous good words and dedication to the task, and to Constance Ober and Mickey Hendricks, who taught me all I know about teleconferencing. Also, appreciation is extended to the Teleconferencing Coordinators, especially to Walter Pennington in Bristol and Ron Hall in Salem, who continuously promoted the use of the system and who were never late with their monthly reports. Thanks are also due Lisa Elko of the Department of Information Technology for her help with the monthly SCATS rates.

Finally, special thanks are extended to several members of the Research Council staff. In particular, to Jennifer Ward of the data systems group for helping develop the cost savings program; to Harry T. Craft who edited all reports and questionnaires; to Susan Kane and Jan Kennedy who typed the forms, questionnaires, and early drafts of this report; and to Howard Newlon, research director, who introduced me to teleconferencing, promoted its capabilities, and himself became a user of the system.

2334

SUMMARY AND CONCLUSIONS

The study evaluated 26 audio teleconferences conducted by the Virginia Department of Highways and Transportation over a one-year period. The teleconferences employed equipment installed in the Department's nine district offices, the Central Office and the Research Council and involved 329 people. The largest of the teleconferences had 55 participants and the smallest had 3; they varied in length from 2 hours to 10 minutes; and the largest was an 11-location arrangement while almost a third involved only 2 locations. Most commonly, they involved the Department's district offices, although several involved out-of-state participants. The most frequent uses of the system were for meetings between district and resident engineers and the dissemination of information from the Central Office to the districts.

A computer program designed by the Department of Information Technology was used to estimate the cost savings realized by substituting teleconferences for face-to-face meetings. This program takes into account the vehicular costs and salaries for nonproductive time that would have been incurred if the participants had had to travel to attend traditional face-to-face meetings. For this study, it was found that the average cost for each participant to have attended a face-to-face meeting would have been about \$58. It then computes the cost of the teleconference as the SCATS rate times the length of the conference in minutes times the number of locations involved, which for these meetings was found to average just over \$6 for each participant. The projected travel costs minus the teleconference costs equal the savings. Using this program, the estimated gross savings for the 26 teleconferences was found to be over \$18,000. It is conceivable that if numerous traditional meetings, especially those between district and Central Office personnel, became teleconferences, savings in excess of \$100,000 a year as compared to present expenditures for travel would not be uncommon.

Questionnaires mailed to participants in the teleconferences revealed an overwhelmingly positive feeling about the use of teleconferencing. About two-thirds of the participants indicated that the teleconferences were as successful as face-to-face meetings. The participants were very positive about having the system available and its potential for enhancing the communication capabilities of the Department. As with any new technology there were glitches which caused some difficulties -- mostly in the form of faulty telephone line hookups and unfamiliarity with the equipment. The responses revealed, however, that for the most part the staff is eager to use the teleconferencing system, would like to see it used more, and believes it to be a definite enhancement to Central Office-to-field communications.

Although the study revealed that many types of meetings can be conducted by teleconference, it also determined that some types cannot. Based on comments of the participants in the teleconferences, the researcher's observations of different types of conferences, as well as discussions with participants, it appears that most meetings involving information exchange, policy formation, announcements, and statewide and districtwide briefings can and should be conducted by teleconference. Meetings at which considerable debate or argumentation is likely to take place are probably best held face-to-face. Also, although the participants believed that some types of training might possibly be conducted by audio teleconference, the need for personal interaction between participants and between participants and instructor precludes the possibility of using this technology for most types of training. It was also generally agreed that meetings involving personnel who are not acquainted or those where "new" information, ideas, or concepts are to be discussed are not easily conducted by teleconference.

The advantages of teleconferences appear to outweigh the disadvantages. They generally are significantly shorter than traditional meetings, result in a more accurate exchange of information because everyone receives the same message at the same time, allow for participation from those who might not normally attend a meeting because of travel and time constraints, and facilitate quick decision making since the needed information is immediately available. On the negative side, open discussion and brainstorming are sometimes suppressed due to the lack of visual contact, and the deliberations tend to be more formal, less personal, and to require more intense concentration than do traditional meetings. Moreover, since some people may view travel as a fringe benefit, they may view a reduction in opportunities to travel as being a disadvantage. If precautions are taken to avoid these negative ramifications, however, the use of audio teleconferencing to conduct Department business is justifiable from several standpoints. It uses a readily available and familiar technology -- the telephone, it can be done on short notice with little preparation or planning, and it is fairly inexpensive. Teleconferencing can increase the productivity of white-collar workers, substantially reduce travel expenditures, and enhance the internal communications of the Department.

## RECOMMENDATIONS

The findings and conclusions from the study have led the Teleconferencing Task Group to make the following recommendations:

1. A teleconferencing coordinator for the Department should be appointed. This coordinator should be assigned to the Central Office and be familiar with the teleconferencing capabilities of both the Department and the Department of Information Technology (DIT). The coordinator's duties should include, but not be limited to, continued promotion of the teleconference medium within the Department through bulletin board postings, written reminders to staff, articles in the Department's Bulletin, and occasional updates on how the system is being used as well as on the frequency of its use., liaison with the DIT, scheduling teleconferences originating in the Central Office, monitoring new developments in the telecommunications field which have potential application in the Department, and generally overseeing and tracking the teleconferencing efforts of the Department, including the activities of the district teleconferencing coordinators.
2. The presently assigned teleconferencing coordinators in the district offices should be retained. Their duties should be to promote and schedule teleconferences among the district, Central Office, and residency staffs. It is advisable that this duty continue to be assigned to the district training officer.
3. A brief orientation and training session on the use of teleconferencing systems should be conducted in each of the nine district offices. This training session should be the responsibility of the district teleconferencing coordinator, and all district staff who regularly travel to meetings should be required to attend this session.
4. Teleconferencing should become less an option and more a policy with respect to meetings between Central Office and district office staffs. It is, therefore, recommended that management establish a policy whereby, to the extent possible, meetings involving dissemination of information to the districts, directives, instructions and the like be conducted by teleconference. The same policy should apply to communications between the districts and the residencies. This recommendation does not imply that all such meetings should be conducted by teleconference -- only that it become a basic business tool rather than an ignored option. It is essential that Central Office staff assume the lead in scheduling teleconferences.

5. For all teleconferences, the following suggestions generally should be heeded:
  - a) All scheduled teleconferences should have an established starting and ending time. Meeting performance can be improved by placing a limit on the length of the teleconference -- something most traditional meetings do not have.
  - b) Whenever possible, conferees should use the Darome or Westell equipment rather than their telephones.
  - c) A teleconferencing coordinator should be present at all teleconferences involving several participants, locations, or both.
  - d) A teleconference should be conducted no longer than 60 minutes without a break. While the meeting must be closed on time, it can be ended early.
6. The teleconferencing activities in the six Salem District residencies having the Westell conference telephones should be evaluated. This evaluation should be made by the author with the assistance of Ron Hall, Salem District teleconferencing coordinator, and the resident engineers in the Salem District. Following that evaluation, the teleconferencing needs of the other residencies should be ascertained.
7. The Department should investigate the feasibility of using videoconferencing in its administrative and technical functions. Such an assessment need not be as intensive as the one described in this report. A technology transfer effort rather than a formal research project is probably appropriate for this investigation. That investigation should be initiated as technological advancements are made in the video teleconferencing field. This recommendation is especially important given the fact that the advancements include the transfer of video signal over telephone lines.
8. Given the often large numbers of participants at the Central Office teleconferencing site, two additional Darome Model 491S microphones should be purchased and added to the system there.

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BACKGROUND

Teleconferencing, in the strictest sense of the word, is communication between three or more people at such a distance from each other that an electronic medium must be used. In the more practical sense, however, it is two-way communication between two or more groups, or three or more individuals, at two or more locations using a telecommunications medium.

In general, the increased interest in teleconferencing can be directly traced to the energy crunch and inflation. As the cost of travel rose, so did the interest in finding alternatives. It has been estimated that in 1982, a total of \$290 billion was spent by industry on meetings and that 50% of that was spent on travel.(1) Case studies abound that show huge reductions in both expenditures and nonproductive time realized by many of the world's largest corporations as a result of substituting electronic meetings for those requiring travel. These take on added meaning given the fact that it has been estimated that the average manager or professional spends 38% of his time attending meetings.(2)

Although teleconferencing has been promoted for more than a decade in the corporate world, government agencies have been relatively slow in adopting it. Recently, the Commonwealth of Virginia became a leader in the use of teleconferencing in the public sector. In 1980, the Virginia Department of Telecommunications (now the Department of Information Technology and hereafter referred to as the DIT) was reorganized to facilitate the statewide use of teleconferencing. One of its primary functions is the coordination and promotion of teleconferencing among and within state agencies, and it reports that since late 1982, more than 900 audio teleconferences have been held by 63 state agencies involving more than 3,500 participants. A computer model developed by the DIT indicates that these teleconferences resulted in substantial dollar savings for the Commonwealth by eliminating some of the need for travel by state agency personnel.

In 1983 the Report of the House Subcommittee studying the Virginia Freedom of Information Act and Telecommunications stated that: "The

subcommittee, recognizing the need for state agencies to use teleconferencing as an efficient and economical tool, supports the use of teleconferencing by state agencies for administrative purposes." In the Governor's Guidance for 1984-1986, Governor Charles Robb expounded his goals and objectives relative to teleconferencing as follows: "We will utilize technology to promote the use of teleconferencing to reduce state agencies' travel expenditures and unproductive travel time."(3)

In view of the commitment of the Commonwealth's administration to teleconferencing, as well as the obvious potential for reducing expenditures, a study was undertaken to determine the feasibility of using teleconferencing in the Department's administrative and technical functions. This report presents the results of that study.

#### PURPOSE AND SCOPE

The objective of the study was to determine how teleconferencing might be used to advantage in the activities of the Virginia Department of Highways and Transportation. This effort was coordinated by an interagency task group appointed by Howard Newlon, Research Council director. A. W. Coates, Jr., management review officer, served as the chairman of the group and the author served as executive secretary.

Although an evaluation of video teleconferencing was not within the scope of the study it should be mentioned that one-way video, two-way audio teleconferences are being used in Virginia by a few state agencies, and a study of how that technology might prove useful to the Department appears desirable.

#### THE VIRGINIA TELECONFERENCING SYSTEM

The teleconferencing medium has four basic forms: audio, visual, graphics, and text. This report addresses one form of teleconferencing used in Virginia -- audio teleconferencing. This is the oldest, simplest, and least expensive form of teleconferencing. It uses the State Controlled Administrative Telephone System (SCATS), which is a state-leased telecommunications network providing long-distance telephone service both within the Commonwealth and throughout the continental United States. The availability of the SCATS system and the teleconferencing bridge, which is a state-owned device that allows as many as 24 locations to be linked by telephone (at no charge to SCATS users), makes audio the least expensive teleconferencing option. Only telephone line charges are billed.

2341

The state teleconferencing system offers two options for connecting conferees via the SCATS telephone. The state has long had the capability for the "conference" call wherein an operator calls all participants and electronically ties them together. However, it is estimated that it takes an operator at least 1.5 minutes to get each participant "on line" for a traditional conference call. That means for a meeting of, say, ten people, as much as 15 minutes could be spent waiting for the meeting to begin. Moreover, as participants are added, sound quality deteriorates. To avoid these problems the Commonwealth uses the electronic "bridge" that allows people to be automatically connected by telephone lines. The bridge compensates and adjusts transmission levels so that all participants hear high quality audio. To use this service, participants call a SCATS number in Richmond that is given them when the teleconference is scheduled. Most of the Department's teleconferences were handled in this manner; they are referred to as "meet me" teleconferences. The other type, called the "dial up" or "dial out" teleconference, is used in instances where conferees outside of the SCATS network are included. These conferees are simply dialed by the bridge operator from a SCATS number. This feature was especially useful in involving out-of-state participants in teleconferences.

Here, an explanation of how a typical teleconference is scheduled and the mechanics for participation might be helpful. To begin, say a division administrator in the Central Office wants to talk to people in each of the nine districts about a new policy. He informs the Central Office teleconferencing coordinator of the day and time that he would like to hold the meeting and how long he expects it to last. The coordinator then reserves 10 ports (9 districts and Central Office) on the teleconferencing bridge by contacting the DIT. At that time, he is given a SCATS number that he sends to each person who is to participate in the teleconference. At the scheduled meeting time, each participant dials that number and is automatically connected to the conference. This can be done using a regular telephone or the Darome Convener.

It is usually wise for the person who has called the meeting to prepare an agenda and send it to each participant prior to the meeting. At the beginning of the meeting, he introduces himself and calls roll to make certain each location is represented. The meeting then proceeds to its conclusion, the meeting leader thanks everyone for taking part, and each participant hangs up his telephone. Because teleconferences tend to eliminate superfluous conversation and social interaction they generally last about a third as long as face-to-face meetings dealing with comparable subject matter.

The two-way audio teleconferences were also used in concert with visuals during this study. Materials such as slides and handouts were sent to the participants at each location in advance so that the visuals could be cued and watched while listening to the audio portion.

METHODOLOGY

In December 1982 the author and Howard Newlon, Jr. participated in an audio teleconference entitled "Automated Office and Electronic Meetings for Today's Managers." This teleconference, originating from Madison, Wisconsin, involved 630 participants at 27 locations nationwide. Upon learning of the tremendous potential that the teleconferencing option had for enhancing communication within the Department and for reducing travel expenditures, Mr. Newlon appointed the aforementioned task group. This group met by teleconference in early 1983 and planned the activities described below.

1. Purchase and installation of teleconferencing equipment; orientation and training of field and Central Office management and staff

Eleven sets of teleconferencing equipment were purchased at a cost of \$700 a set and installed at the nine district offices, the Central Office, and the Research Council. Each set, manufactured by Darome Inc., consisted of the following items:

- 1 Model 610 teleconferencing Convener
- 1 Model 431 microphone with push-to-talk bar
- 1 Model 491S microphone with push-to-talk bar and lock on switch
- 1 Model 680 carrying case for the above

The push-to-talk bar on the model 431 microphones permits the speaker to transmit only when the bar is pushed. The model 491 S microphone, on the other hand, is equipped with a switch that allows the speaker to lock the microphone in the on position without pressing the talk bar, a feature that is used for long presentations and in quiet rooms. (See Appendix A for specifications.)

The set at each location was placed in a conference room and made available for use by all staff. A teleconferencing coordinator was chosen for each location and given the responsibility of providing training in the use of the equipment, promoting its use, and reporting usage to the researcher. The researcher met with the coordinators periodically to keep them abreast of the research effort as well as pertinent developments in teleconferencing. In all districts except Northern Virginia, the district training officer was appointed teleconferencing coordinator (see Appendix B). Orientation and training of the coordinators was conducted by

2043

the researcher. The statewide system was in place and ready for use by early October 1983.

2. Adaptation of DIT computer model to VDH&T teleconferencing activities

A computer model developed by the DIT calculates the amount of money state agencies can avoid spending by using teleconferencing instead of holding traditional meetings. This model includes conservative estimates of the cost of travel, lodging, and meals, and the average salary paid for unproductive travel time for attending face-to-face meetings. These estimates minus the per minute cost of using SCATS for teleconferenced meetings give the savings achieved. The model divides the state into several zones so that the estimates for travel expenses can be based on travel distance.

This computer model was used to determine the savings realized by the Department. Zones were established using the eleven locations of the teleconferencing equipment as data points. For example, if a teleconference was originated by the Central Office and involved individuals from all districts, the program determined the approximate cost for those individuals to travel to Richmond for a face-to-face meeting. This amount, minus the SCATS cost, which is the per minute SCATS rate times the number of minutes the meeting lasts times the number of locations involved, equals the cost savings by meeting via teleconference. That amount was computed for every teleconference held by the Department.

3. Scheduling of "experimental" teleconferences

It was first thought that a series of teleconferences of an experimental nature, originating from the Central Office, would be scheduled. However, certain district office personnel began holding teleconferences immediately after the equipment was installed, and the task group decided that experimental teleconferences were not necessary.

4. Evaluation of teleconferences by users

Department personnel participating in the teleconferences were sent a questionnaire asking a series of questions regarding their teleconference experience (Appendix C).

234

5. Promotion of teleconferencing concept

Throughout the course of the study, promotional efforts were carried out. Several articles citing the cost savings and enhancement of the Department's communications realized through teleconferencing were published in the Department's Bulletin. Flyers promoting the use of the equipment (Appendix D) were issued to each location equipped with teleconferencing gear.

Throughout the study both the task group and the teleconferencing coordinators met periodically to learn of the progress of the research, receive updates and directions, and comment on the teleconferencing activities of the Department. These meetings were usually held by teleconference and were invaluable in guiding the research.

STUDY RESULTS

The study period encompassed about one year -- from November 14, 1983, to November 13, 1984. During that time the Department held 26 teleconferences. This section of the report gives a description of these teleconferences, the results of an economic analysis, and the opinions expressed by the people who participated in them.

The Teleconferences Monitored

Table 1 lists the 26 teleconferences held by the Department during the study period. This table lists only the teleconferences scheduled through the bridge; likely, there were countless instances where two offices desiring to include more than one participant at each site held mini teleconferences using the Convener and microphones. This usage was encouraged but not monitored as closely as were the bridged teleconferences. All scheduling and coordination of the meeting rooms and equipment was the responsibility of the teleconferencing coordinators. Since some 70 state agencies use the bridge, it had to be reserved 7 to 10 days in advance. That, too, was the responsibility of the coordinators.

Table 1

## Teleconferences Monitored During Study

<u>No.</u>	<u>Date</u>	<u>Originating Office</u>	<u>Number of Participants</u>	<u>Number of Locations</u>	<u>Meeting Length (In Minutes)</u>
1	11/14/83	Research Council	29	10	50
2	11/15/83	Salem District	7	7	30
3	12/1/83	Salem District	6	6	10
4	12/12/83	Central	55	11	70
5	12/19/83	Salem District	7	6	30
6	1/4/84	Bristol District	18	4	40
7	2/17/84	Culpeper District	5	2	20
8	2/29/84	Salem District	7	7	30
9	3/6/84	Bristol District	8	7	47
10	3/12/84	Culpeper District	7	2	120
11	4/18/84	Culpeper District	8	2	30
12	4/20/84	Culpeper District	3	2	25
13	4/26/84	Central	29	8	50
14	5/30/84	Central	11	5	86
15	6/29/84	Culpeper District	6	2	15
16	7/10/84	Research Council	17	2	34
17	7/23/84	Central	28	10	28
18	8/14/84	Edinburg Residency	3	3	68
19	8/21/84	Research Council	9	8	50
20	8/23/84	Culpeper District	6	5	20
21	8/27/84	Bristol District	9	7	16
22	9/24/84	Bristol District	7	7	30
23	9/25/84	Bristol District	7	7	25
24	10/19/84	Central	24	2	120
25	11/7/84	Central	4	2	75
26	11/13/84	Bristol District	9	8	95

2746

Roughly 329 of the Department's personnel participated in the 26 teleconferences, for an average of about 12 per meeting. The largest teleconference had 55 participants and the smallest had 3. They varied in length with the longest lasting 2 hours and the shortest only 10 minutes. The majority (19) lasted less than an hour and only 3 ran for longer than 1½ hours; about one-third were in the 25-to-35-minute range. None used the full bridge capacity of 24 locations; with the largest using all eleven locations having the conference equipment. Almost a third were two-location conferences with more than one participant at each site. It should also be noted that all of the teleconferencing coordinator meetings and all but one of the task group meetings were held by teleconference.

The district offices participated in the majority of the teleconferences and, in fact, 16 of the meetings were originated by persons in the Bristol, Salem, and Culpeper districts. It is somewhat disappointing to note that the other six district offices did not originate a single multi-point "meet me" teleconference. Central Office people also appeared reluctant to use the system, although 6 teleconferences did originate there, the majority of them during the final 6 months of the study period.

Most of the teleconferences involved the dissemination or exchange of information, decision making, or problem solving. Some involved discussions of new Department procedures or specifications. In the Salem District, the district engineer used teleconferencing to call quick meetings with the resident engineers. One of these conferences was held to discuss snow removal operations and another to pass along personnel information. The obvious benefit of passing this information on in such a manner was that it was instantaneous and the same message reached everyone at the same time.

The teleconferences originating in the Central Office were usually held to discuss new policies or procedures with district personnel. In two instances a committee chairman used teleconferencing to meet with committee members located in New York, Delaware, Iowa, and the District of Columbia. In another instance a member of the DIT staff, a Department division head, and the researcher gave a presentation by teleconference to a group of research managers in Delaware. This presentation included slides of the presenters which were shown while they were making their presentations.

These last few examples, though atypical of the types of state agency teleconferences normally held, illustrate some of the opportunities teleconferencing has offered the Department. The next subsection of the report focuses on the economic aspects of teleconferencing.

Cost-Effectiveness of Teleconferencing

One of the most obvious benefits of using teleconferences in place of certain face-to-face meetings is the cost savings realized as a result of the reduction in travel required to attend those meetings. The aforementioned DIT computer model estimates that savings of \$642,643 were realized during FY83-84 by state agencies and institutions holding teleconferences instead of traditional meetings. Table 2 presents a breakdown of the expenditures and the savings realized by the Department for the 26 teleconferences conducted during the study period. As mentioned earlier, the DIT computer model was used in this study. To arrive at expenses normally associated with travel, the computer model divides the Commonwealth into zones. The travel that would have occurred from one zone to another basically determines the expenses the traveller would have incurred.

Figure 1 is an example of one of these zone maps using the Central Office as the originating office. The following example illustrates how the computer program works. Teleconference number 13 originated at the Central Office and involved 29 participants at 8 locations. Ten of these participants were in Zone A (Central Office and Richmond District) 10 in Zone B (Culpeper, Lynchburg, Staunton and Fredericksburg districts), 4 in Zone C (Salem District), none in Zones D and E, and 5 in Zone F (Bristol District). This information, along with the SCATS rate (which for April 1984 was 26¢ per minute), the length of the meeting (50 minutes), and an estimate of the number of automobiles that would have travelled to the Central Office if the meeting had been held face-to-face, is entered into the computer. These numbers are retrieved from two forms filled out for each teleconference (Appendices E and F). The form in Appendix E is filled out at the office originating the teleconference. This information is then transferred to the form in Appendix F to be entered into the computer. In this case, it was estimated that one automobile would have carried the four participants in the Richmond District to the meeting; four would have been needed to transport those attending from the Culpeper, Lynchburg, Fredericksburg, and Staunton Districts; and 2 would have been necessary to transport the five Bristol participants. The computer model contains several constants that are coupled with these characteristics of the meeting participants to give an estimate of what the total trip costs would have been had the participants all travelled to Richmond.\* To determine the cost of the teleconference, the computer simply multiplies the number of locations times the length of the conference (in minutes) times the SCATS rate. For this particular teleconference, if all 20 participants (the reader will remember that 6 participants were already located at the Central Office) had travelled to Richmond, the trip cost would have been \$2,479.84. The cost of the teleconference was 8 locations x 50 minutes x 26¢, or \$104.00. The savings then was \$2,479.84 minus \$104.00 = \$2,375.84.

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\*These constants include a per hour average wage rate for state employees, an average overnight lodging rate, a mileage rate, and an average meal rate.

Table 2

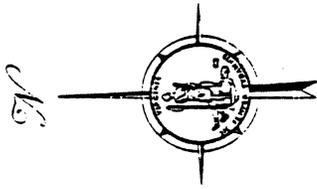
VDH&T Teleconferencing Expenditures & Savings

Originating Office	Number of Participants	Number of Locations	Meeting Length(min.)	Face-to-Face Cost	Cost of Teleconferences	Savings
1 Research Council	29	10	50	\$2,775.94	\$145.00	\$2,630.94
2 Salem District	7	7	30	272.76	60.90	211.86
3 Salem District	6	6	10	239.54	15.00	224.54
4 Central	55	11	70	3,425.76	192.50	3,233.26
5 Salem District	7	6	30	862.40	45.00	817.40
6 Bristol District	18	4	40	1,538.46	52.80	1,485.66
7 Culpeper District	5	2	20	316.98	5.20	311.78
8 Salem District	7	7	30	229.54	54.60	167.94
9 Bristol District	8	7	47	295.98	88.83	207.15
10 Culpeper District	7	2	120	190.32	32.40	157.92
11 Culpeper District	8	2	30	327.20	7.80	319.40
12 Culpeper District	3	2	25	136.88	6.50	130.38
13 Central	29	8	50	2,479.84	104.00	2,375.84
14 Central	11	5	86	512.74	133.30	379.44
15 Culpeper District	6	2	15	243.76	3.45	240.31
16 Research Council	17	2	34	83.44	5.44	78.00
17 Central	28	10	28	1,583.68	89.60	1,494.08
18 Edinburg Residency	3	3	68	210.10	55.08	155.02
19 Research Council	9	8	50	757.96	108.00	649.96
20 Culpeper District	6	5	20	189.32	27.00	162.32
21 Bristol District	9	7	16	329.20	30.24	298.96
22 Bristol District	9	7	16	272.76	52.50	220.26
23 Bristol District	7	7	25	272.76	43.75	229.01
24 Central	24	2	120	921.60	33.60	888.00
25 Central	4	2	75	630.00	37.50	593.50
26 Bristol District	9	8	95	851.40	190.00	661.40
TOTAL	329			\$19,944.32	\$1,619.99	\$18,324.33

Cost of Teleconferencing Equipment = \$7,702.20  
 Actual Savings = \$18,324.33 - \$7,702.20 = \$10,622.13

# COMMONWEALTH OF VIRGINIA

## DEPARTMENT OF HIGHWAYS AND TRANSPORTATION TRAFFIC AND SAFETY DIVISION CONSTRUCTION DISTRICTS



LEGEND  
○ - DISTRICT ENGINEER'S OFFICE

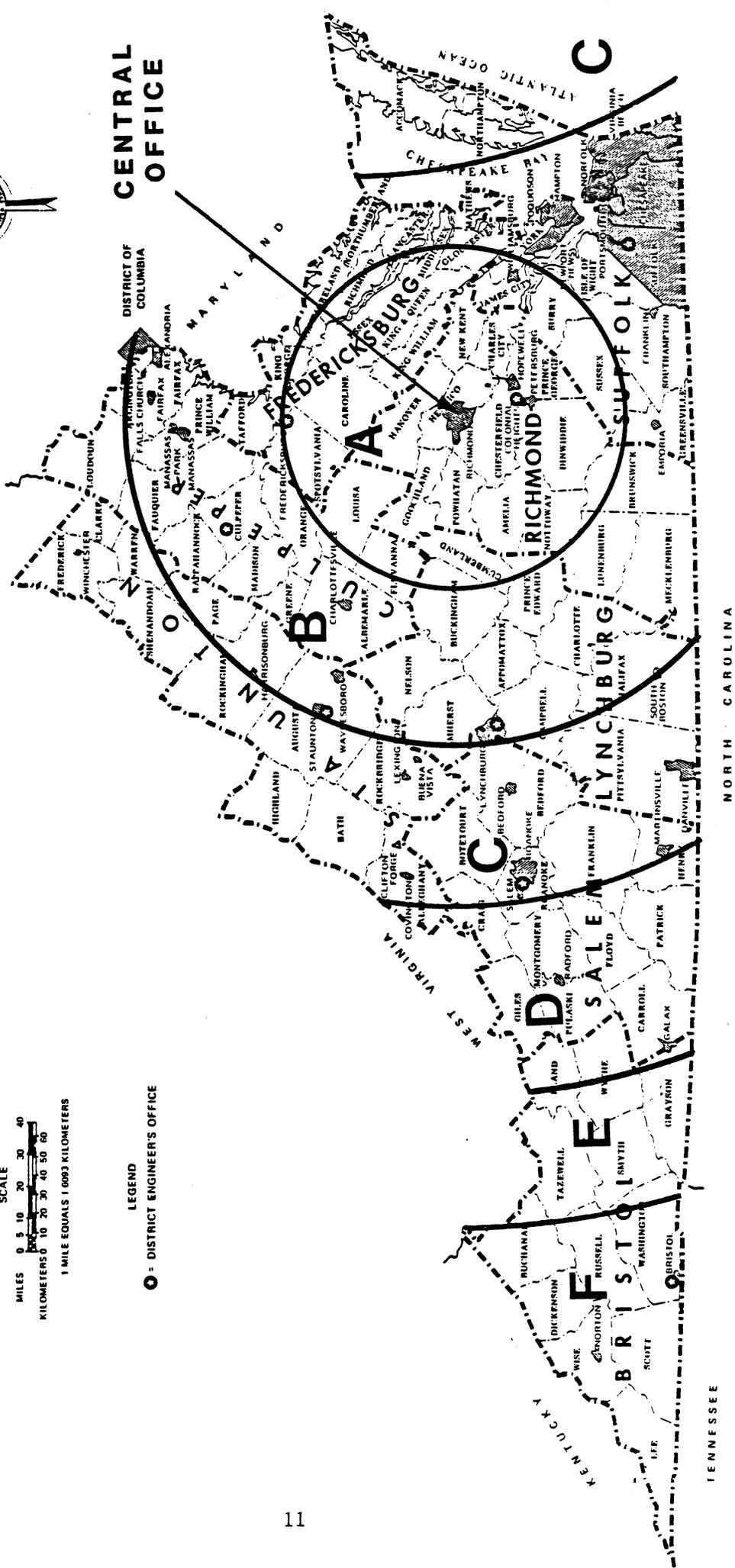


Figure 1. Zone map for Central Office as teleconference originator.

2250

Perhaps one additional example would help clarify further a comparison of the costs of holding a teleconference versus those for a traditional meeting. Say that a division administrator in the Central Office would like to meet with people in three district offices to discuss a new policy. These people are located in Suffolk, Fairfax, and Salem. The meeting is to last for two hours. Costs for travel to Richmond are as follows:

Transportation: @ 20¢ per mile for automobile		
	Suffolk: 164 x 0.20 =	\$32.80
	Fairfax: 200 x 0.20 =	\$40.00
	Salem: 332 x 0.20 =	\$66.40
	TOTAL	\$139.20
Meals: Suffolk & Fairfax - 1 meal each	\$10.00	
Salem - 3 meals	25.00	
	TOTAL	\$ 35.00
Hotel Room: 1 night for Salem staff		\$ 45.00
Salaries for Unproductive Travel Time:		
Suffolk: 3 hours travel round-trip	\$54.80	
Fairfax: 4 hours travel round-trip	73.07	
Roanoke: 7 hours travel round-trip	127.88	
@ \$38,000*	TOTAL	<u>\$ 255.70</u>
Total Cost for Traditional Meeting		\$474.90

\*Average state salary including an overhead figure

12351

Using the April 1984 SCATS rate as in the preceding example, the cost of holding this meeting by teleconference would be:

3 Locations x 120 minutes x .26 or \$93.60

The cost savings for this teleconference, then, can be computed as follows:

Cost for Traditional Meeting		\$474.90
Cost for Teleconference	-	<u>93.60</u>
COST SAVINGS		\$381.30

Granted, the savings accrued in the above example seem small considering the Department's travel budget of approximately \$2 million; however, if this amount were multiplied by hundreds of instances where teleconferences could be substituted for traditional meetings, the savings would be substantial. Moreover, as exemplified in Table 2, the larger the attendance and more spread out the teleconference is, the greater the savings. The table shows that the savings realized by the Department during the study period was \$10,622. Since the equipment is a one-time expense, future savings will be even greater. Looked at another way, the cost of the teleconferencing equipment was offset by the savings realized from the first six teleconferences. Since the equipment is now paid for, the more the system is used, the greater will be the savings in costs.

There is yet another way to look at the cost vs. savings of teleconferencing. Table 3 presents a statistic that is often used by meeting planners to determine travel budgets; that is, the cost per participant for attendance at meetings. Although it varies by the distances travelled by the participant, the difference in the cost per participant for teleconferences versus that for face-to-face meetings is considerable. If these 26 meetings had been held in the traditional face-to-face manner, the average cost per participant would have been about \$52, while that for the teleconferences was only about \$6. Both this information and the cost figures given in Table 2 state quite convincingly that teleconferencing is an extremely cost-effective means of conducting meetings.

2051

Table 3

Per Participant Teleconferencing Costs

<u>No.</u>	<u>Number of Participants</u>	<u>Face-to-Face Cost Per Participant</u>	<u>Teleconference Cost Per Participant</u>
1	29	\$ 95.72	\$ 5.00
2	7	38.96	8.70
3	6	39.92	2.50
4	55	62.28	3.50
5	7	123.20	6.43
6	18	85.47	2.93
7	5	63.39	1.04
8	7	32.79	7.80
9	8	36.99	11.10
10	7	27.18	4.63
11	8	40.90	0.97
12	3	45.62	2.16
13	29	85.57	3.58
14	11	46.41	12.11
15	6	40.62	0.57
16	17	4.90	0.32
17	28	56.56	3.20
18	3	70.03	18.36
19	9	84.21	12.00
20	6	31.55	4.50
21	9	36.57	3.36
22	7	38.96	7.50
23	7	38.96	6.25
24	24	38.40	1.40
25	4	157.50	9.37
26	9	<u>94.60</u>	<u>21.11</u>
AVG. COST/PARTICIPANT		\$ 58.37	\$ 6.16

2353

An analysis from the communications standpoint follows in the next section of the report. This includes the results of the questionnaires sent to teleconferrees.

Opinions of Teleconferrees and the Communication  
Capabilities of the Teleconferencing System

All persons participating in the teleconferences were mailed a questionnaire to obtain their opinions about the teleconferencing concept, the equipment, the particular conferences they participated in, and the types of Department meetings they felt could be handled by teleconference. Of the 329 questionnaires sent out, written responses were received from 80, or about 24%, of the participants. Many of those not responding to the questionnaire telephoned to say that though they had been listed as a teleconference participant they had been present only as an observer and therefore did not feel qualified to respond. The author suspects that this was the case for roughly 10% of those listed as participants.

About half of the respondents were first-time teleconference participants, one-fifth were participating in their second conference, and the remainder had participated in three or more. Respondents were overwhelmingly positive about the use of teleconferencing within the Department. Only one respondent commented negatively about the concept. A little more than 67% stated that teleconferences were as successful as face-to-face meetings, 27% thought they were less successful, and 4% that they were more successful. More than half of those who thought the teleconference was less successful had participated in one in which some type of equipment had broken down. Several losses in transmission for extended periods were cited, as well as speakers "breaking up" during the course of the conference. The former problem was caused by a faulty hookup with the public utility's equipment. The latter problem was the most often reported, and in most cases it was caused by speakers not holding down the "press to talk" bar long enough or firmly enough. Many of the participants were not comfortable with having to press the bar in order to talk, and some simply were not happy about having to pass the microphone back and forth. As the staff becomes better acquainted with the equipment, these problems will likely become less frequent.

The remainder of the participants who stated that the teleconference was less successful than a face-to-face meeting said that the teleconference medium was somewhat limiting for discussing detailed matters and tended to limit open, expanded discussion. Some of this opinion was also a result of the newness of this type of communication. If these meetings involved bargaining or negotiations or were ones which involved participants who didn't know each other very well, the opinions of these respondents would have to be considered well founded. Since

the researcher was not in attendance at all teleconferences, the circumstances characterizing each is not known; but suffice it to say, that it is the researcher's opinion that once the staff becomes accustomed to communicating electronically, many meetings involving information exchange, decision making, problem solving, and policy formation will be conducted via teleconference every bit as successfully as they would have been by traditional means.

The foregoing discussion introduces a consideration of which types of meetings can be successfully teleconferenced and which types cannot. From the outset, all principals in this study were acutely aware that certain types of meetings could be teleconferenced and certain types could not. While teleconferencing was not viewed as a replacement for all face-to-face meetings between the field and the Central Office, for instance, it certainly was seen as an effective way to replace some of them. Likewise, it was believed that some of the meetings between the districts and residencies, those between districts, and even those between Department staff and other agencies could likely be held by teleconference. Table 4 illustrates the types of meetings held by teleconference during the study period.

Table 4

Participants of Teleconferences Convened by Unit

<u>Participant Units</u>	<u>Number of Teleconferences</u>
District to Residencies	10
Central Office to Districts	7
District to Central Office	4
Research Council to Districts/ Other States	2
District to District	2
Central Office to Out-of-state Office	1

The first unit (or office) listed in the left-hand column of the table was the initiator of the teleconference. On ten occasions, the district engineers at Salem or Bristol used the teleconferencing system to converse with resident engineers, generally to disseminate information or to inform them of a policy. The seven meetings originating from the Central Office and the four originating from the districts to the Central Office were for the same purposes. The two teleconferences between districts were held by personnel in the same discipline needing to discuss an issue. One of these meetings, for

2255

instance, involved all the district training officers. The conferences originating at the Research Council were either task group or coordinator meetings. The final teleconference listed in Table 4 was for an unanticipated use of the system -- a preliminary job interview with a prospective employee located in Miami, Florida. In lieu of paying for the applicant to travel to Richmond, the interview was conducted by three Department managers by teleconference. This application, while certainly useful in the preliminary screening of job applicants, would probably not be desirable for final interviews where a face-to-face meeting is necessary.

The people who participated in the Department's teleconferences also had definite feelings about the types of meetings that can be conducted by teleconference. Table 5 shows that almost 70% of the respondents were of the opinion that state and district briefings could be held by teleconferences.

Table 5  
Opinions on Uses for Teleconference  
N=80

<u>Meeting Type</u>	<u>Very Useful</u>	<u>Somewhat Useful</u>	<u>Not Useful</u>	<u>No Response</u>
Statewide/districtwide briefings	55	18	5	2
Meetings between field units and Central Office personnel	45	34	1	0
Meetings between district and residency personnel	40	39	1	0
Meetings between personnel in different district offices	24	29	20	7
Committee meetings	20	47	13	0
Training/educational courses	2	33	44	1

The practicality of using teleconferencing for communications between field units and the Central Office and between district and residency personnel is also apparent to these respondents. They were not nearly so anxious to hold committee meetings by teleconference, and even less anxious to see training carried out by teleconference. The

practicality of using teleconferencing for these last two types of meetings is definitely debatable. Certain types of committee meetings could easily be teleconferenced (for example, all but one task group meeting was teleconferenced), while those involving intensive problem solving, debate, argumentation and the like are probably best held face-to-face. Some types of training, for example, can be achieved by audio teleconference, especially if supplemented with other media forms. The participants tended to think, however, that personal interaction between participants and between participants and instructor was necessary for successful training. They also think that meetings involving people who are not acquainted or where new information, ideas, or concepts are presented are not easily held by teleconference. Many also stated that a teleconference inhibits open discussion and brainstorming and may tend to thwart creativity. There was a consensus that meetings involving these types of activities and behaviors should continue to be conducted in a face-to-face manner.

Finally, the participants were asked how they thought teleconferencing might alter the time they spend travelling. Almost 80% said that travelling could be reduced by substituting teleconferences for some meetings. Even more important, more than 90% said that teleconferencing would enhance communication within the Department. Regarding this issue, several respondents commented that the teleconferencing system is of great help to those who heretofore may have been reluctant to meet and talk because of the travel required to do so. Others believed that the system was an excellent means for disseminating broadly based data and information to affected groups. They thought the system could definitely replace scores of written memorandums on policy announcements, emergency situations, etc. One said that "Very often we all need to hear the same thing at the same time. This system allows us to do just that."

#### EXTENSION OF TELECONFERENCING SYSTEM INTO THE RESIDENCIES: A PILOT STUDY

As was mentioned earlier, the teleconferences were continuously monitored by the researcher to acquire ongoing knowledge of the activities of the field offices. In light of the fact that a number of the initial teleconferences were held between the district engineer and the residencies (especially in Salem and Bristol), the task group decided to install teleconferencing units in the six residency offices in the Salem District to determine whether or not the teleconferencing system should be extended into the residencies statewide. These units are being integrated into the communications systems in the Salem, Christiansburg, Bedford, Hillsville, Martinsville, and Rocky Mount residencies. The units are manufactured by Westell, Inc., and feature

hands-free, voice-activated operation (See Appendix G). The cost is about half of that of the Darome units installed in the district offices. These units, called conference telephones, are designed for use in individual offices or small conference rooms. The audio quality exceeds that of the traditional desktop "squawk box", but is inferior to that of the Darome convener. As of this writing only the unit in the Salem Residency has been installed and in use for any length of time. The resident engineer there reports that he uses the unit almost daily and that it has become an integral part of his communication with the district, central, and other residency offices. When the units in the other five residencies become operable, an evaluation of the residency system seems warranted. The installation of units in other residencies should be explored based upon that evaluation.

#### SUGGESTIONS FOR FUTURE RESEARCH

Audio teleconferencing is being used in most departments within the Commonwealth. It is, however, but one form of teleconferencing. Video teleconferencing is also available and, like audio teleconferencing, its use is being coordinated by the DIT. Several agencies use video teleconferencing to train staff and to communicate visually. Video teleconferencing, although more expensive than audio, can be very cost-effective if the goal is to reach large numbers of people separated by distances, and if a presentation needs considerable visual support and the presence of a chairman or speakers. Furthermore, the cost of video teleconferencing is declining rapidly. It would behoove the Department to assess how video teleconferencing might be used in its operations. Such an assessment need not be near as intensive as that conducted for audio teleconferencing, however. It is envisioned that this assessment would be more of a technology transfer effort than a formal research project.

Additional efforts should also be made to evaluate the teleconferencing activities in the residencies in the Salem District and assess the potential for putting the system in the other 39 residencies in the Department.

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REFERENCES

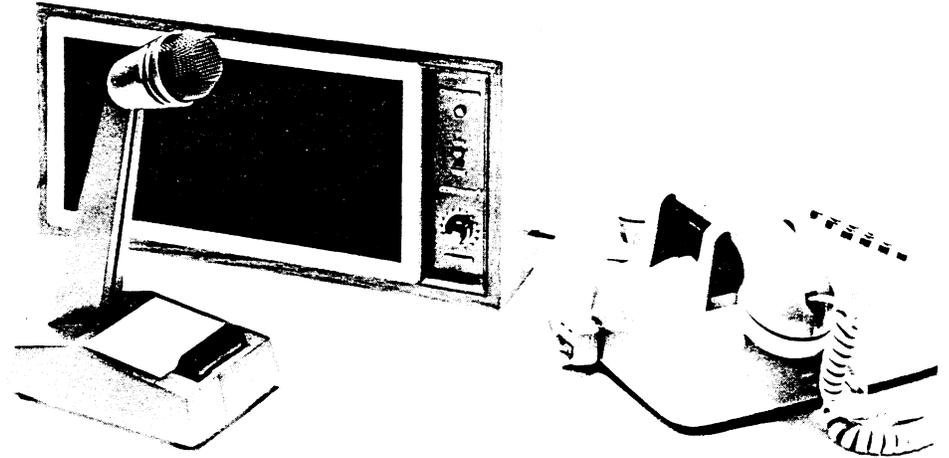
1. Automated Office and Electronic Meetings for Today's Managers,  
University of Wisconsin, December 1982.
2. Ibid.
3. Teleconferencing: Moving Ideas and Information Instead of People,  
Virginia Department of Telecommunications, February 1983.

-2330

2331

**Darome Standard  
CONVENER™  
Teleconference  
System**

**Model 610 & 1610**



Darome Standard Convener, Model 610. Connects simply to the telephone line. Ideal for large groups . . . for structured conferences, with many participants in many locations. A new communications tool that makes telephone conferences as effective as face-to-face meetings. Easy to use. Flexible, portable, compact, with powerful amplification.

You get true, person-to-person phone call sound, amplified for group participation. Powerful 14 watt amplifier accommodates large groups. More microphones can be added as needed.

Comes with adapter that simply plugs into the telephone. (If your telephone doesn't have a modular jack, the phone company will install an in-wall jack for a nominal charge.)

Darome Conveners have dual use as public address systems for large meeting rooms. Model 610 features include:

**Front control panel**

Has on/off switch, red indicator light and volume control dial for ease of operation.

**Powerful 14 watt RMS amplifier**

Delivers exceptional clarity for large and small conferences. Handsome walnut grained vinyl-covered cabinet with brushed gold finish trim is compatible with any decor. Steel protector behind the grill cloth keeps speaker from being damaged.

**Local public address capability**

Amplifies voices of participants present in the room as well as at other participating locations.

**Jacks for tape recorder input, tape playback, and external speakers**

Built-in tape jacks let you tape record the meeting or play tapes.

**FCC registered**

**Highly directional, desk style, cardioid microphone**

Gives clear, crisp voice reproduction. Accommodates two to three people comfortably.

**Press-to-activate drawbar on microphone**

Microphone is off until speaker presses drawbar so there is no pick up of background noises and side conversations during teleconference.

**Easy microphone connections**

Allow any number of microphones to be joined in chain fashion and plugged into the Darome Convener.

**Optional**

Additional microphones and sturdy, walnut-grained vinyl-covered carrying case with reinforced corners.

2301

## TELECONFERENCING COORDINATORS

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SCATS 366-9951

2334

TELECONFERENCING QUESTIONNAIRE

2335

In general, how do you feel about the use of teleconferencing within the Department?

- (a) Very Positive
- (b) Positive
- (d) Negative
- (e) Very Negative

How many teleconferences have you participated in?

- (a) 1
- (b) 2
- (c) 3
- (d) 4
- (e) 5
- (f) 6 or more

In how many of these teleconferences did you actively participate? (i.e., use the microphone/handset)

- (a) 1
- (b) 2
- (c) 3
- (d) 4
- (e) 5
- (f) 6 or more

How successful were these teleconferences compared to face-to-face meetings?

- (a) More successful than face-to-face
- (b) About as successful
- (c) Less successful than face-to-face

Please list any teleconferences you participated in that you feel were not successful and explain why you feel this way.

---



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Please explain any difficulties, questions, etc., you may have had concerning the teleconferencing equipment (i.e., conference units, microphones, etc.)

---



---

How useful do you think teleconferencing would be for the following Department activities?

Meetings between personnel in field units and in the central office      (a) Very useful      (b) Somewhat useful      (c) Not useful

Meetings between personnel in district offices and in residencies      (a) Very useful      (b) Somewhat useful      (c) Not useful

Meetings between personnel in district offices      (a) Very useful      (b) Somewhat useful      (c) Not useful

Statewide/district wide briefings (such as snow conditions, etc.)      (a) Very useful      (b) Somewhat useful      (c) Not useful

Committee meetings      (a) Very useful      (b) Somewhat useful      (c) Not useful

Training/educational courses      (a) Very useful      (b) Somewhat useful      (c) Not useful

Other (Please list) \_\_\_\_\_      (a) Very useful      (b) Somewhat useful      (c) Not useful

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2298

8. (a) What types of meetings do you feel could not be held by teleconference? \_\_\_\_\_

(b) For each type of meeting you listed please explain why you feel as you do. \_\_\_\_\_

9. On an average, how many days per month are you involved in meetings away from your office (ie out-of-town)?

- (a) 1 day per month
- (b) 1-4 days per month
- (c) 5-9 days per month
- (d) 10 or more days per month

10. On an average, how many days per month are you involved in out-of-town meetings with people you don't know very well?

- (a) 1 day per month
- (b) 1-4 days per month
- (c) 5-9 days per month
- (d) 10 or more days per month

11. How do you feel about the amount of traveling you are required to do?

- (a) Would like to travel more
- (b) Travel enough
- (c) Would like to travel less

12. How useful do you think teleconferencing will be in reducing the time you spend in traveling?

- (a) Very useful
- (b) Somewhat useful
- (c) Not useful

13. How useful do you think teleconferencing will be in enhancing communications within the Department?

- (a) Very useful
- (b) Somewhat useful
- (c) Not useful

14. What do you feel are the benefits of using teleconferencing? \_\_\_\_\_

15. What suggestions, if any, do you have for improving teleconferencing? \_\_\_\_\_

(For further comments use the back of this sheet)

THANK YOU - PLEASE LIST YOUR

Location of employment \_\_\_\_\_

Position \_\_\_\_\_

Age \_\_\_\_\_ Sex M F

PLEASE FOLD AND MAIL TO:

Michael A. Perfater  
 Virginia Highway & Transportation Research Council  
 P.O. Box 3817 - University Station  
 Charlottesville, Virginia 22903



# NEXT TIME, TELECONFERENCE.

TELECONFERENCING LETS YOU ATTEND A MEETING WITHOUT WASTING VALUABLE TIME TRAVELING THERE. CALL ( Mike Perfater ) AT ( 293-1939 ) TO SEE HOW YOU CAN SPEND LESS TIME ON THE ROAD AND MORE TIME ON THE JOB.

**VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION**





2070

2371

APPENDIX F

TELECONFERENCING COMPUTER FORM

Date of Teleconference \_\_\_\_\_  
Scats Rate \_\_\_\_\_  
Length of Call \_\_\_\_\_  
Number of Sites \_\_\_\_\_  
Total Number of Participants \_\_\_\_\_

How many participants were from Zone A? \_\_\_\_\_

How many cars would have gone from Zone A? \_\_\_\_\_

How many participants were from Zone B? \_\_\_\_\_

How many cars would have gone from Zone B? \_\_\_\_\_

How many participants were from Zone C? \_\_\_\_\_

How many cars would have gone from Zone C? \_\_\_\_\_

How many participants were from Zone D? \_\_\_\_\_

How many cars would have gone from Zone D? \_\_\_\_\_

How many participants were from Zone E? \_\_\_\_\_

How many cars would have gone from Zone E? \_\_\_\_\_

How many participants were from Zone F? \_\_\_\_\_

How many cars would have gone from Zone F? \_\_\_\_\_

2072

## Conference Telephone

The C10 Conference Phone offers the convenience of a hands-free telephone and the versatility of a teleconference terminal. The C10 is designed for use in individual offices or with groups in moderate-sized conference rooms. The quasi-duplex audio system features an adjustable electret microphone that provides legible pick-up within fifteen feet or more of the unit.

The C10 is an independent device with self-contained touch pad, electronic ringer, redial and mute features. The unit may be used alone or in conjunction with a telephone as it has automatic turn-off circuitry to allow private conversations via a telephone handset. The FCC-registered unit can interface with any type of phone system and is available in seven decorator colors.



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Willowbrook, IL 60521  
(312) 789-0888  
Printed in USA  
October 1983

### Features

- ★ Locking mute switch
- ★ On/off rocker switch
- ★ Microphone sensitivity switch
- ★ External microphone jack
- ★ Slide type volume control
- ★ LED indicates on/mute status
- ★ Omni-directional electret microphone
- ★ Speaker and cabinet matched for optimum audio
- ★ Available in Brown, Black and Ivory
- ★ One-year full warranty

### Technical Features

- ★ Echo suppressive-type nearly instantaneous voice switch
- ★ AGC receiver circuitry equalizing receive audio for constant output
- ★ External microphone jack allows the use of the Contech C150 desk-style push-to-activate microphone in single or daisy chain connections.

- ★ Transmit levels varied by position of sensitivity switch
- ★ Unique synchronous audio gate circuit eliminating speaker "pops" associated with signal phase discontinuities
- ★ Switch hook detection circuit disconnecting the unit when the telephone handset is lifted off the hook during a conference
- ★ Switch-selectable pulse or DTMF dialing
- ★ Automatic redial in pulse dial mode
- ★ Ring detection circuit with level adjustable electronic tone ringer
- ★ Out-of-band noise rejection circuitry
- ★ Powered with a UL-approved Class 2 transformer providing 500MW of audio at 5% THD
- ★ Typical tip and ring outgoing signal of +4dB, -10dB at 300-3500Hz
- ★ Connect to telephone system with RJ11C/RJ35X jacks
- ★ Fully FCC-approved #CH88BB-68986-MA-E Ringer Equ. 0.9B
- ★ One-year full parts and labor warranty

### Optional Feature



Optional C150  
Desk Microphone  
for use with C10

**Contech:**  
Creating the Alternative  
Meeting Environment



products manufactured and distributed exclusively by Westell, Inc

2674