

FINAL REPORT
A HIGHWAY ADVISORY RADIO FOR CONSTRUCTION
AND MAINTENANCE OPERATIONS

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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SUMMARY

The Virginia Department of Highways and Transportation utilized an advisory radio to advise motorists of possible delays caused by resurfacing operations on a major interstate highway and to give information concerning the use of an available detour. This report describes an evaluation of the effectiveness of the radio unit on the basis of the use made of the radio messages by motorists and the effect of the messages on traffic flow through the maintenance area and available detour. The results of traffic counts, time delay runs, and a motorist survey indicated that the unit used was not fully effective because of the inability of motorists to tune in the frequency or to hear or understand the message; however, it is felt that the concept of the highway advisory radio has good potential as a source of information and possible aid to motorists.

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INTRODUCTION

Maintenance and construction operations, in combination with the increasing traffic volumes on interstate highways, often cause congestion resulting in traffic backups and delays. In view of the extensive maintenance and construction work scheduled for the interstate and primary highways in Virginia, the Department of Highways and Transportation purchased a highway advisory radio unit to help alleviate anticipated traffic congestion. Because of the uniqueness of this unit and the Department's lack of experience in using it, the Research Council was asked to assist in evaluating it.

PURPOSE AND SCOPE

The purpose of the study was to evaluate the highway advisory radio unit on the basis of its use and the effect of the broadcasted messages on the flow of traffic through a pavement resurfacing project on I-95 near Fredericksburg. The unit was used to advise motorists of possible delays caused by the maintenance operations and to provide information on an alternate route (Rte. 1) that could be used as a detour to avoid delay.

The study was limited to an evaluation of the effectiveness of the radio advisory system for the purposes and particular circumstances cited.

HIGHWAY ADVISORY RADIO

Hardware

The radio apparatus consists of an audio sine, 110 milliwatt transmitter, Model Number AM 100-11S, and a recorder tape player,

model number AL 187 R. The 8-ft. antenna for the unit was mounted 30-ft. above ground adjacent to the interstate and prior to the section of highway being resurfaced. The approximate transmitting range for this particular setup was a 1/2 mi. radius for one-third radio volume. The message was carried on a 30-sec. continuous cassette tape with 28 sec. of recording and 2 sec. of silence.

Installation and Application

As noted above, the unit was used to advise motorists of possible delays caused by resurfacing operations on I-95 and offered information concerning the use of an available detour. The message was as follows:

You are tuned to the Virginia highway advisory radio. The northbound lanes of Interstate 95 are being resurfaced for the next 10 miles for your comfort and safety. Only one lane of traffic is now moving through the work area. You may wish to leave the interstate at the next interchange and follow Route 1 to Route 630 at Stafford, where you can return to Interstate 95 for travel to the north. Watch for signs and drive carefully.

A map of the area encompassing the advisory radio, the work area, and the Rte. 1 detour is shown in Figure 1. The section of Rte. 1 used as a detour passes through Fredericksburg and is a 4-lane primary highway (1.5 mi. divided) 14 mi. long. Speed limits on the section vary from 35-45 mph in the Fredericksburg urban area (approximately 4 mi.) to 55 mph in other areas. There are eight traffic signals along the detour with the majority being in the vicinity of Fredericksburg. The distance on I-95 between Rte. 1 and Rte. 630 is 14.5 mi.

The advisory radio was positioned adjacent to I-95 approximately 3/4 mi. from the Rte. 1 exit as shown in Figure 2. Three sets of signs provided information concerning the activity ahead and the possible avoidance of delay by tuning the radio to AM 1200 and following the advisory instructions. Signs were set 300 ft. apart within each set. The advisory message could be picked up after passing the second set of signs and lasted until the vehicle was approximately 1/4 mile from the Rte. 1 detour.

I-95 adjacent to the advisory radio is a 4-lane divided highway with an average daily traffic volume of 34,000 vehicles.

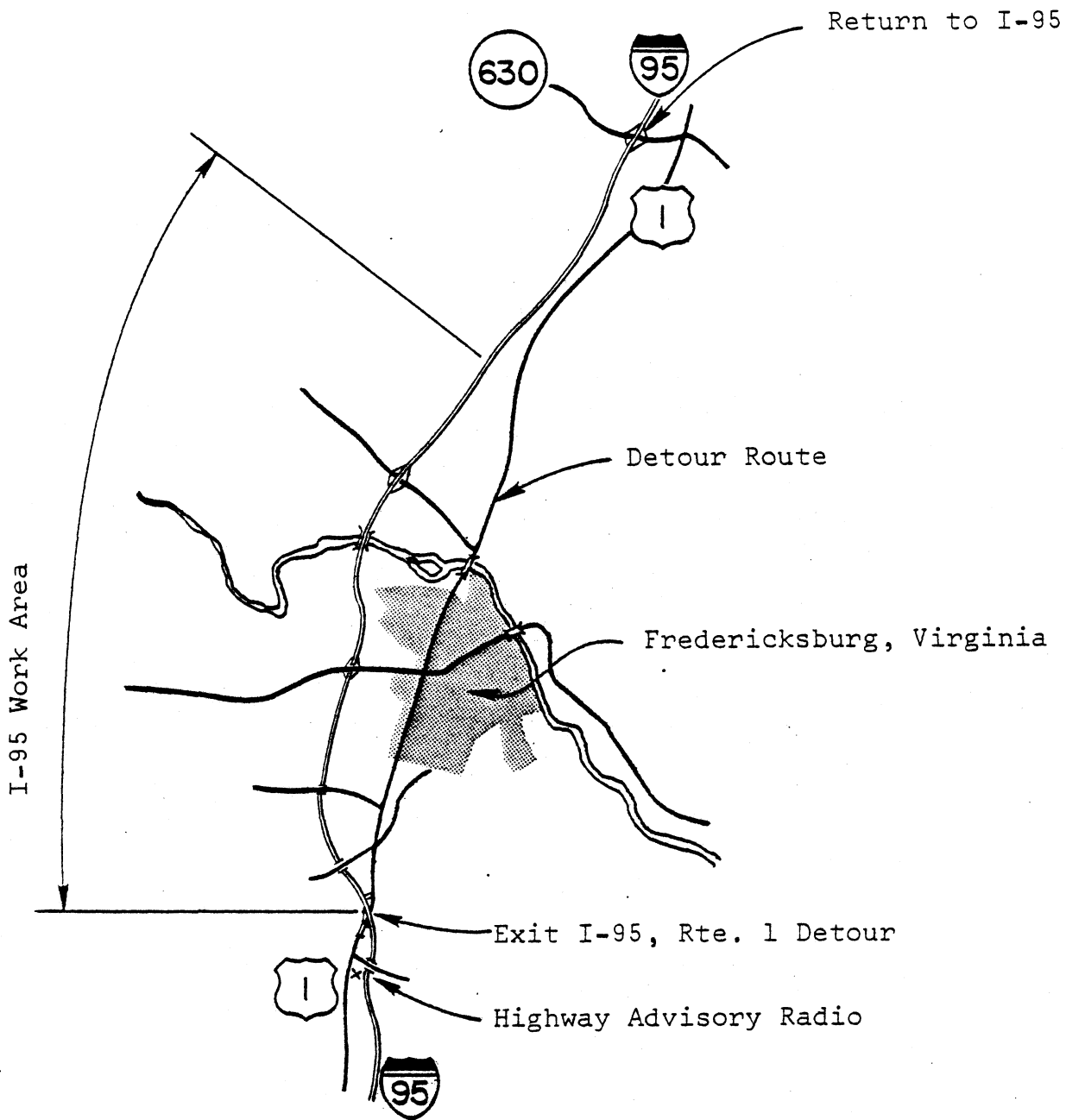


Figure 1. Map of area encompassing advisory radio.

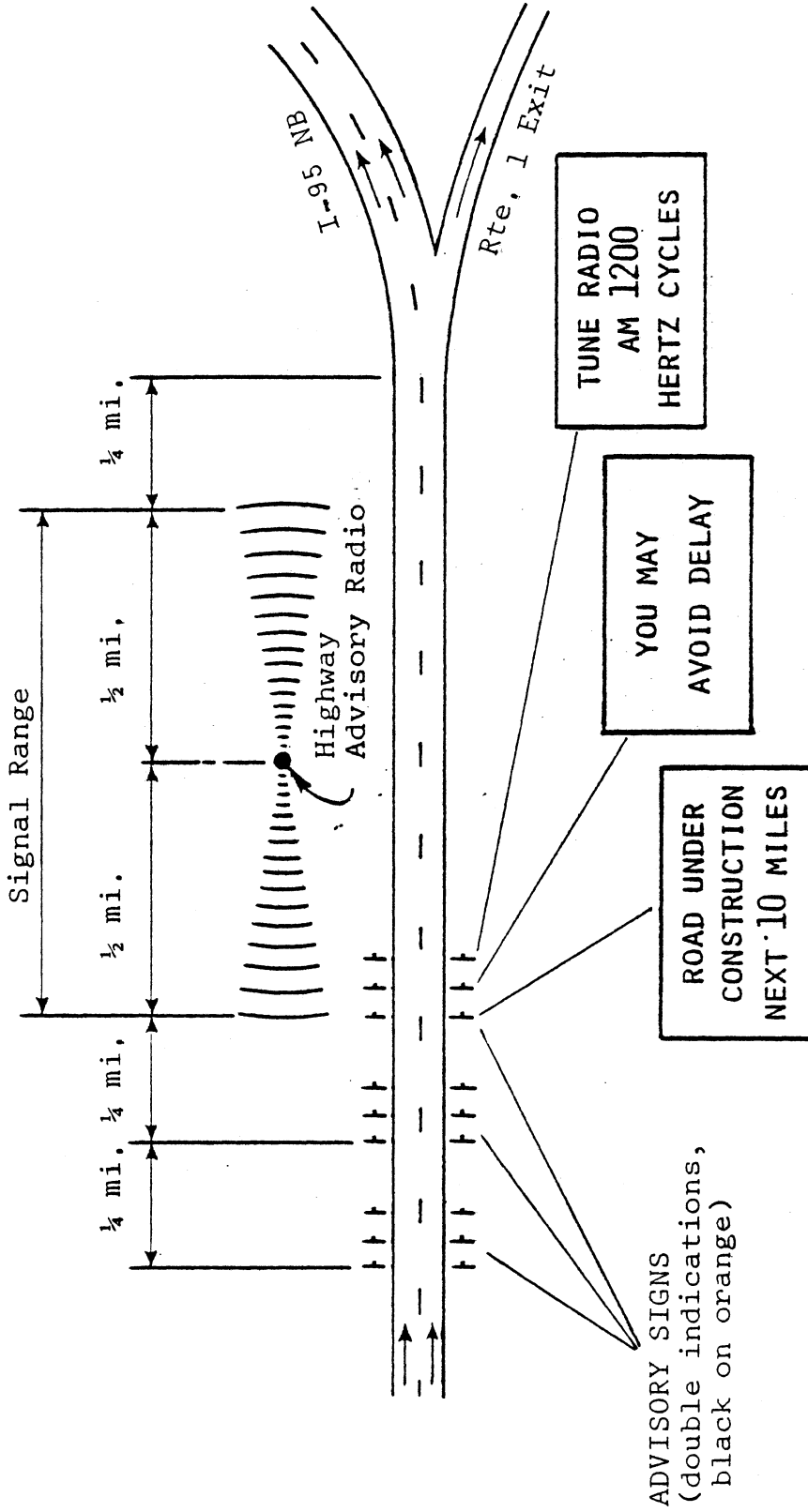


Figure 2. Position of highway advisory radio and advisory signs.

PROCEDURE

For an evaluation of the highway radio advisory in the use explained above, data were accumulated for 5 days; 3 days with the radio on (7/26/78, 7/27/78, and 8/8/78) and 2 days with it off (7/25/78 and 8/2/78). Data were taken between the hours of 9:00 a.m. and 7:00 p.m. The location of the resurfacing operation varied from day to day, but no part of it was visible to the northbound motorist prior to his reaching the Rte. 1 exit.

Traffic Counts

Traffic volume counts were made at the intersection of I-95 northbound and Rte. 1 (Massaponax interchange) to determine the increase in traffic on Rte. 1 resulting from the advisory radio. Counts included volumes on the I-95 and the Rte. 1 off-ramp for 3 days with the advisory radio on and 2 days with it off.

Time-Delay Runs

Time-delay runs were made for traffic remaining on I-95 and traffic following the suggested Rte. 1 detour. These data were gathered so that travel times for the routes could be compared. Two vehicles were used in determining the time required for travel between the Rte. 1 exit and the Rte. 630-Stafford interchange. The drivers of the vehicles were told to flow with traffic and to alternate routes. Also, they were instructed to note the milepost of the start of any traffic backup, the location of the work area, and any other impediment to the flow of traffic.

Motorist Interview

Motorist interviews were conducted at the Dumfries rest area located approximately 30 mi. north of the work area on I-95 to gather information concerning motorists' use of the advisory radio system and their choice of routes.

RESULTS

Traffic Counts

The percentage of northbound traffic exiting at the Rte. 1 interchange is shown in Table 1. As noted 1.8% and 1.6% more traffic

exited on Tuesday and Wednesday, respectively, when the advisory radio was in operation. Volumes were recorded for the same time intervals for 7½ hr. on Tuesdays and for 5 hr. on Wednesdays.

Table 1

Percentages of Traffic Exiting Rte. 1

Tuesday		Wednesday	
7/25 - Unit Off	8/8 - Unit On	8/2 - Unit Off	7/26 - Unit On
15.5%	17.3%	13.9%	15.5%

Table 2 gives the average travel times for alternate routes along with the average backup on I-95. The travel time on I-95 is a function of the length of the backup on this route, with the higher travel times generally corresponding with the longer backups. Also, in most cases travel times were higher for I-95 than for Rte. 1. With the available data, it is difficult to say with any certainty what influence the advisory radio had on relative travel times because of the influence of variables such as traffic volume, location of work area, interchange location, accidents, and weather. For example, on Wednesday, July 26, 1978, the work area was prior to the Rte. 17 interchange and there was little or no backup and relatively low travel times. For all other days, the work area was past Rte. 17 and there was increased congestion as a result of traffic entering I-95 from Rte. 17.

Table 2

Travel Times for I-95 and Route 1

Day	Advisory Radio	Average Travel Time, min		Number of Runs		I-95 Average Backup mi	Comparative Volumes	
		I-95	Rte. 1	I-95	Rte. 1		I-95	Rte. 1
Tue. 7/25	OFF	37.4	22.6	8	8	2.8	6633	1212
Tue. 8/8	ON	30.3	24.7	8	8	2.6	6905	1446
Wed. 8/2	OFF	23.7	22.2	5	4	1.7	5470	801
Wed. 7/26	ON	16.1	23.7	8	8	0.0	5156	970
Thur. 7/27	ON	33.2	26.7	6	7	3.2	--	--

Motorist Interview

Interviews were obtained from 849 motorists for 3 days (7/26/78, 7/27/78 and 8/8/78) while the radio advisory was in operation. They were asked questions relating to the highway advisory radio using the questionnaire shown in Figure 3, which includes the percentages of motorists' responses for the questions. Following this figure are comments on the responses to each question asked.

This questionnaire survey is being conducted by the Virginia Department of Highways and Transportation for the purpose of improving the safety and convenience of the motorist traveling through areas in which construction and maintenance activities are taking place. Your cooperation in answering some questions will be appreciated. Thank you.

1. Did you notice the signs about 30 miles back referring to the use of your car's AM radio for highway information?
 (Road Under Construction Next 10 Miles)
 (You May Avoid Delay)
 (Tune Radio AM 1200 Hertz Cycles)
90.5% yes
9.5 no (if no, ask origin and destination and terminate interview)
2. Which of the following do you have in your vehicle?
77.4 radio
1.2 CB
3.2 neither (18.2 both)
3. If you have a radio, did you tune to 1200 and hear the advisory message?
43.9 yes
56.1 no
4. Did you understand the message?
36.1 yes
63.9 no
5. Which of the following routes did you take?
89.7 I stayed on Interstate 95
10.3 I took the Route 1 detour
6. On what did you base your decision as to which route to take?
7.9 Radio advisory message
9.7 CB
82.4 Other (please explain)
7. What is your origin _____ and destination _____?
8. Comments -

Figure 3. Questionnaire responses.

1. Did you notice the advisory signs about 30 mi. back referring to the use of your car's AM radio for highway information?

It was interesting to note that almost 10% of the motorists had not seen the signs although there were three sets of signs with each sign having double indications. There were no comments on the questionnaires indicating that the signs were ineffective.

2. Which of the following do you have in your vehicle?

As was expected, a large percentage (96%) had AM radios; 18% had both CB and AM radios. One percent had CB radios only; 3% had neither.

3. If you have a radio, did you tune to 1200 AM and hear the advisory message?

Forty-four percent of the motorists had tuned to 1200 AM and heard the message; 56% had not. Based on the comments, many of the motorists had tried to find the message, however, and could not.

4. Did you understand the message?

Of the 44% who had tuned to 1200 AM and heard the message, only 36% had understood it. Many reasons for not having been able to understand the message were noted in the comments; however, the most prevalent were that "the entire message was not heard" or "the message was not clear". These findings indicate that 16% of the motorists on I-95 had tried to pick up the message and had been able to understand it.

5. Which of the following routes did you take?

Ninety percent had taken I-95 while the other 10% had traveled Rte. 1. Some of the motorists who had taken Rte. 1 indicated that they had done so for reasons other than the radio advisory.

6. On what did you base your decision as to which route to take?

It was found that the decision on which route to take had been based on the advisory radio 8% of the time; however, 31% of those having based their decision on the advisory radio had stayed on the interstate. The CB radio had been responsible for the motorists' decision 10% of the time and 72% of these respondents had stayed on the interstate.

7. What are your origin and destination?

This question was asked to determine if the motorist had traversed the area containing the highway radio advisory message.

8. Comments.

The majority of the questionnaires did not have comments; however, those comments from motorists who had stayed on I-95 are loosely categorized below.

- Shortest, fastest, best, simplest, or most direct route.
- Traffic moving or no backup.
- In no hurry.
- Followed traffic.
- Could not locate station.
- Could not hear message.
- Message not clear or poor reception.

CB Usage

A CB radio was monitored during the 5-day (3 days on and 2 days off) period for which data were taken. There was frequent talk on the CB radio concerning the resurfacing work, the traffic backup on I-95, and directions concerning the Rte. 1 detour, even when the advisory radio was off.

CONCLUSIONS AND RECOMMENDATIONS

It should be reiterated that the advisory radio was evaluated on only one project and that the results thus reflect only one set of conditions. Also, because of the many variables associated with the overall operation, the conclusions are in general terms. Further, it is realized that a degree of bias may be expected since interviewing was limited to a rest area; however, it was felt that the results were useful for the purposes of this study.

Based on the evaluation, the use of the highway advisory radio to advise motorists was not fully effective because of the inability

of most motorists to tune in the frequency or to hear or understand the message. Although only 16% of the motorists actually received and understood the message, it is important to note that over half the motorists having radios in their vehicles tried to tune it in. This effort on the part of the motorists indicates that the concept of the highway radio advisory has good potential as a source of information and possible aid to motorists. Also, it is felt that, regardless of whether specific instructions are given or followed, the advisory radio informs the motorists of road conditions and is an asset in public relations. Based on the responses to the questionnaire, it seems that if the motorist is given a choice, he is reluctant to use a detour, especially if he is unfamiliar with the detour route and there is no visual evidence of a traffic backup.

Special note should be made of the comments received from the public concerning the maintenance operations. There were generally fewer complaints received when the advisory radio was used as compared with those received without the advisory radio. This would tend to support the use of a highway radio advisory as a source of information adding to the public acceptance of the traffic congestion resulting from maintenance and construction operations.

For future evaluations of this type, it is recommended that a more powerful radio advisory system be used. Although not directly related to this evaluation, the following suggestions may be considered for future use of the highway advisory radio.

1. The message should be as short and simple as possible.
2. Messages or tapes might be changed to correspond to changing conditions.
3. One or more units might be used in conjunction with each other.
4. A mobile unit with live voice communication might be effective.
5. A special CB channel might be used to obtain information on motorists' reactions.
6. Special emergency broadcasts with the radio advisory might be feasible.