# MAINE FACILITY RESEARCH SUMMARY

## RESULTS 1973-1976


RURAL ROAD EXPERIMENTATION FOR TRAFFIC SAFETY AND CAPACITY

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| Joseph S. Koziol | DOT-TSC-FHWA-76-2 |
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16. Abstract

An overview of the Maine Facility - a two-lane rural highway test site - is presented, and past experimentation conducted at the facility is summarized. Experiments briefly described include Speed Control in Rural School Zones, Evaluation of Speed Control Signs for Small Rural Towns, Narrow Bridge Warning Devices, Flashing Traffic Control Devices at Intersections, and Passive Signing at Railroad Crossings.

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# PREFACE

This report is intended to disseminate the results of research activities at a two-lane rural test site for improving traffic safety and capacity on two-lane rural roads through speed and hazard-warning displays, and to introduce potential users to the experimental capabilities of the site. More detailed information on the subject matter of this report is avaiable from the Transportation Systems Center, Code 721, Cambridge MA 02142, or from the Federal Highway Administration, Traffic Systems Division, HRS 33, Washington DC 20590.

# 1. INTRODUCTION

This report presents an overview of the Maine Facility—a two-lane rural highway test site—and summarizes past experimentation conducted there. The Maine Facility[1] is a 15-mile (24 km) section of electronically instrumented two-lane highway capable of detecting vehicles and their approximate size and tracking their positions in real time. The data are collected via a computer-controlled data acquisition system and stored on magnetic tape for subsequent data reduction and evaluation of traffic behavior. Manual data such as vehicle type, male/female driver, and in-state/out-of-state vehicle may also be collected and collated with the electronic data for evaluation. Data reduction to the form of statistical tables is also preformed at the facility.

Thus, the facility serves as a test site (data collection and reduction) for obtaining basic traffic characteristics data and for developing and evaluating static and dynamic traffic control remedial aids in the interest of improving safety and the level of service on rural two-lane highways. The 15-mile section of highway has many of the potentially dangerous characteristics found on rural two-lane highways—sight restricted intersection, narrow bridge, steep grades, populated areas, at-grade railroad crossings, narrow shoulders, and a relatively high percentage of seasonal nonlocal traffic. Several experiments have already been conducted at the facility. Five of these studies and results are summarized in the following sections. All additional completed experiments run at the Maine Facility will be similarly summarized, and information on these can be obtained by filling out the mail-back form located on the last page of this report.

## 2. SPEED CONTROL IN RURAL SCHOOL ZONES[2]

The objective of this experiment was to determine the most desirable speed limit of rural school zones and the most effective passive and/or active sign configurations, including sign locations which optimize driver understanding, acceptance, and compliance to this speed limit. The signs included some mandatory and advisory school zone signs from the "Manual on Uniform Traffic Control Devices" (MUTCD)[3] as well as a new dynamic "Speed Violation" sign. Altogether, five sign conditions were examined. These are shown in Figure 1. No enforcement was used during the period of the experiment (January-June 1973). Data were collected and analyzed only for those periods that school was in session. The results of this experiment showed that:

a. The 1961 MUTCD school sign (sign condition 1) was not adequate in getting drivers to comply with Maine's 15 mph (24 km/h) school zone speed limit.

b. The 1971 MUTCD school speed limit sign (sign condition 2) was very effective in achieving a reasonable speed reduction—between 13 and 14 mph (21 and 22 km/h).

c. The reduced speed advance advisory sign caused drivers to reduce their speed more in advance of the school.

d. A speed of 15 mph (24 km/h) for rural school zones where there are very few children walking to the school area and where adjacent posted speed limits are 50 to 60 mph (80-96 km/h) cannot be achieved by the MUTCD signing and the auxiliary signing used in this experiment.

Further experiments to evaluate the effectiveness of the 1971 MUTCD school speed limit sign, use of flashing beacons, and the speed violation sign are underway in Mississippi, California, and Oregon (2 sites in each state) by the Transportation Systems Center (TSC) under Project Agreement with the Federal Highway Administration. Data from these experiments will be

processed at the Maine Facility. These experiments are intended to verify the above findings and to answer additional questions related to signing effects. The implications of all findings will be reviewed to determine potential applications for a safe, practical speed control signing system for rural school zones.

## 3. EVALUATION OF SPEED CONTROL SIGNS FOR SMALL RURAL TOWNS[4]

The objective of this experiment was to develop safe, practical traffic control devices to alert drivers to the need for reducing speed when approaching small towns and to invoke voluntary compliance with the speed regulartory devices in a manner promoting increased safety in vehicle operations. Twelve signing configurations were evaulated by comparing speed profiles and compliance measures of motor vehicles as they approached and passed through a small rural town. The 12 sign configurations were tested over 9 separate time periods of 2 weeks each and 2 directions of travel (eastbound and westbound). There were thus 18 sign conditions, with several signs repeated and tested in both directions for experimental control purposes. The tests were conducted between November 1973 and June 1974. The sign descriptions and test configuration sequence are shown in Figure 2. The 12 signing configurations included passive signs only (sign conditions 1, 2, 3, 4, 5, and 8, eastbound, and 1, 5 and 8, westbound), signs with flashing beacons (sign conditions 2, 3, and 4, westbound), a symbolic sign (sign condition 6, westbound), dynamic speed violation signs (sign conditions 7, westbound, and 6 and 7, eastbound), passive signs coupled with rumble strips (sign condition 9, eastbound), and passive signs coupled with "funneling" pavement markings (sign condition 9, westbound). The results of this experiment showed that:

a. The dynamic speed violation signs were the most effective signs (statistically significant), reducing speeds by an additional 3 to 4 mph (4.8 to 6.4 km/h) compared to the passive signs.

b. No sign achieved as much as 30 percent compliance with the existing speed limit.

c. Signs with flashing beacons appeared to be next in effectiveness during the day (after dynamic signs) but reduced speeds by only an additional 1 to 2 mph (1.6 to 3.2 km/h) compared to the passive signs.

d. Pavement markings and rumble strips appeared to be next in

effectiveness at night (after the dynamic signs), followed by the signs with flashing beacons. This was based primarily on the percent of drivers who complied with the speed limit—25 to 30 percent for the dynamic speed violation signs, 18 percent for the pavement markings and rumble strips, and 15 percent for the signs with flashing beacons.

e. Signs with flashing beacons were about as good during the day as during the night.

f. Very few differences were found between the various passive signs.

Similar experiments involving the signs with flashing beacons and the dynamic speed violation signs are underway at two other sites in Mississippi by TSC to verify the above findings for the town signing experiment and to answer additional questions related to signing effects. Again, all data will be processed at the Maine Facility. The implication of the additional findings will be reviewed to determine potential applications for a safe, practical speed control signing system for small towns located along primary highways.

# 4. NARROW BRIDGE EXPERIMENT[5]

This experiment was performed by the Texas Transportation Institute (TTI) as part of the National Cooperative Highway Research Program (NCHRP) Project 20-7, Task 7. The purpose of the task was to define the narrow bridge problem, appraise corrective measures, and develop guidelines for treatment. TTI's experiment consisted of a field study of 25 bridges (including one on the Maine Facility) in 7 States.

The objective of this experiment was to

a. Develop functional specifications for implementing passive remedial systems to reduce the hazards and vehicle conflicts on narrow bridges.

b. Develop guidelines for the use of these systems.

c. Evaluate the effect on driver performance of the various geometric, structural, operational, human, and environmental factors associated with bridge crossing.

Three remedial aids were tested on the Maine Facility between July and September 1974:

1. Edge striping (treatment 1)

2. Lateral clearance warning sign with advisory speed plate (treatment 2)

3. Full guard rail over bridge and approaches (treatment 3).

The remedial aids are shown in Figure 3.

A final report[5] on the narrow bridge experiment was prepared by the TTI and is currently being reviewed by the NCHRP. Preliminary findings indicate that:

a. Treatment 1 caused significantly better placement in one direction, but did not significantly change placement in the other direction.

b. Treatment 2 improved placement in both directions.

c. Treatment 3 had adverse effects. Although the guardrail placement seemed to cause unopposed drivers to drive closer to the centerline, there is no doubt to their added safety effect in redirecting vehicles.

d. The treatments caused no significant changes in speed.

The results of this experiment will be extended and applied to additional experimentation to be conducted at the Maine Facility to develop and test dynamic remedial aids for narrow bridges.

## 5. INTERSECTION EXPERIMENT[6]

This experiment was performed by KLD Associates, Inc., under contract DOT FH-11-85-32 to the Federal Highway Administration (FHWA), "Guidelines for Flashing Traffic Control Devices."

The objective of this experiment was to test the effectiveness of flashing traffic control devices at dangerous intersections. In addition to an intersection on the Maine Facility, 4 intersections in Charlotte, N.C., and 25 intersections in the New York City area were studied. Thirteen different sign conditions were tested. These are shown in Figure 4. The signs consisted of a completely passive type (base condition, sign condition 1), continuously flashing types (sign conditions 2, 5, and 6), and dynamic flashing types (sign conditions 3, 4, 7, 8, 9, 10, 11, 12, and 13). Data were collected on the Maine Facility between February and September 1975.

A final report[6] on the results of the experiment was prepared by KLD and is currently being published by the FHWA. The following results from the Maine data were found:

Main Road Rte. 2: Although some statistically significant differences in speed along the main road near the intersection were found for the various sign conditions (speeds were lowest for sign conditions 9-13) the differences were rather small—less than 3 mph (4.8 km/h).

Side Road Rte. 152: a. The simple continuous flashing beacon encouraged significantly lower speeds on the approach to the intersection, but again the differences were small—less than 2 mph (3.2 km/h). The use of actuated beacons and the addition of actuated beacons and the addition of actuated stop sign beacons did not result in speed profiles significantly different from ones caused by the stop sign control.

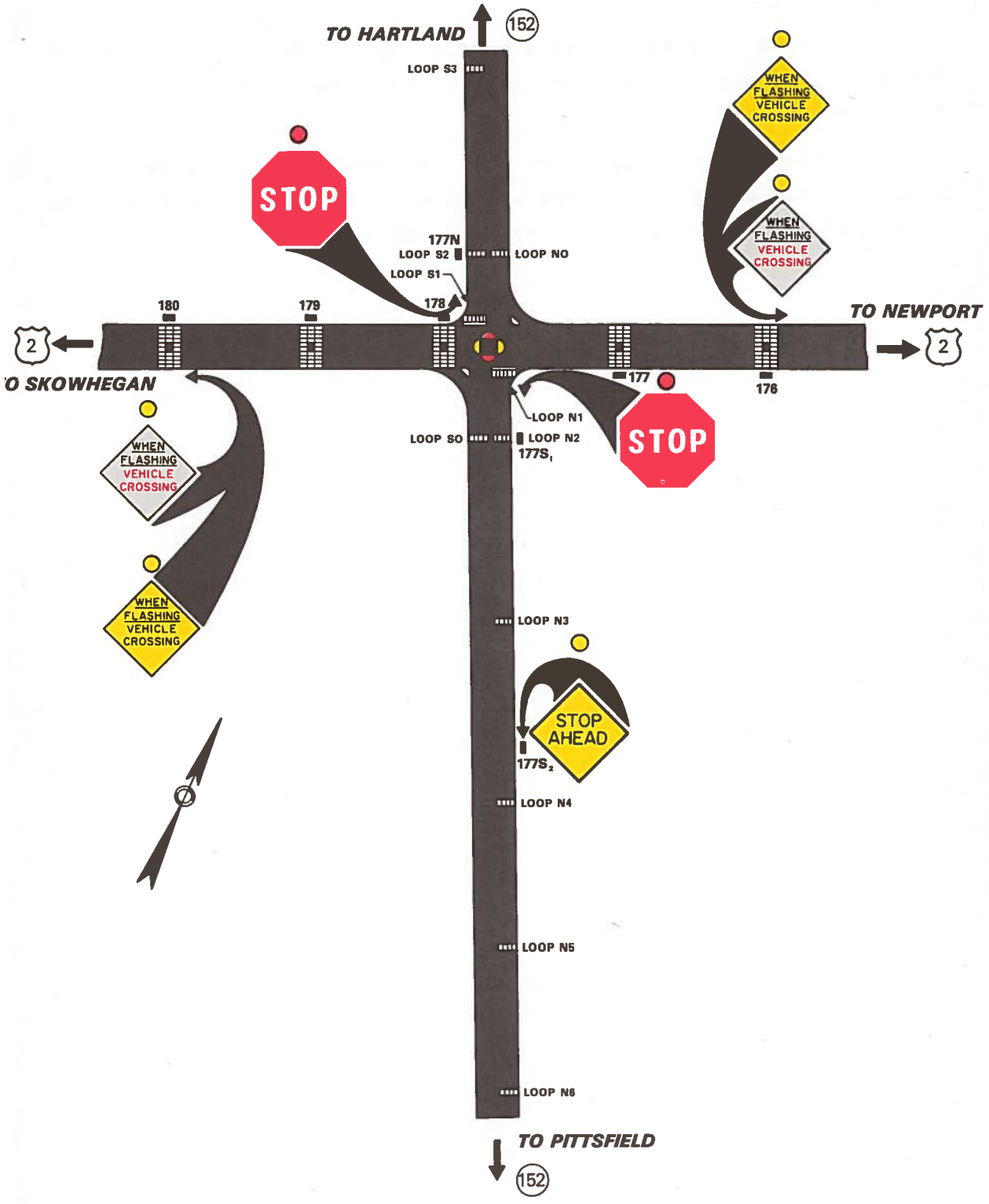


FIGURE 4b. INTERSECTION SIGNS - SIGN CONDITION LAYOUT

## 6. RAILROAD CROSSING EXPERIMENT[7]

This experiment is being conducted by TSC under project agreement with the FHWA. The project is a pool-funded effort involving 25 States, the Federal Railroad Administration, and the FHWA. Phase I of the two-phased study involved five sites in Ohio and one on the Maine Facility. Data were collected between March and October 1975. All data were processed at the Maine Facility.

The objective of this study was to evaluate the effectiveness of seven new passive signing systems in notifying drivers of the presence and dangers of at-grade railroad crossings. The base signing system (also passive) was in conformance with the existing MUTCD standard and consisted of the standard white crossbuck with black "Railroad Crossing" legend, yellow circular advance warning sign with a black "X" and the letters RR, and pavement markings. The seven advance signs and five crossbucks evaluated in the experiment are shown in Figure 5. The results of Phase I showed that:

a. The new signing systems averaged an increment of 19 percent more head movement than the base system. (In this experiment, head movement—that is, looking for a train—was taken to be a prime indicator of sign effectiveness.

b. Two signing systems—one involving signs with alternate red and yellow quadrants and one involving a yellow look-for-train sign with black lettering—showed the most effectiveness, although not significantly with respect to the other new signs and crossbucks.

The study is currently in Phase II with additional tests being conducted on the three most promising signs[8] from Phase I at 18 sites in 14 States. Based on the results obtained from Phase I and Phase II, a final report will be written making recommendations on what sign or signs should be adopted for driver warning at railroad highway grade crossings.

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The Maine Facility
Attn: Maurice Lanman
RFD Box 421
Pittsfield ME 04967

Please send me:

☐ Additional information on the following experiments described herein:

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☐ Future summaries of completed experiments.

☐ Additional information on the operation of the Maine Facility.

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