

INTERIM RESULTS

Well trained field teams in all areas of the research are now productively generating research data, but only limited data are currently in a form which permits reasonable preliminary evaluation. The information available has been analyzed and some of these preliminary results are being presented. Also, information developed on factors affecting fuel savings identified during the study are summarized. For a more complete review of the project and findings to date, the reader is directed to the complete report of interim results published as "Report II - Midterm Report - Preliminary Results and Analyses" - September 1977 (Ref. 1).

VEHICLE SPEEDS

A series of traffic-behavior experiments were designed to develop data needed for modeling vehicle speeds as a function of roadway characteristics. Nine main experiments were designed, six for measuring the free speed of vehicles, two for measuring operating speed, and one for measuring acceleration using project test vehicles. Also, four satellite studies were defined. This group of experiments is summarized in Table 1.

Even though only one of the experiments (TB-2) has been completed at this time, it is possible to report partial results. The analysis represents only a portion of the total amount of data currently available. In addition, analysis of the impact of the speed-limit enforcement law has been performed.

Preliminary Analysis on TB-2

The purpose of this analysis was to develop a preliminary regression equation which would predict the free speeds on negative grades. The data were collected before the enforcement of the 80-km/h speed-limit law, and the radar meters were in view of the drivers. Because of the possible effects of the

TABLE 1 - ROAD USER COSTS AND TRAFFIC EXPERIMENTS

| CATEGORY | NUMBER | TITLE | PURPOSE |
|--|--------|-------------------------------|--|
| TRAFFIC BEHAVIOR MAIN EXPERIMENTS | TB-1 | Free Speed on Positive Grades | Determine the distribution of free speeds on positive grades for each vehicle class |
| | TB-2 | Free Speed on Negative Grades | Determine the distribution of free speeds on negative grades for each vehicle class |
| | TB-3 | Acceleration on Grades | Use test vehicles to determine acceleration rates on positive and negative grades |
| | TB-4 | Free Speed on Curves | Determine the distribution of free speeds on horizontal curves for each vehicle class |
| | TB-5 | Trip Purpose | Determine if free speeds are a function of trip purpose or length |
| | TB-6 | Free Speed Calibration | Independent data collection for verifying and calibrating models from experiments TB-1 through TB-5 |
| | TB-7 | Radar Effect | Determine if speed data is being affected by test procedures |
| | TB-8 | Speed/Capacity | Collect data for developing speed versus volume relationships for simulating operating speeds on rural roads |
| | TB-9 | Operating Speed Calibration | Independent data collection for verifying and calibrating models from experiment TB-8 |
| TRAFFIC BEHAVIOR SATELLITE STUDIES | TBS-1 | Wet/Dry | Define differences in driver behavior due to climatic conditions |
| | TBS-2 | Surface Types | Define differences in driver behavior due to different gravel surface types |
| | TBS-3 | Deceleration | Collect data on deceleration rates used when approaching a horizontal curve |
| | TBS-4 | Dust Effect | Collect data on the effect of dust on vehicle speeds and headways |

exposed radar on these data and the effect of the speed-limit enforcement program on future observations, the analysis presented here will have to be modified. The analysis and results are described simply to explain the types of relationships that will be developed in the future. They are not to be accepted as final since the speed-limit and exposed-radar effects are not explained in these equations.

Background - The sampling frame used for this study is given in Figure 4. A total of six smooth paved sections were used in the experiment. On each section spot speeds of vehicles were collected at five stations 500-m apart. Eleven separate vehicle classes were used for classification of the observed vehicles as well as four load classifications. More than 17,000 vehicles were observed.

Analysis - It was impossible to observe many of the vehicle classes under various load conditions on all of the sections and at all of the stations. Of particular difficulty were the truck classes. To ensure that data were available for all classes, at all sections, and at all stations, new vehicle classes were defined by grouping the original load and vehicle class combinations. The new classes are defined as follows:

New Class

1 = Cars

2 = Buses, All Loads

3 = Utilities, Empty

4 = Utilities, Half and Full Load

5 = Trucks, Empty

6 = Trucks, Half and Full Load

As a preliminary analysis procedure, the mean spot speeds were analyzed "as if" they were all estimated from equal sample sizes.

Weighted regression analysis was performed on the func-

| | | | | | | | | | | | | | | | | |
|------------|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|
| | | GRADE | | | | | | | | | | | | | | |
| | | 1 | | | | | 2 | | | | | 3 | | | | |
| REPLICATES | 1 | STATION | | | | | STATION | | | | | STATION | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| | | | | | | | | | | | | | | | | |
| | 2 | STATION | | | | | STATION | | | | | STATION | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| | | | | | | | | | | | | | | | | |

Figure 4 - Sampling Frame for Free-Speeds-on-Negative-Grades Pilot Study

tions and the following equation represents the best fit on the functions tried.

$$S=59.3+7.3 \left[18.6-(G-3.8)^2 \right] \cdot 5^{-3.25C+.56L+.240} L^{G/2.6}$$

where S = mean spot speed

L = station (1, 2, 3, 4, 5)

1 is equivalent to 2000 meters up a negative grade

2 is equivalent to 1500 meters up a negative grade

3 is equivalent to 1000 meters up a negative grade

4 is equivalent to 500 meters up a negative grade

5 is equivalent to the bottom of a negative grade

C = new vehicle class (1, 2, 3, 4, 5, 6)

G = grade in percent

The equation is graphically presented in Figures 5, 6, and 7.

Effect of the Speed-Limit Enforcement Program

Free-speed data from four negative grade sections have been collected with the radar units in view before and after the speed-limit law. The four sections have grades of 1.3%, 3.6%, 6.0%, and 6.1%. As a preliminary examination, it is possible to compare the effects of the speed-limit law on the speed patterns of the four sections.

Analysis of the results indicates that the speeds measured after the speed-limit law are significantly lower than those measured before the law. The effect of the law is much more pronounced on the steeper grades where speeds are in general higher.

Conclusions - A large mass of free-speed data was collected within three months after initiation of the speed-limit law with the radar visible. The preliminary analysis of these data indicates the speed-limit law has reduced speeds significantly on negative grades when the radar units are visible. Recommendations are being considered now for further work, so that adjustments can be made on these reduced speeds.

FUEL CONSUMPTION

The fuel-consumption experiments will provide the data re-