



Report Title	Report Date: 2000
SpeedGuard Radar Speed Reporting System	
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Supplemental Notes	
Abstract A radar actuated speed display board was deployed in a rural Interstate work zone in which traffic was reduced to one lane in each direction. Speeds were measured at several locations over a span of about a mile. Data were collected without the display for one week and then with the display in operation for another week. Comparison of traffic characteristics showed statistically significant decreases in mean speed, 85 th percentile speed, and percent speeding, both at the display location and as much as half a mile downstream. The mean speed reduction between the before (without the display) and after (with the display) data was about 3 mph at the display and about 1 mph half a mile downstream. Data were also collected for several hours while a Kansas Highway Patrol (KHP) vehicle was positioned at the same location. Changes in speed characteristics relative to baseline conditions were similar to those observed with the speed display at the display/vehicle location. A half-mile downstream, though, speeds were well above baseline speeds when the KHP was present.	

SPEEDGUARD RADAR SPEED REPORTING SYSTEM

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Description

Various technologies which use radar to determine speeds of vehicles in the work zone will be used. A speed trailer will be used which displays vehicle speeds. Another option is to use a speed trailer with a VMS displaying speed and projected fine.

The speed display evaluated comprised a back-lit dynamic speed display, a standard speed limit sign posted above the display, and a strobe flash, all contained in a trailer mount. The strobe flash was set to activate when a vehicle's speed exceeded 103 kph (64 mph). A second threshold speed could be set that activated an alarm horn. The horn would sound toward the construction zone to alert workers that a vehicle was approaching at a potentially reckless speed. A maximum speed could also be set for the display, discouraging drivers from competing to post higher speeds on the display. Only the strobe threshold was set for the evaluation period. The device is bulletproof to withstand substantial vandalism attempts. The device is camera-ready to allow photo enforcement, although no camera was used in the evaluation (Photo enforcement is at this time prevented by state statute. In order for a citation to be issued, an offense be witnessed by a law enforcement officer present at the time of the offense.).

Study site

I-70, Wabaunsee County

During project's phase II and at various locations within the work zone, but likely at or near the entrance to the work zone.

The evaluation was conducted in an 8 km (5 mile) construction zone on I-70 approximately 44 km (30 miles) west of Topeka, Kansas. The test was conducted using eastbound traffic during the second phase of a reconstruction project in which the eastbound lanes were closed, and two-way traffic was being carried on the westbound lanes. Originally, data was to be collected at ten locations in the vicinity of the device. Equipment failures resulted in usable data being obtained from only four of the collection points during the time the speed display was operating.

Performance Measures

The objectives of this application and the associated performance measures are shown in Table 3-21.

TABLE 3-21 Radar enabled speed display: objectives and performance measures.

Objectives	Performance Measures
Reduce speeds in work zones	1. Speed
Reduce speed variance in work zones	2. Speed distribution

Experimental Design

Study type: before and after.

Data Collected

Vehicle Speeds

Collection method: pneumatic tubes and automatic traffic recorders.

Sample size: 1 week, 24 hrs/day, with and without radar.

Analysis technique: Comparison of 85th percentile, mean, and standard deviation.

Prior to the deployment of the speed display, a week of baseline data was collected, followed by a week in which radar drones were deployed and more data collected. The week following the deployment of the speed display, the Kansas Highway Patrol (KHP) provided active speed enforcement for a total of 8 hrs, recording the times during which an officer was present so that the corresponding data could later be identified. A fifth data set was included in the analysis, comprising the hour immediately following the departure of the KHP.

Evaluation Results

Figure 3-16 shows the mean speed, 85th percentile speed, and percent speeding for the speed display at all data points where data was available. Baseline data is also shown for comparison. Figure 3-17 shows the same parameters for law enforcement, and Figure 3-18 shows the data for post-law enforcement, or the hour immediately following the departure of the highway patrol. Vehicles passed over data points in reverse order, i.e., data point 10 was the farthest upstream of the data points, while data point 1 was farthest downstream. The speed display was deployed near data point 7 at a median crossing. KHP locations were not recorded, but it is likely they were observing from the same location, because the shoulders were not suitable for parking and the median crossing near data point 7 would be the best location from which to observe traffic. The radar drone showed little or no effect on speeds or on the percent of drivers exceeding the posted limit.

In all cases, the speed display resulted in a significant reduction in mean speeds, 85th percentile speeds, percent of drivers exceeding the posted limit, and speed variation (standard deviations), as can be seen in . Figure 3-17 shows that law enforcement produced similar results at data points 8, but at data point 4 the values *increased* relative to the baseline. Interestingly, data during the hour following the KHP's departure from the test site (i.e., "Post-Law Enforcement", shown in (Figure 3-18) showed that speeds at data points 8 and 9 not only increased to normal, but *exceeded* baseline speeds.

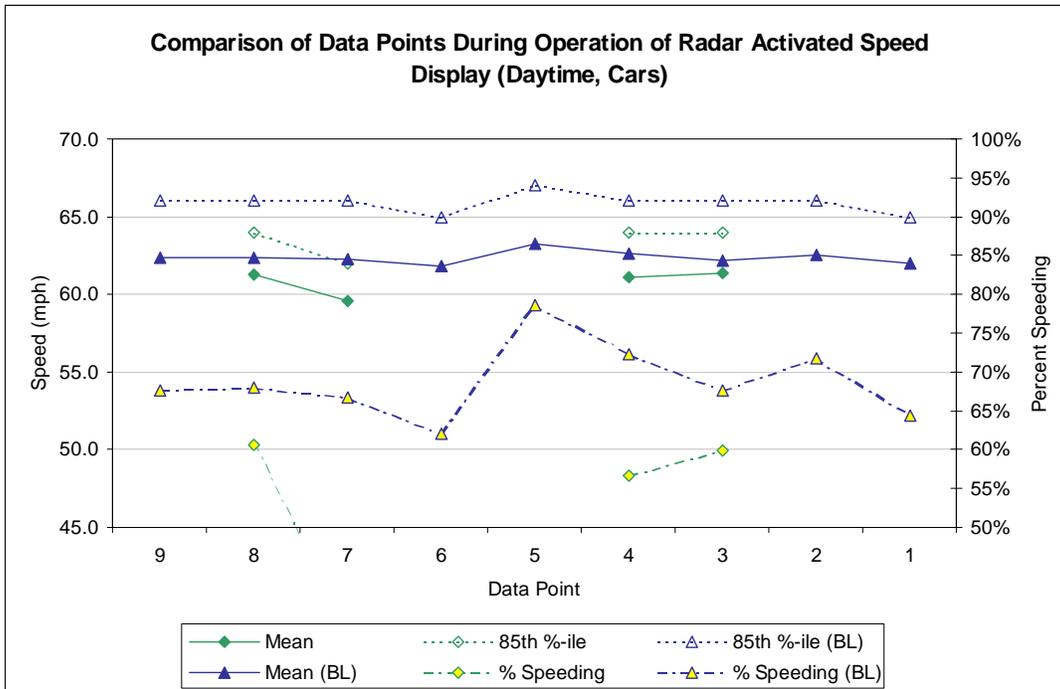


FIGURE 3-16 Speed display results (daytime, cars).

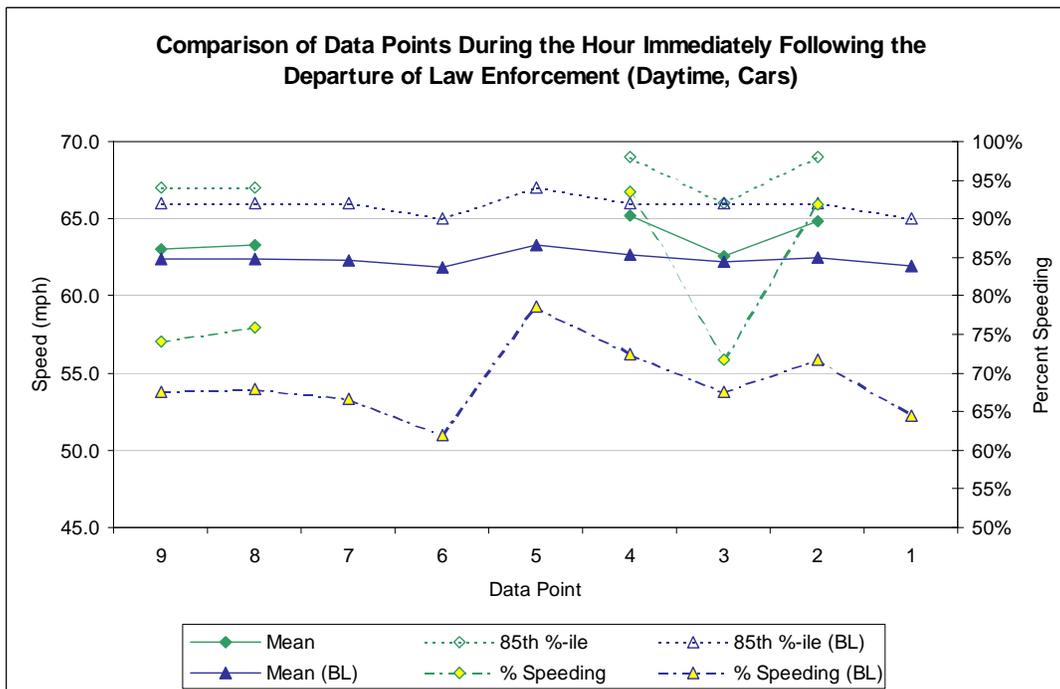


FIGURE 3-17 Law enforcement results (daytime, cars).

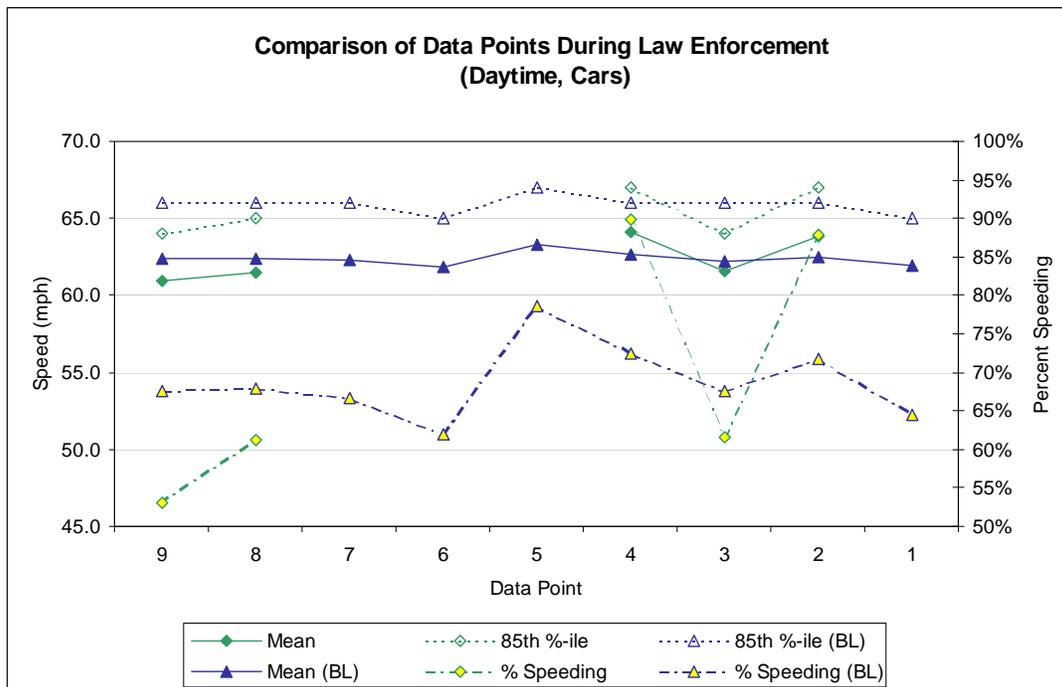


FIGURE 3-18. Post-law enforcement results (daytime, cars).

Conclusions

From the data collected, it is reasonable to conclude that the radar drones are not effective devices for reducing speed-related traffic characteristics. The radar-triggered speed display was easily deployed and very mobile. The setup time was less than 10 minutes once the site was identified. The display was quite effective, reducing mean speeds, 85th percentile speeds, percent of drivers exceeding the posted limit, and standard deviations for both cars and trucks. The effects were less pronounced, but still significant, at data point 4, which is approximately 0.8 km (0.5 mi) downstream of the speed display. In contrast, law enforcement appears to cause an increase in speeds downstream from the patrol car. Additionally, speeds continue to increase after the patrol car is no longer in the area. The reason for this phenomenon is unknown.

Recommendations

Speed reductions resulting from the deployment of the radar-triggered speed display were comparable to those occurring during active law enforcement. However, the speed reduction resulting from the activation of the speed display propagated downstream to the last operational data collection point, while speeds actually increased at the same location during the periods of active law enforcement. The portability of the device, the ease of setup, and the sturdy construction are significant advantages. Ongoing tests in Texas and a planned test in Kansas during 2001 will further evaluate the effectiveness of this device, focusing on aspects such as the distance over which the speed reductions deteriorate and potential enhancements to the display such as complimentary signing.