

SCHOOL BUS SAFETY
EQUIPMENT
EVALUATION

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

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DISCLAIMER

This report was prepared in cooperation with the State Department of Highways and Public Transportation and the National Highway Traffic Safety Administration of the U.S. Department of Transportation. The conclusions and opinions expressed in this document are those of the author, and do not necessarily represent those of the State of Texas, the State Department of Highways and Public Transportation or any political subdivision of the State or Federal government.

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SCHOOL BUS SAFETY EQUIPMENT

Introduction

The second special session of the 68th Legislature of the State of Texas produced two senate concurrent resolutions (SCR) dealing with school bus safety. The first, SCR 9, required that the Department of Public Safety (DPS) investigate the advisability of authorizing the placement of rooftop strobe lamps on school buses for the purpose of increasing their conspicuity under conditions of low visibility during inclement weather. The second resolution, SCR 17, required the DPS to initiate a pilot study of the effectiveness of stop arms on school buses as a means of reducing the frequency of illegal passing by motorists.

The Texas Transportation Institute (TTI), using funds provided by the Traffic Safety Section of the State Department of Highways and Public Transportation, assisted the DPS in complying with these resolutions by performing the work described in the detailed report.

Objectives - The work accomplished by TTI was designed to satisfy the following objectives:

1. To determine the effect of the use of stop arms on illegal passing of school buses.
2. To survey the level of motorist understanding of the existing loading/unloading warning light system, and to determine if the level of understanding can be improved by adding a stop arm or verbal message decal.

3. To determine the extent to which the use of roof mounted strobe lamps or other devices improve the conspicuity of school buses under conditions of reduced visibility.

Summary of Findings

Summary for SCR 17 - The outcome of the evaluation of the use of stop arms on school buses authorized under SCR 17 is shown in Table 1 and summarized as follows:

1. During the period of the study the use of a swing-out stop arm on school buses significantly reduced the proportion of bus stops where traffic was present that experienced at least one illegal pass.
2. The magnitude of this reduction is between 30 and 48 percent. The 30 percent reduction is a conservative estimate established by statistically adjusting for possible regression to the mean.
3. The use of swing-out stop arms also reduced the average number of vehicles passing at each stop with illegal passes and the average number of vehicles illegally passing each bus each day.
4. Survey results indicate that the use of the stop arm significantly enhanced the meaning of the stop and prepare to stop messages.
5. The estimated cost for retrofitting 21,700 buses statewide with swing-out stop arms is \$3.4 million.
6. The accident reduction benefit that would accrue from equipping all buses with stop arms statewide is estimated to be 45 injury accidents out of 300 accidents expected in a ten year period. This estimate is based on a 30 percent reduction in stops with illegal passes and assumes that this reduction is

TABLE 1 SUMMARY OF DATA FOR SCHOOL BUS ROUTES

	Bus Days Observed	Total Stops w/Traffic	Number of Stops with at least one Illegal Pass	Percent with at least One Illegal Pass	Number of Vehicles Passing at Stops with Illegal Passes	Number of Illegal Passes Per Bus Per Day	
Treatment Routes (19)	Pre Period	267	5436	964	17.73	1.67	6.02
	Treatment Period	251.5	5124	471	9.19	1.27	2.38
	Percent Change	-	-		-48.16	-23.95	-60.47
Control Routes (6)	Pre Period	78	1024	129	12.60	1.33	2.06
	Treatment Period	91.5	1309	183	13.98	1.21	2.43
	Percent Change	-	-		+10.95	-9.02	+17.96

only 50 percent effective in reducing accidents.

These results, which are consistent with findings from other studies, indicate the extent of the positive influence of the use of stop arms on illegal passing behavior. The use of such devices cannot be expected to eliminate the behavior entirely. Additional countermeasures such as increased enforcement of illegal passing violations, an increase in fines, and the implementation of public information and education campaigns to inform motorists of their responsibilities will be required to achieve further reductions.

Summary for SCR 9 - The results of the evaluation of signalling devices for use on school buses during periods of poor visibility is shown in Table 2 and can be summarized as follows:

1. Test results indicate that the use of additional lamps to increase the conspicuity of school buses under conditions of reduced visibility is feasible and would require few changes to existing policies.
2. There are several types of devices which represent a substantial improvement over the existing lighting system on school buses. These devices include flush-mounted strobe lamps, 360 degree strobe lamps, and rotating halogen beacons.
3. These devices differ in their method of application, number required, color and cost. The most expensive and most conspicuous are red strobes that mount in the existing loading light housing. Four of these devices would be required at a

TABLE 2 BOX SCORE OF WARNING LAMPS

DEVICE #	DEVICE	Mean Ft-Lamberts to Occlude	Cost/Bus	Effectiveness Relative to Std. Device
6	Flush Strobe-Red	40.0	\$555	2.70
9	360° Strobe-Amber	37.3	220	2.51
5	Rotating Halogen-Clear	30.4	95	2.06
4	Rotating Halogen-Amber	21.9	95	1.47
1	Std. Bus Lamp Red	15.1	100	1.00
8	360° Strobe-Blue	13.9	220	0.97
2	Rotating Halogen-Red	12.9	95	0.87
7	360° Strobe-Red	7.4	220	0.52

total cost of \$555, which includes the cost of the power supply. The other devices are single units intended to be roof mounted approximately four feet from the rear of the bus. These include a 360 degree, amber strobe and rotating halogen beacons, either clear or amber. These lamps cost \$220 and \$95 respectively.

New technology and increases in demand are likely to lead to the introduction of improved devices in time. Consequently, if these or similar devices are approved for use, they should be authorized through a minimum standard specification.