Abridgment

Bus Priority System Studies Using Instrumented Buses

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Priority treatment for buses on urban roadways has been implemented in various forms in an attempt to reduce bus operating costs and to encourage more commuters to use buses. This paper deals with one aspect of bus priority: the use of instrumented buses to study the operational effectiveness of bus priority schemes. The studies, which were carried out in Miami, Florida, evaluated two bus priority techniques:

1. Local preemption of traffic signals by buses and
2. Preemption of traffic signals plus use of an exclusive, reversible bus lane.

Data from two stages of operation, each associated with a particular bus priority technique, were collected and compared with the conditions that existed prior to the implementation of the system.

DATA COLLECTION AND ANALYSIS

An automated data collection technique was developed for this study. The objective of the technique was to obtain a large amount of data over a series of short sections of roadway at a low cost. Placed aboard the bus were cassette recorders that were connected to the bus odometer to record the trajectory of the bus in 30-m (100-ft) increments. The raw trajectory information from each sample run was analyzed by computer and combined with corresponding information from several similar runs to generate nine measures of effectiveness:

1. Average speed,
2. Running speed,
3. Total delay,
4. Stopped delay,
5. Travel time,
6. Fuel consumption (estimated from travel parameters),
7. Number of stops,
8. Number of speed changes, and
9. Speed noise.

STUDY RESULTS

The data collected during the three stages of the project (including a preliminary stage) showed that the use of the preemption system resulted in substantial improvements and that the use of an exclusive bus lane further improved the bus operations. The most important measures of effectiveness are summarized in the following table, which gives the percentage of improvement that was measured at each stage during the afternoon peak period, with the signal preemption and with the addition of the exclusive, reversible lane.

Measure of Effectiveness	Signal Preemption	Bus Lane
Travel time	25	8
Total delay	61	15
Speed noise	46	12
Number of stops	68	19
Speed changes	27	12
Estimated fuel consumption	7	3

Several interesting relationships between the measures of effectiveness were also developed. The average speed in a given section was found to be strongly correlated with the delay, number of stops, number of speed changes, speed noise, and fuel consumption. Of the three measures of effectiveness proposed as indicators of passenger comfort, speed noise was suggested as the preferred measure, since the number of stops tended to be somewhat inconsistent in the lower speed range and the number of speed changes tended to diminish at speeds less than 24 km/h (15 mph), giving a false indication of passenger comfort.

The measurement technique shows considerable promise for widespread use. Both the hardware and the software are reasonably simple and contain no proprietary constraints. Efforts are under way to simplify the process so that it can be used by many other agencies and studies.

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