

miles travelled (exposure) but is not sensitive to the finer differences one would need for understanding accident causes and for development of safety counter-measures. This is a type of gross index which may be of utility at the federal level as a national program monitoring measure, providing it could achieve sufficient accuracy and confidence for use in decision making. The form of equation to be used in developing a Measure of System Safety is:

$$MSS = \frac{N_E}{N_v \cdot A_v}$$

$N_E, a. t. i.$ = Number of unsafe events (accidents or fatalities or injuries per year per vehicle class, trucks (t), buses (b), passenger cars (p) . . .)
 N_v = Number of vehicles in fleet class t, b, p
 A_v = Activity per vehicle of class t, b, p in miles/year. (It would also be nice to include tons of freight hauled or passengers moved in the denominator in an improved model.)

The National Safety Council and the ICC also publish rates but they do not quite achieve the goal established here as the ICC covers only the regulated segment of the truck fleet while the NSC lumps all segments together. The following exercise, combining data from various sources is, however, used to assist in pointing out deficiencies of existing data as well as their utility and helps to identify future needs for accident investigation.

Some of the separate inputs to the MSS are of considerable interest of themselves, before they are combined.

Fleet Size (N_v).—Figure 2 shows the estimated number of vehicles in the truck, bus, and passenger car fleets as they have grown over the years (4). The quantities for 1966 are those used in computing the indices which are discussed later. The truck fleet covers the range of vehicle types illustrated in Figure 1 and includes interstate, intrastate, and urban operations.

A bus by definition is a commercial vehicle which carries a driver and ten or more passengers. Taxicabs are also included in the bus category, as are school buses.

Miles Travelled (A_v) · (N_v).—Figure 3 shows the trends in estimated miles travelled per year for each class. The average miles per vehicle per year (A_v) for 1966 for each class are shown in Table 1.

It is a bit surprising that the truck, which we think of as the economic work horse running all day, only develops an average of 11,800 miles per year. This seems to indicate that it is sitting around most of the time, just like the passenger car. This is one of the reasons containerization is so promising as an efficient improvement—it keeps the load moving through a variety of modes of transport.

There is, of course, great deviation from the average in each class, for different uses. Long haul intercity trucks, for example, put on about 82,000 miles and intercity buses 90,000 per year.

Unsafe Events (N_E).—Unsafe events can be characterized in various ways, depending upon the interests of the user. For example:

All Accidents	Fatalities
Fatal Accidents	Occupant Fatalities
Injury Producing Accidents	Pedestrian Fatalities
All Injuries	

Each type of unsafe event will have its own peculiar definition, depending on the rules used for collecting the original data. For purposes of illustration three types are used in Table 2.

Some Examples of MSSs.—The following rates for 1966 are computed for each vehicle class for each type of unsafe event and are shown in Table 3 based on 100 million vehicle miles. This mileage figure has been used for some time by the National Safety Council and others. The reason for this particular choice is not known—some agencies use 1 million vehicle miles, others different values. In any event it is an arbitrary choice, but once chosen it is more meaningful to remain with it.

The accuracy of these rates, as shown in Table 3, is not known as the input data come from different sources, have different criteria for entering the sample, and there is some estimating involved. For example, actual vehicle mileage is reported to ICC only for the regulated portion of the trucking fleet, mileage for the rest of the fleet is estimated. Annual mileage for passenger cars is estimated based on fuel consumption. The property damage level for accident cases