TG-1 GENERAL FRAMEWORK FOR A TRAFFIC RECORDS SYSTEM

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Concept

A traffic records system is a group of data files, readily accessible, which will meet the data requirements of all users to the extent that such data files can be economically justified.

The matrix shown in Figure 1 and introduced by the National Highway Traffic Safety Administration, (NHTSA) has broad general applicability. It provides a perspective for analyzing traffic related problems leading to the definition of solutions and the application of corrective measures.

As shown in Figure 1, the files should contain four general or broad categories of data.

1. Driver Data
2. Vehicle Data
3. Roadway Environment Data
4. Accident-Related Data

Those broad categories of data shown in the pre-crash column include such records as driver licensing and performance records, vehicle registration and inspection, roadway characteristics and traffic control elements.

The crash column categorizes information on accidents. These records are linked with appropriate pre-crash data. Data in the crash column or time frame characterizes such things as accident severity, location, contributing factors, and people involved.

The post crash column or time frame includes data gathered after an accident such as property loss, medical care involved and contributing factor correction.

It should be recognized, the traffic records system that will contain the above types of data is not required for all users. Some users may get all the information they may ever need through the use of simple programs involving only pre-crash data, such as driver data from registration files. Other users may require a complicated program or series of programs to search several files. A traffic records system must provide that flexibility.

Examples of Data Use

1. Some examples of the use of roadway-related data include high accident location identification and surveillance, identification of deficient roadway elements and traffic control devices, the analysis of predominant accident types, short and long range planning of maintenance, improvements, and enforcement. A specific example of the data use is shown in Figure 2.

Figure 1. A matrix framework for a traffic records system.

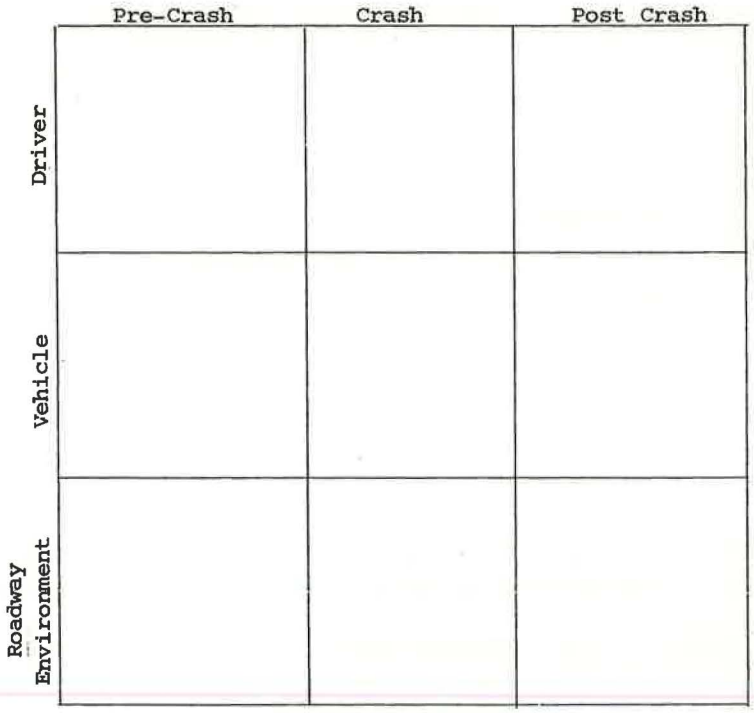
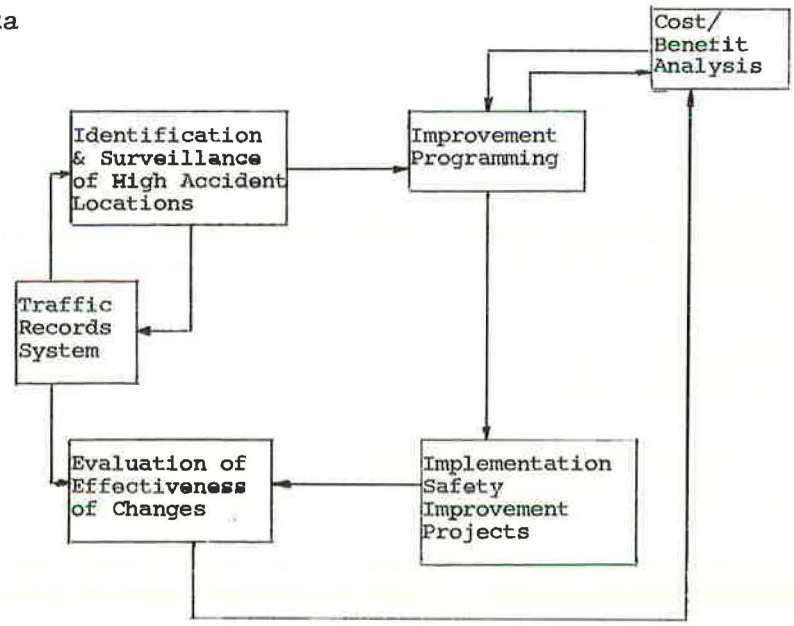


Figure 2. Roadway-related data use.



The identification and surveillance of high accident locations is the beginning of a decision-making process. With data from the roadway- and accident- files, locations (intersections or street segments) can be ranked by accident rates (preferable) or by total accidents (when traffic volume data is not available).

Roadway data could be used to group locations by common characteristics so what would be considered a high accident rate at a particular type of location is not included with other locations, with different characteristics, which typically have higher accident rates. Examples of possible groupings which would improve the process of identifying high accident locations are listed below.

Street Segments	Street Intersections
8 or more lanes	signalized
6 lanes	stop signs (all approaches)
4 lanes	stop signs (partial)
2 or 3 lanes	Non-controlled

Since there are hundreds of possible combinations of mutually exclusive groupings of locations which can be defined using data from the roadway-related files, statistical tests could be used to select those location groupings with accident rates significantly different from other trial groupings.

With this approach, multiple lists of high accident locations can be produced for the surveillance function rather than just one large master list. Field studies can then be scheduled by working down each list in parallel.

The results of the Identification and Surveillance activity are passed on to the Improvement Programming Activity. In this step, estimates are made of reductions in various types of accidents at the problem locations which can be achieved through implementation of the safety improvement projects recommended in the previous step. Estimates of the costs of the recommended projects are also made. These estimates are then used in the establishment of priority rankings for all recommended projects based on cost/benefit ratios.

Subsequent to the implementation of the recommended improvements, the Traffic Records System could be used to provide data for evaluating the effectiveness of the changes. For example, how is the accident rate of signalized intersections affected by the installation of mast arm signals.

The results of an Evaluation Activity provide the necessary feedback for the next cycle of benefit estimates which serve as input to Improvement Programming.

2. Vehicle-related data use includes information which would permit a determination of the need for certain motor vehicle safety standards and the evaluation of the effectiveness of vehicle safety components like energy absorbing steering systems, head restraints, side beams, and occupant restraint systems.

   See Figure 3 for a specific example of vehicle-related data use.

If it were deemed, based on traffic records, fatalities due to ejection from motor vehicles appeared excessive, some corrective action (countermeasure) would be in order. To consider plausible alternative countermeasures, it is necessary to know the nature and extent of motor vehicle occupant ejections and the conditions under which the ejections occured. Information like frequency of occupant ejections, mode of ejection, seated position of occupant prior to ejection, occupant use or lack of use of restraint (e.g., lap and shoulder belt) system, etc. might be extracted from the traffic records system. Alternative countermeasures are a function of the knowledge of combinations of information from the data file. For example, if ejections through vehicle side glass are predominant, the use of high penetration resistant glass may be an appropriate countermeasure. Should a cost/benefit study tend to support the selection of such a countermeasure then the new safety feature could be manufactured and installed. Following the introduction of this kind of safety measure, the traffic records will be monitored to obtain measures of the efficacy of the vehicle component change. The new information closes a loop in the decision making process for which the traffic records system is the heart.

3. Driver-related data is used to issue restrictive licenses, establish driver training programs, provide information for court use, and study trends in driver behavior. License revocations are based on the historical data files of each driver's accident and traffic violation citations.

   See Figure 4 for an example of such data use.

If in investigating an accident, a police officer learns from driver performance files in the traffic record system that an involved driver had excessive citations, corrective action is required. The remedial action might include a repeat of the usual kind of driver-ed course, participation in a course on defensive driving, or training in a dynamic vehicle - road simulator. A consideration in selecting the proper countermeasure is the costing of the improvement program. Are the expected results commensurate with their costs? The previously poor driver is expected to be a better driver after he has gone through the appropriate corrective training. Measures of the effectiveness of the

Figure 3. Vehicle-related information use.

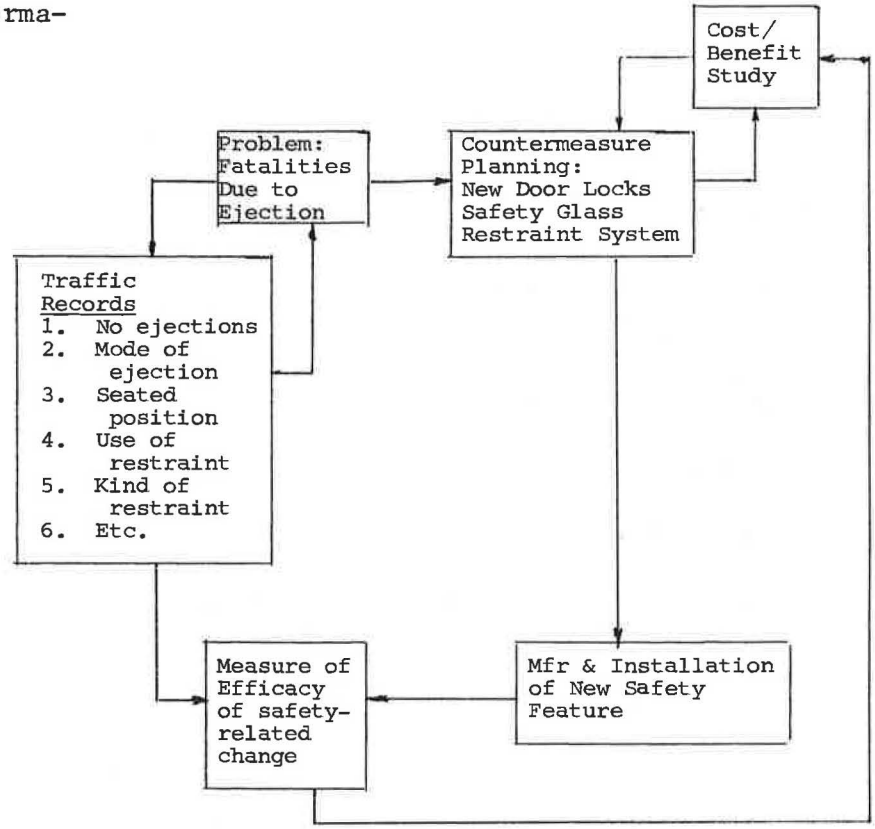
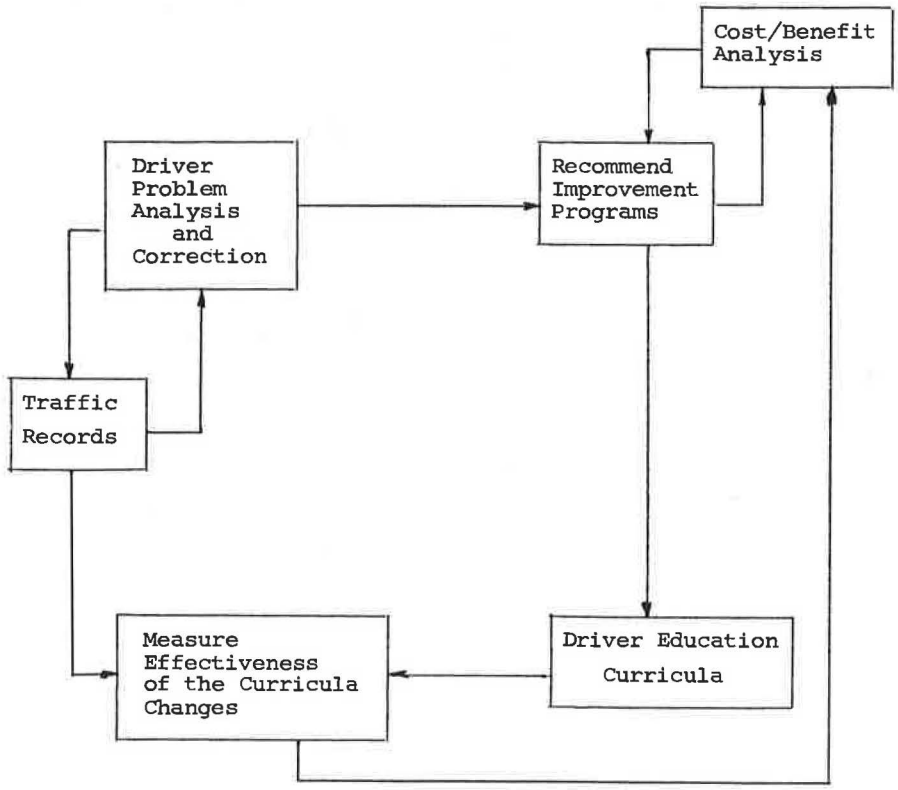


Figure 4. A driver related data use.



specific training are expected to be provided by changes (for the better, hopefully) of drivers who had the same exposure, and which changes are accurately reflected in the continuing traffic records system. The ongoing data files, thus, are used to highlight driver-related problems and to provide information about the effectiveness of improvement-seeking programs to which the derelict driver is being exposed.

Other Considerations

Because each user places different requirements on the functioning of the entire system, there are facets of a Traffic Records System that have not been evaluated in this report.

Some are:

1. Timeliness of data collection.
2. Validity of source data.
3. Completeness of the source data.
4. Media of the source data reporting.
5. Definition of the data element.
6. Hardware and software for computer-aided data storage.
7. History retention.
8. Report processing flexibility.
9. Report formats (fixed output programs).
10. Who is to receive the reports.
11. Capability of report recipient to take an action.

A traffic records system should contain only items known to be required for production of required or desired output. While content should be limited, flexibility should not. A variety of statistical techniques should be evaluated for appropriateness and those with potential provided for. Select and sort criteria for reports should be readily changeable. Levels of information (technical for research and non-technical for lay users) may have to be provided if all users are to be satisfied. Confidential items must be identified and safeguarded.

As indicated by these "other considerations" a traffic records system needs to be viewed as part of a larger interactive system if its use is to be maximized.

General References

1. Accident facts published by
   - National Safety Council
   - Individual states
   - Federal agencies
     - National Highway Traffic Safety Administration
     - Federal Highway Administration

2. How to design data files

- D20 Committee, American National Standards Institute
- Traffic Records Program Manual 10,
- Code books and dictionaries
  - Calspan Corporation
  - Highway Safety Research Institute

3. Existing useful files

- National Highway Traffic Safety Administration
  - National Accident Summary
  - Fatality File
  - Multidisciplinary Accident Investigation Team Report

  Calspan Corporation (Buffalo N.Y. area)
  - Automotive Crash Injury Program files (1954-1969)
- Highway Safety Research Institute, University of Michigan
  - Crash Performance and Injury Report File
  - Seattle file
  - Denver file
  - Texas File
- Highway Safety Research Center, University of N.C.

4. Selected reports from contractors and government docket

Example:
"Evaluation of Criteria for Safety Improvements on the Highway", Roy Jorgensen and Associates, 1966. (Report to Bureau of Public Roads, Office of Highway Safety)