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Development of a Master File of Essential Highway-Safety Planning and Evaluation Data

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The National Highway Traffic Safety Administration requires that each state file an annual highway-safety work program as a prerequisite for obtaining federal Section 402 safety funds. However, the work program serves as more than a mechanism for obtaining funds; it induces planning, programming, and budgeting of highway-safety projects. The commonwealth of Virginia has endorsed the work program concept and is continually striving to improve its highway-safety planning process. The most recent improvement was the incorporation of the concept of problem identification and management by objectives into the state's highway-safety work program. Local highway-safety commissions and state traffic-safety agencies were asked to complete their annual work program submissions by using this concept, the intent being to enhance the quality of their planned highway-safety activities. The research reported here was an attempt to further implement the concept by offering refinements. Under these refinements, the local commissions and state agencies are not asked to generate much of the problem identification data; the necessary information is provided to them. These data should aid the local commissions and state agencies in identifying problem areas. This approach was well received when first used in preparing Virginia's FY 1977 annual highway-safety work program. However, the methods of compiling and disseminating information proved laborious and time-consuming. Therefore, methods for automating various parts of the information-retrieval, assimilation, and dissemination stages were developed.

With the advent of the annual highway-safety work program (AHSWP) in 1969, the National Highway Traffic Safety Administration (NHTSA) plotted a new course for the administration of the state highway-safety program. Before then, NHTSA (or its predecessor, the National Highway Safety Bureau) had required that its personnel review each highway-safety project for which federal funds were requested. Afterward, federal funding was integrated into state planning. That is, each state was required to develop a comprehensive plan for highway-safety management and, to obtain federal funds, each was asked to document its safety-program needs. This annual state submission became known as the annual highway-safety work program.

The new approach was aimed at the overall goal of identifying problem areas in the highway-safety program structure. This approach also had several secondary goals. First, by introducing statewide planning, the AHSWP attempted to produce a systematic, continuous review of safety programs. Second, by linking planning and budgeting, the AHSWP forced the states to review their current and future needs so that federal funds would be used efficiently. Finally, the AHSWP's emphasis on planning was designed to mesh with an evaluation process to ensure effective program implementation, review, and continuation.

Yet from its inception the AHSWP has created some problems. In Virginia, the program was initiated in precisely the manner described by NHTSA (1). Each state traffic-safety agency and local highway-safety commission was asked to complete a subelement plan in which each organizational unit concerned was to list safety programs it wished to implement and the associated costs. No emphasis was placed on problem identification. Consequently, the programs listed under the subelement plan were sometimes chosen quite arbitrarily.

In 1976, the Virginia Highway and Transportation Research Council (VHTRC) proposed revisions to the AHSWP in Virginia (2). After a review of the existing system for completing the AHSWP, it was concluded that the system was inadequate, and a resurrection of the goals outlined by NHTSA when the AHSWP was created was recommended. Specifically, an AHSWP was outlined in which the identification of highway-safety problem areas was emphasized.

On the adoption of the VHTRC recommendation, state agencies and local commissions were given problem-identification statements for each program area to aid in focusing attention on problem areas. The agencies and commissions were asked to use these problem-identification statements in completing their subelement plans. However, in the initial year of implementing the revised plan, a number of commissions and agencies failed to complete the work program in the prescribed format. As a result, some subelement plans were again prepared in a less-than-creditable manner.

The VHTRC recommendation pointed out that, for the AHSWP to work, those formulating the tangible safety

programs (i.e., the local commissions and state traffic-safety agencies) must be provided the data necessary for identifying problem areas and that, once these problem areas had been identified, the agency or commission could create a plan to give them the needed attention and request funds on a priority basis. These requests could then be compiled in the state's AHSWP and submitted to the appropriate federal agencies. Thus, the AHSWP would accurately represent Virginia's funding and programming needs. Furthermore, when the block grant was received, the submissions from the commissions and agencies could be used as a basis for systematically and fairly distributing the funds.

STATEMENT OF THE PROBLEM

The approach introduced by VHTRC in 1976 focuses on submission of the subelement plan by the commissions and agencies. The information on a particular program area to be presented to the commissions and agencies must be gathered routinely from the various state agencies directly involved. For instance, the information presented to the local commissions concerning the driver-education programs in their localities is obtained from the Driver Education Services of the State Department of Education. Because most of the needed data are not computerized, the information must be obtained manually. As one can imagine, this task is formidable. The data must be manually gathered from each state agency in whatever format they are available, be rearranged in the format required for the problem-identification statement, and be compiled in information packets to be sent to each commission and state agency.

To provide a solution to this problem, a study was undertaken to investigate automation of the compilation and dissemination stages for the problem-identification data needed in the commonwealth's AHSWP and, if deemed appropriate, to prescribe a viable method for accomplishing such automation.

An overview of the processes used in collecting the information needed in the problem-identification statements and supplying it to the local commissions showed that different costs, efforts, and skills were associated with the different standard areas in the AHSWP. These processes are described in the following discussion.

Retrieval of Information

Depending on what standard area and what state agency or agencies were involved, the methods of retrieving information varied. Three general methods were used. One of these was used to gather the information processed by computer and available on either computer printouts or computer tapes. The Division of Motor Vehicles (DMV) and the state police were the only two agencies that supplied computerized information.

A second method of retrieval involved traveling to those state agencies that had stored in their files information related to their particular highway-safety program areas. The standard areas involved were driver education and emergency medical services. The information to be retrieved was determined by prescreening the data bank and then visiting an agency to extract the raw data from the files and record them on prepared forms. This task took several days. This noncomputerized information is manually updated and filed periodically.

The last method employed various activities fashioned to fit the situation. Some information, such as that for pupil transportation, is available on request from the agencies involved. Other information, such as that for debris, hazard control, and cleanup, is not under the auspices of any particular agency and therefore is difficult to obtain. This last type of information is also referred to as noncomputerized information.

Assimilation of Information

Once the information has been retrieved, it is compiled, processed, and recorded in rough-draft form. For this process, which is the most time-consuming activity in the entire system, two general methods are used. One is used for computerized information, available in the form of printouts or computer tapes. The data on printouts must be manually processed; however, for the data on computer tapes, a computer program can be written for automatic processing into the format desired. During the past year, a program was written that automatically processed about 90 percent of the accident data received from the Department of State Police. The information from DMV was processed manually from computer printouts.

The second method of assimilating information is the manual processing of noncomputerized information available from agencies or bureaus that do not store or process the information on computers. The data are available in a wide array of written formats, ranging from an agency's complete annual report to sheets of raw data. This information is manually translated into the desired format.

Dissemination of Information

The final process in supplying information to the local highway-safety commissions is printing or typing it into final form and reproducing it. If this process is done manually, the information is typed in final form for reproduction on a copying machine. If the process is automated, the information can be manually typed into a data file and then automatically typed in the final format with as many copies as required.

AUTOMATED APPROACH TO PREPARING AHSWP

Although complete automation of the Virginia AHSWP is not possible at this time, the initial stages of automation should be developed. Even in the absence of computerized information, it would seem that a format program could be developed to type out a data page of the information packet. The data could be retrieved as usual but then keypunched into the format program. Thus, a completed work-program information package could be obtained without the cumbersome dissemination stage.

The development of a format program would (a) allow data to be keypunched and stored in the computer as they are retrieved throughout the year (thereby avoiding the bottleneck that develops during the final stages of preparing the program) and (b) permit information to be stored by year (thereby creating a useful data base and enabling a comparison of the work programs for successive years).

Although a completely automated AHSWP is impossible at present, completely automated standard areas would be possible where computerized information is available. These areas will be noted in the ensuing discussion.

General Information

The first data sheet in the work program's information package contains general data ranging from population figures to crash statistics. The diverse sources of data for this sheet make it useful in illustrating the gamut of processes that can be performed in advance of complete automation.

Noncomputerized information for this data page includes the following:

1. Population: These data come from a brochure prepared by the University of Virginia's Tayloe Murphy Institute. The data change annually and therefore would require annual keypunch additions to the format program. It is unlikely that computerized information on these statistics will become available in the near future.
2. Number of licensed drivers and registered vehicles: DMV provides computer printouts containing this

information. At present, this information would have to be keypunched annually; however, it has been recommended that the source tapes be furnished to VHTRC. Once this computerized information has been received by the council, these two sources could be completely automated. Progress could be made in this area in the near future.

3. Road miles: This information is gathered from Mileage Tables, a publication of the Virginia Department of Highways and Transportation (VDHT). The road mileage for some localities could change annually and therefore require additional keypunching by VHTRC. In other instances the data will be unchanged and the previous year's data could be recalled and used for current needs so as to make further keypunching unnecessary.

Computerized information is only available for crash data. These data are illustrative of an area in which complete automation would be possible. At present, VHTRC receives crash data in computerized form. A program has been written to extract the data required for the work program. In the absence of complete automation, this printout would be the source for keypunching changes to the format program. Pervasive changes would be required annually. However, complete automation could be achieved if a program were written to interface with the present program for extracting the data from the tape and the format program. This complete automation should be accomplished in the near future by VHTRC.

Motorcycle Safety

Noncomputerized information in this area is only available for training data. These data have been difficult to obtain because of the absence of a state agency that focuses directly on motorcycle education programs. The data that are made available, however, come from driver education files, which makes complete automation in the future extremely improbable. However, as will be seen in various other standard areas, this information changes only slightly, thus making format programming quite significant. If no new information is obtained, the previous year's information, which has been stored in the computer's memory, could be recalled and printed on the appropriate line for current needs. No manual process would be involved.

Assuming no changes in the training data section and the complete automation of the crash data section, these data could be furnished without manual effort.

Computerized information, again, was only available for motorcycle crash data. This section parallels the crash data section on the general information sheet. At present, the computerized information is converted into a printout from which the appropriate data are collected. These data could be keypunched into the format program. However, this section should be completely automated in the near future.

Driver Education

The data source for this standard area must be drastically changed before complete automation can occur. The data are from the driver education files, from which they are manually compiled into the AHSWP format. The information thus gathered would have to be keypunched into the format program. Extensive keypunching would be required annually.

Codes and Laws

This locally gathered information, although not computerized, rarely changes. Once keypunched into the program, the data would not need much updating from year to year. Since computer recall would suffice, manual labor would be eliminated.

Traffic Courts

These data are now received from DMV in computer-printout form. The printouts list convictions by court jurisdiction and by violation number. The various violation numbers, which correspond to the general types of violations involved, must be compiled and added to the work sheets. The data must then be transferred from the work sheets to forms that reflect the work-program format. In essence, there is a deficiency in each of the general stages: retrieval, assimilation, and dissemination. Systematic improvement in each stage could be readily achieved, however.

First, by using the format program, the data could be keypunched directly from the work sheets into the program, which would significantly improve the dissemination stage.

Second, if VHTRC could obtain the source tapes rather than computer printouts, the standard area could be completely automated. This automation would be a two-step process. A program would have to be written to extract the data required for the work program. Note that this would require a subprogram to compile and add those violation numbers that correspond to the types of violations involved. Once this program has been written, it could be interfaced with the format program. In summary, the computer could extract the appropriate data from the source tape, assimilate the data to correspond to the prescribed violation types, and print out a completed form. Thus, complete automation for the standard area would be achieved.

Alcohol in Relation to Highway Safety

In this area, the noncomputerized information consists of breath-test data, the automation of which will remain a burdensome process. The data are now sent to VHTRC by Consolidated Laboratories in the form of brochures and will not be computerized in the near future. Thus, the data would have to be keypunched into the format program at VHTRC. Annual changes would be extensive.

Under the category of computerized information, the only data are those on crashes. Crash data for this section differ from those described for other areas in that the data are presented as percentages, not straight figures. This difference would require a program to be written to perform the mathematical computations once the information was extracted from the crash tapes but before it was fed into the format program.

If this stage could not be computerized, the process would be considerably lengthened. These crash data also differ in that they are derived from a separate printout prepared for the Virginia Alcohol Safety Action Program (VASAP). Presumably this printout would still be generated even if the general AHSWP crash-data printout were discontinued when complete automation of those data was achieved. If so, the manual computations would not be more expensive or burdensome than under the present system. However, if the VASAP printout were discontinued, the absence of a computer program for performing mathematical computations would require a separate printout of these data so that the computations could be manually performed. This extra step would be a waste of time. Therefore, a program should be written to extract the appropriate data from the source tape and to perform the necessary calculations; this program should then be interfaced with the format program.

Identification and Surveillance of Accident Locations; Highway Design, Construction, and Maintenance; Traffic Engineering Services

The data for these three standard areas all follow the same pattern. For all counties except Henrico and Arlington, the data are treated similarly, since they are under the control of VDHT. Moreover, the data rarely change. For all cities, plus the counties of Henrico and Arlington, the data are

unique to each location, but here again the data rarely change. The changes that do appear are made by each local commission. The likely continuity in these areas would mean that they would benefit particularly from the format program.

Traffic Records; Debris, Hazard Control, and Cleanup

Like that for the previous three standard areas, the information for these two rarely changes, making them particularly amenable to format programming. However, these areas are not controlled by any one state agency. Thus, any changes made could come from a number of state agencies as well as from various county and city commissions. The likelihood that these areas will be completely automated is very slight.

Emergency Medical Services

This standard area does not lend itself to extensive automation. The data source is noncomputerized information, the data change extensively each year, and the source data will not be computerized in the near future. The changes would require annual keypunching.

Pedestrian Safety

As was the case for crash data from other areas, this standard area would immediately benefit from increased automation. The data source is computerized information, and no calculations would be necessary. Thus, complete automation could be achieved by interfacing a retrieval program with a format program.

Police Traffic Services

Only noncomputerized information is available in this area. Program data and system-operations information cannot be gathered from one state agency; instead, it must be updated by the local commissions. This indicates that it is unlikely that computerized information will be forthcoming. This standard area would benefit from the format program, however, because annual changes would be minimal.

Traffic-summons data are not now computerized. The data, received in computer-printout form, would have to be keypunched annually. However, if the source tapes for the data could be obtained from DMV, complete automation of this standard area could be achieved.

Pupil Transportation Safety

School-bus operations are considered noncomputerized information. These data are received in brochure form from Pupil Transportation Services. The extensive changes in these noncomputerized data would have to be keypunched annually. Complete automation of this area in the near future is unlikely.

As with other types of crash data, those from this area would be easily automated.

Accident Investigation and Reporting

Data for this standard area undergo extensive annual changes. For this reason, complete automation should be attempted. At present, the data are in the form of computer printouts. If the source tapes can be obtained, complete automation would be possible in the near future.

SUMMARY

The prior discussion has revealed that the information for various standard areas or portions thereof could at present benefit from automation. The areas are as follows:

1. Areas in which computerized information is currently available and that should be completely automated in the near future:
   a. General information—crash data
   b. Motorcycle safety—crash data
   c. Alcohol in relation to highway safety—crash data (assimilation stage would require computerization)
   d. Pedestrian safety
   e. Pupil transportation safety—crash data
2. Areas in which computerized information is not available but in which complete automation might be achieved in the near future:
   a. General information—licensed drivers and registered vehicles
   b. Traffic courts
   c. Police traffic services—traffic summons data
3. Areas that are substantially the same each year and thus would particularly benefit from partial automation:
   a. Motorcycle safety—training data
   b. Codes and laws
   c. Identification and surveillance of accident locations
   d. Highway design, construction, and maintenance
   e. Traffic engineering services
   f. Traffic records
   g. Debris, hazard control, and cleanup
   h. Police traffic services—program data and systems operation
4. Problem areas that will not be completely automated in the near future and that would require extensive annual changes:
   a. General information—population and road miles
   b. Driver education
   c. Alcohol in relation to highway safety—breath-test data
   d. Emergency medical services
   e. Pupil transportation safety—school-bus operations

CONCLUSIONS

The time and manpower needs for handling the problem-identification data in the compilation and dissemination stages of the work-program information packet are immense. Therefore, it is essential that an ongoing program be initiated to achieve complete automation of these stages and, if possible, the remaining planning components of the highway-safety plan. This program would ensure optimum use of personnel in preparing the work program and would foster the level of validity and the reliability of and accessibility to data necessary for sound program management.

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