

Administration of Highway Transportation Functions: Status and Research Needs — A Symposium

I. Provision of Service and Status of Management Study

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• DEVELOPMENT of highway transportation by motor vehicle may be said to have taken place by parts— with respect to its physical elements, with respect to attention to its development, and with respect to policy concerning it. Developmental efforts, promotional attitudes, and fostering policies focused now on one component and now on another, of the highway transportation system as it evolved to its present status.

These changing emphases were probably brought about, at various times, as much by recognition of lagging development of one component as by substantial advances in the technology of some other. And probably, at least in part, because of this historical pattern of priority attention to separate parts of the highway transportation system relatively little consideration has been given to overall performance of the system as a whole. In fact, although spoken of glibly as the "highway transportation system," reference still is largely to a mere aggregation of components, rather than to something unified by coherent management and coordinated operational policies. It might be added, also, that the preponderance of research effort in the field of highway transportation has been a history of attention to separate elements, rather than to a composite functioning system.

Because of the magnitude of the overall transportation service now provided by highway motor vehicles, and because of the impact of this activity on the economy, on the social structure, and on the other modes of transportation, it seems pertinent to improve the concepts of a working highway transportation

system. At the same time, it is becoming important to attain increased appreciation and understanding of the complex of administrative processes which add up to the provision of highway transportation service, in order that consistent and well-moderated policy be evolved. Also, because of renewed interest in a general re-examination of national transportation policy on the one hand, and urban transportation policy on the other, it appears timely to look at highway transportation in some perspective.

This over-all view is also especially desirable from a research standpoint as a step toward discerning and appraising gaps in information and blanks in understanding concerning this transport activity.

Ultimately, to optimize service and costs some kind of analytic scheme for examining the performance of the over-all system will have to be evolved and accepted. Some of the tools by which such an analysis can be made are becoming available, but the parameters and the interrelationships of the variables must be identified and established. This in itself is an area of potential research which has great promise.

During the past two decades, important contributions (1, 2) have been made to a composite picture of highway transportation from the viewpoint of the economist. The emerging situation makes it desirable, however, to extend these concepts to the formulation of a "verbal model" (3), from the viewpoint of overall administration of highway transportation functions, and finally to attempt the formulation of analytic models (4)

to aid in comprehensive transportation planning.

The purpose of this brief symposium is to bring together, in a preliminary way, some thoughts and considerations relating to the administration of highway transportation functions. This part offers a thumbnail sketch of administrative features of highway transportation activities and some notes on the status of study of management of highway agencies. Part II discusses the problem of administration of functions which affect motor vehicles and operators. Part III considers the operational aspects of the highway system.

FEATURES OF A HIGHWAY TRANSPORTATION SYSTEM

The end product of any transportation system is the provision of service for which there is need and demand. Three major and characteristic elements of a transportation system combine to affect the cost and quality of the ultimate service provided as follows:

1. Provision of the fixed plant and the maintenance thereof. (The fixed plant includes the traveled ways and accessories thereto, and terminal facilities.)

2. Provision of rolling stock and the servicing and maintenance thereof.

3. Provision for operations, which includes:

- (a) Selection and control of operators (drivers).
- (b) Selection and control of vehicles.
- (c) Devising an operational scheme for the system as a whole and the control of movement thereon.

In an idealized and self-contained system, prudent management would be expected to seek to optimize the service for which there is effective demand while minimizing the cost by maintaining an appropriate balance of plant, rolling stock, and level of operation.

In the United States, however, the elements of the "system" through which highway transportation service is fur-

nished are not provided by a single management, but are developed and made available in separate ways. Some agencies of government provide roads. Both governmental and private agencies provide terminal facilities. The rolling stock is acquired and operated by millions of separate operators, the majority of them being individuals and business firms. The operators have an appreciable range of choice with respect to operating characteristics and operating costs of vehicles. The operational scheme is quite flexible with respect to routes and schedules, but is conditioned by operating rules (driver licensing, vehicle size and weight limits, safety rules, traffic laws, etc.) imposed and enforced by a variety of governmental agencies.

Because the highway plant and its operational features are provided through the agencies of government, and because the charges for plant and its operation are paid for separately in the form of taxes to government (and also, coincidentally, possibly because a large fraction of the total cost of highway transportation service is made up of vehicle and operating costs, the annual cost of the highway plant and its operational features being only about 10 percent of the total annual cost), one "verbal model" that may be constructed is that the highway user as a free agent-consumer purchases "highway service" comprising use of the plant and its operational features.

It happens, however, that the practices relating to the development, maintenance and operation of the highway system, and the policies relating to the charges made for the highway service, have a complex interrelationship with the nature and quality of the ultimate transportation. Vehicle operating costs and total transportation costs are influenced in various ways by the characteristics of the fixed plant and its operating rules. Operating conditions (such as travel time, accident exposure, convenience, amenities), hence the actions of users, are affected by the nature of the plant at any given time. Additionally, over-all regulatory conditions, some of which are

not directly related to the operation of the highway system *per se*, are imposed through the actions of government. And conditions arising from economic factors can have strong influence on the plant, vehicle usage, and system operation. The concept of merely providing the service of the physical highway plant has limited value in attempting to estimate the performance and impact of highway transportation service.

In a broad sense, the processes by which highway transportation affairs are administered may be said to include establishment of public policy and imposition of a range of operational controls, as well as provision of facilities, procedures and devices through which the highway services are afforded.

OVER-ALL PATTERN OF ADMINISTRATION

It is obvious, of course, that in the administration of highway transportation affairs much more is involved than is involved in the management of a transportation system by a single organization. In the conduct of affairs resulting in provision of highway transportation service, there are included actions by the three branches of government (legislative, executive, judicial) at the several jurisdictional levels of government (federal, state, local), and there are included a variety of responses, decisions and actions in the private sector of the economy.

In the scheme of things that has evolved, although the general public, the vehicle producers, the highway users, and other interested parties can and do influence the conduct of highway transportation affairs at various points, provision of highway plant and control of its operation is predominantly a function of government. Although, as mentioned previously, cost of the plant and its operation is a relatively small fraction of the total transportation cost, the part played by government in performing its role is an extremely crucial one and is a key factor in the scheme of administering highway transportation affairs. Thus, discussion in this symposium

confines attention principally to the role of government.

Three broad functions involved in the administrative process are development and expression of policy, establishment of objectives, plans and management organizations to carry out the policy, and production of plant, goods and services in accordance with the objectives and plans. These have been characterized as the directorship function, the general management function, and the operational management function. The exercise of these functions is usually not sharply and uniquely confined to separate agents of the administrative complex; it is possible, for example, to discern levels or orders of policy making, the development of which may be largely centered in, but not confined to, a given level of administrative action.

Policy Expression and Guidance

Modes of expressing policy may be by law (constitutional law, statutory law, judicial interpretation), by formal declarations of policy intent (resolutions of legislative bodies, commissions, boards), by administrative directives and regulations, or by adoption of standards of practice. Because the levels and methods of highway financing have an impact on costs and demand for services, the pattern of finance is a potent policy instrument.

In general, the main features of policy in highway affairs are laid down by legislative action (in their respective jurisdictions by Congress, by state legislatures, or by boards of supervisors, commissioners or councilmen). Actions taken at one government level may become policy conditions for administration at another level (for example, Congressional acts, the judicial interpretations and the administrative extensions thereof, may provide guidelines for, as well as limitations on, actions by the states). Conversely, the simple failure of one government level to act may induce another to take actions which establish a new direction of policy (for example, the slowness, in some respects, of state governments to

give recognition to urban problems has resulted in a growing activity on the part of the Federal Government relating to problems of the municipalities.) Further, interpretations by the courts of previously unsettled points of common law (as opposed to statute law) may result in a shift in policy (for example, the evolution within the past two or three decades of policies concerning highway access control).

Within the scope of authority delegated by a legislative body, a board or commission may have policy-making functions; for example, certain policy-influencing responsibilities (such as budgeting or route adoptions) are delegated to some state highway commissions. And within the scope of broader policy established by legislation and by declaration of a policy-making commission, the executive officers and the line supervisors in the operating organization (say a highway agency or motor vehicle department) adopt various standards by which to control their product or their operations.

Aspects of Highway Policy

Certain broad aspects of public policy bearing on highways may be identified at this point. These are development policy, operational policy, and regulatory policy.

Most highway personnel are familiar with the features of highway developmental policy in the United States. It is only necessary to recall, as examples, the attitude of the Federal Government concerning the use of Federal aid for highways, the assumption by the states of prime responsibility for major highway construction and maintenance, and the evolution of systems of state-collected highway-user taxes closely associated with highway expenditures, as expressions of policy that have had profound influence on highway development.

Although a body of operational policy may be said to exist, to an extent it exists more as an accumulation of rather diverse practices than as a coordinated and premeditated expression of guidelines for system operation.

Prime responsibility for control of highway use and motor vehicle operations rests with the states, and the authority here hinges largely on exercise of the police power. Involved are public safety, efficient use of facilities, and, to an extent, the enforcement of tax collections. All states have evolved working laws and regulations concerning vehicle registration, operator licensing, rules-of-road operations, and other traffic and safety regulations. (Because of involvement of several jurisdictions, certain types of safety regulations are established and enforced by the Federal Government on vehicles in interstate commerce.) The pattern of administration of these motor vehicle operation control functions varies considerably among the states. In many states separate motor vehicle departments handle a number of the functions. In most states law enforcement on state highways is generally handled by a policing agency primarily concerned with on-the-road operations. In other cases some of the various operational activities and controls may be scattered, sometimes turning up in the highway department, the finance or tax department, a public service commission, the office of Secretary of State, or even in certain offices of local government.

Some measure of national uniformity has been achieved concerning traffic operation and regulation through the promulgation of a model "Uniform Vehicle Code," prepared by the National Committee on Uniform Traffic Laws and Ordinances through the cooperative efforts of public and private agencies of local, state, and national origin. Most legislatures have incorporated substantial parts of the code into statute law.

Local governmental units, under grants of power from their state legislatures, also generally impose and enforce operational controls within their jurisdictions. Operational policy among the municipalities tends to be more varied than that among the states, although efforts such as the composing of a "Model Traffic Ordinance," also prepared by the National Committee on Uniform Traffic

Laws and Ordinances, are having beneficial effect.

In view of the rather highly disparate state of policy and management of motor vehicle control functions, this should be a fruitful area of study and research. It will be discussed in more detail in two later papers in this symposium.

The third major aspect of policy, which is a part of the administration of highway transportation affairs in the broad sense, concerns general regulation of transportation. At the federal level, under the "commerce clause" of the Constitution of the United States, by authority delegated by the Congress, the Interstate Commerce Commission regulates certain commercial motor carriers engaged in interstate commerce. These regulations pertain primarily to economic matters, such as the granting of permission to carriers to operate, and to the prescribing of rates and routes. However, the Commission also imposes and enforces regulations on certain carriers in the interest of safety of vehicle operations.

Most states, through Public Utility Commissions or the equivalent, exercise similar regulatory controls over certain for-hire carriers operating wholly within a state. Among the local government units, certain practices can be discerned which may be considered to be regulatory, some imposed for purposes not necessarily directly connected with the functioning of the highway system. For example, special taxes may be imposed not related to the support of the local highway system or its operation. Or special routings may be prescribed, such as special truck routes to prevent the annoyance of heavy trucks in residential areas. Also to be noted are the requirements set up for street layout in subdivision developments with intent to promote amenable land use.

Many of these regulatory policies may be recognized as having objectives other than optimizing highway transportation *per se*, yet they often have a bearing on the task of providing highway transportation service.

The subject of regulation in trans-

portation as it applies to commercial carriers has received much attention by transportation economists; numerous treatises are available. However, a studious review of regulatory policies and practices at all levels of government concerning highway motor transport, with a view to estimating the interaction of regulatory practices and other phases of highway operation and development, would be helpful. One recent effort along this line is a study (5) of the influence of proprietary trucking on minimum rate policy in California.

Establishment of Objectives and Plans

Insofar as the development of agencies to plan, construct and maintain the physical road plant is concerned, practical organizations have evolved at each level of government. The status of studies of highway agencies will be considered later.

As mentioned earlier, owing probably to the fact that the attention to motor vehicle control and operating functions evolved under political and administrative conditions peculiar to each state, policy and practice concerning the administration of such functions has a varied pattern. Some states have well-organized and well-managed motor vehicle departments, even though all do not have the range of related functions under their purview. Forward-looking motor vehicle administrators are aware of the needs to study management problems, as will be discussed in Part II.

In the area of traffic operations and control, much has been learned in recent years concerning the management of these functions, as will be discussed in Part III. A remaining problem appears to be the development of sufficient appreciation, on the part of policy makers, of the role of these functions in the administrative setting, particularly in local jurisdictions.

An over-all problem relative to these phases of administration is that of achieving, among departments dealing with different phases of highway transportation, consonance of objectives and

coordination of plans and activities which affect the same highway systems. It may again be observed in passing, however, that broader appreciation and understanding of the nature of the provision and over-all administration of highway transportation could contribute much to coordinated conduct of the several management components.

It can be noted with interest and satisfaction that top management in governmental agencies concerned with highway transportation appears to be giving increasing attention to administrative functions and techniques. And it can be expected that this tendency will be increasingly reflected in clear recognition of organizational objectives and in refinement of the advance planning process as it concerns both organizational effort and performance of technical functions.

Intergovernmental Relations

The provision of highway transportation service in the United States involves a division of responsibility in both administration and financing among governmental levels and jurisdictions. But no clear-cut and logically-based division of responsibility has evolved. Further, in the provision of highway transportation service, responsibility for administration and financing are not necessarily concomitant. Thus, an appreciation of the role of each level and unit of government is important, not only to an understanding of how the highway transportation system functions, but also to the fostering of workable intergovernmental relations.

An essential feature in the division of responsibility with respect to the provision of the road plant is road classification. Generally speaking, the tendency has been for the states to have responsibility for the main routes on which there is appreciable intercommunity movement, and for local governmental units to have responsibility primarily for roads and streets whose function is predominantly land service. Except for roads on federal lands, the interest and responsibility of the Federal Government has

been in select portions of the state and local systems through a financial aid program, and does not involve direct responsibility for construction or operation.

The background, nature and difficulties of road-system classification are well enough known so that mention will be made of only one feature which has become of increasing interest and significance. It is generally recognized that the establishment or improvement of roads, especially the trunkline routes, can affect both community land use and the operations on other roads within some zone of influence. As highway agencies have developed improved techniques of advance and long-range planning, it has become increasingly practicable for, say, the state highway agency to coordinate its plans for system development with local community plans, if such have been developed. This practice appears to offer attractive possibilities for minimizing jurisdictional conflict and is an important step in developing good intergovernmental relations of one sort, at least.

With respect to responsibility for highway operations and traffic control, the pattern is less clear and more varied than that for construction.

This whole field of intergovernmental relations in highway transportation has many features which are worthy of intensive study. Should anyone dream of achieving fully-coordinated highway transportation administration, he will find that some knotty problems in the realm of intergovernmental relations are important objects for attention.

POLITICAL ASPECTS OF PROVISION OF HIGHWAY TRANSPORTATION SERVICE

It is nowise derogatory to emphasize that basic objectives, fiscal policies, and at least the broad outlines of management of highway and operational affairs are established through political processes, and will so continue. These processes are, in fact, an important element of the broad concept of the administration of highway transportation service.

Whereas the processes for provision of plant and services, and the financing

practices that have been evolved, have greatly lessened the tendency for political influence and "pork-barrel" tactics to have important impact on the general course of development, those concerned with the top management phases of highway transportation affairs will wisely recognize that policy and direction do evolve in a political atmosphere. This very fact, however, establishes one of the significant challenges in administration in this field of endeavor. It is an important function of management to so advise and explain to the policy-making agency concerning the nature and effects of proposed courses of action that enlightened decisions can be made. Granted that opposing pressures usually exist, and decisions unwise for the general benefit are and will sometimes be made, clear proposals, skillfully-handled, and understood, and known to be justified by the public interest, can greatly enhance the chances for equitable decision.

This ever-present environment, a feature of the democratic process, places a premium on the planning function of management and on research and analysis to support it.

SUMMARY AND CONCLUSION

In an attempt to focus thought and attention on the broad considerations in the provision of highway transportation service, and to stimulate interest in problems associated with the over-all administration of affairs related thereto, the status of several aspects of highway transportation administration has been reviewed in this introductory statement.

Of necessity the treatment has been selective and brief, and attention has been given mainly to the functions of government agencies in highway transportation matters. Discussion of the important role played by the private sector of the economy in the ultimate production of transportation service has been omitted, as has consideration of the role of other modes of transportation, which modes affect and are affected by highway transport.

The purpose of this statement has been

to provide a setting for the subsequent discussions of particular phases of the administration of transportation functions, although the opportunity has been taken to point out some needed, and possibly fruitful, areas for research and study in this field.

STATUS OF MANAGEMENT STUDY

In these notes attention is given to the management aspects of providing for highway plant, an area of activity sometimes thought of as the whole of highway administration. But without belaboring the use of words, it should be clear that the subject to be considered relates to how agencies whose basic responsibility is to plan, design, construct and maintain roads are organized and their affairs are managed.

Considerable general knowledge exists concerning the principles and techniques of organization and management, developed from experience and study in the areas both of business administration and public administration. (Some of the results of more recent study in the field now designated as management science may have pertinence to highway agency management, and those concerned should be aware of developments in this field. See, for example, *Management Science*, the periodical publication of the Institute of Management Sciences, which presents papers and reviews books of interest to that field.)

In most state highway agencies and in the road departments of many local governmental jurisdictions, one or another of the common patterns of organization is discerned, and accepted general principles and techniques of management practice are employed. Differences between agencies, or disagreement as to the effectiveness of practices of particular agencies, usually occur with respect to details. Where serious crises have occurred, or allegations are made of grossly ineffective conduct of affairs, common potential sources of difficulty may lie in personnel management policies and practices, in the failure of the organization to adapt to new situations and technical

practices, or sometimes simply in poor public relations owing to failure or unwillingness to create adequate external understanding of the functions and performance of the organization.

In some local jurisdictions, especially in cities where activities pertaining to streets and motor vehicle operations are scattered through a variety of municipal departments (such as the public works bureau, the city engineer's office, the departments of streets and sewers, and the police department), the conduct of highway transportation affairs may be (although is not necessarily) something less than coordinated and effective.

Actually, considerable effort has been expended in study of highway agencies. Numerous management studies, either internally or by management consultants, have been made of individual highway agencies. Over the past decade, the Highway Research Board Committee on Highway Organization has sponsored several studies of various features of state highway management, such as of the forms and characteristics of top management organization, and of various personnel practices. In recent years this committee has sponsored a number of studies of local rural road management.

It has been characteristic of studies of the form and nature of highway management that they are descriptive, rather than analytical. In specific agency studies, where recommendations are made for change they rest on value judgments of the pertinence of proposed changes, although the accumulated results of observation and experience may provide reasonable guides for identification of organizational defects and estimation of probable effectiveness of proposed changes.

Probably one of the most effective immediate measures that can be applied to enhance the organizational functioning is a program of in-service training of the members of the agency in management duties and concepts appropriate to the level of management responsibility held by the individual. It is of interest to note a marked increase in interest in management and supervisory training by highway agencies in recent years. Some excellent training programs have been instituted.

It seems clear that there may exist many variations in the details of organization and of management practices, yet informed judgment indicates that equivalent quality of general performance and productivity are possible. Some way of measuring or rating pertinent variables in the operation of organizations appears to be a necessary prelude to more analytical study of management systems. Probably one of the most important needs is the development of measures of effectiveness for performance and output of highway agencies.

REFERENCES

1. DEARING, C. L., "American Highway Policy." The Brookings Inst., Washington, D. C. (1941).
2. OWEN, W., "Automotive Transportation." The Brookings Inst., Washington, D. C. (1949).
3. BROS, I. D. J., "Design for Decision." Chap. 10. Macmillan, New York (1953).
4. GOODE, H. H., AND MACHOL, R. E., "System Engineering." Chap. 10. McGraw-Hill, New York (1957).
5. DODGE, W. H., AND CARLL, R. R. *Vanderbilt Law Rev.*, 11:4, 1109 (Oct. 1958).

II. Motor Vehicle Administrative Functions

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• ALTHOUGH ASSIGNMENT of responsibility and authority having to do with highway transportation areas concerned primarily with safety of traffic movement varies state by state, the functions with which the motor vehicle administrator is concerned generally include driver licensing, vehicle registration and certificate of title, accident records, administration of the financial responsibility law, and, in some states, vehicle inspection. In a few states (the author's, for example) the highway patrol, which is the traffic law enforcement agency, is directed by the motor vehicle administrator.

The driver licensing process in every state grants the privilege of driving to those persons who, by examination, demonstrate their ability to drive safely. They retain that privilege as long as their driving record shows they are worthy. Those who cause trouble may have their licenses suspended for a period, or revoked, according to provisions of the law. Rehabilitation of problem drivers through a driver improvement process is part of a good driver licensing program.

Registration of the vehicle with the state, which then issues numbered plates to be attached in prescribed manner to the vehicle itself, is to provide evidence the tax is paid, and for purposes of identification of the vehicle and its owner to aid enforcement, to help fix responsibility in case of accident, and to serve as a tool of justice and public protection in a variety of other ways.

A certificate of title, issued to the vehicle owner and recorded in the state's motor vehicle department, is a deterrent to motor theft and aids in recovery of stolen vehicles. It is a protection, not only for the owner, but also for the lien holder whose equity is duly noted on the certificate and in the central records, and generally serves to protect all per-

sons involved in sale and transfer of a new or used vehicle. This is important in view of the ever-increasing turnover in vehicle ownership and the growing number of time-payment contracts in motor vehicle buying.

A good centralized system of accident records is the heart of a well-rounded traffic accident prevention program. Complete reporting of facts, including whatever can be found out about causative factors, and thorough analysis of accident information, are essential if such information is to serve as a useful guide to accident prevention activities carried out by highway and traffic engineers, police and courts, driver licensing authorities and, in fact, any other state or local agency responsible in one way or another for safety and efficiency of traffic movement.

The financial responsibility law is not a safety measure primarily, but rather is an economic protection to the motorist public, in that it requires proof of the driver that he is covered by insurance or otherwise capable of satisfying possible judgment against him in the event of an accident.

These are the major functions, then, which most generally are assigned to the motor vehicle administrator. These functions, dealing as they do with human life, rights, and privileges, add up to one of the really big jobs in government today. The state motor vehicle administrators, collectively, are responsible for regulation and control of more than 68 million motor vehicles in the United States, and some 80 million drivers.

Some of these functions have been performed by the states for the past 50 years, especially in the east, where driver licensing and vehicle registration, for example, had an early start. The concepts and philosophies applying to these functions, however, have undergone great change over the years, as experience has

given better understanding of the part each function must play in carrying out the state's responsibilities to its people.

Since those early days, when states first began to recognize that the motor vehicle and its use constituted a proper concern of state government, the state agency assigned to administer the resultant laws has experienced, year by year, increasingly greater demands on its manpower, facilities, and over-all capacity to perform to expectations. There is no mystery about this, of course, for more vehicles, more drivers, greater annual travel mileages with accompanying accident exposure, and increasing numbers of accidents, all have multiplied many fold the job that state government originally set out to do.

This evolution has been a result of the expanding economy and the growth of the roads system. Development of roads has progressed from the early uncoordinated and locally managed programs of construction and maintenance to today's programs in which all planning, programming, and financing are on an orderly, long-range, and coordinated basis, founded on solid knowledge gained in factual surveys of need and resources.

Highway needs lend themselves to precise engineering measurement. Problems of design, construction, and even many phases of highway operations, can be met by use of the physical sciences and the special techniques and methods developed through research and study over the years.

Officials responsible for administration of motor vehicle affairs are just as much in need of guidance and assistance through research and study as are officials in the highway field. It is safe to say, however, that research and study in the highway field has far surpassed anything done so far in the areas of state responsibility bearing on use of the motor vehicle.

Perhaps one reason for lag of activity in this field is that so far there has not been any concerted and overwhelming surge of public demand for improvement in motor vehicle administration, such as has been experienced in the highway

program. This probably is because the state's problems of regulation and control of use are not nearly so evident to the people as their own everyday problem of trying to drive over inadequate facilities.

Motor vehicle administration lacks the precise standards that have been developed in the highway construction field. Much of the work, particularly driver licensing, deals with intangible values — with people and their myriad personalities, idiosyncrasies, capabilities, and other psycho-physical factors which must be considered in the varied make-up of people. One cannot design the perfect driver as an engineer can design highways to the highest standards known. Even if it were possible, one would not be sure of what pattern to use, for it is not known exactly what makes a good and safe driver and what characteristics to look for in a potentially bad and dangerous driver. There is no mathematical formula to apply.

With problems of motor vehicle regulation and control getting heavier and more complex as time goes along, it is becoming increasingly important that administrators of motor vehicle affairs have the benefit and guidance of all the factual knowledge it is possible to obtain in each of the functional areas of responsibility. The administrator needs this knowledge for refinement of policies and procedures. He needs to know everything he possibly can to advise the lawmakers intelligently in development and promulgation of laws under which he must perform his duties.

This is not meant to infer that motor vehicle personnel have been going along over the years completely blind and ignorant of what constitutes a reasonably adequate job of motor vehicle administration. From the rather fuzzy beginning years ago, when the state legislatures and the administrative officials were not quite sure what the job was and how best it might be done, there has evolved a definite idea of the nature and scope of the job. Over the years a number of research and study projects have served to upgrade the knowledge and effective-

ness of the administrator. The American Association of Motor Vehicle Administrators has been identified with many developments in this search for knowledge, and continues that interest and participation today.

More than 20 years ago the association, in cooperation with others, initiated several research projects which today still are serving a very useful purpose. The standards resulting from them have been revised periodically to keep them up to date.

The AAMVA, early in its existence, established a cooperative working relationship with the Automobile Manufacturers Association. In 1937, through a joint committee, AAMVA and AMA joined forces in research and development of the sealed-beam headlight. Since that time the two organizations have worked closely together on many matters involving improvements in headlighting, directional signals, braking equipment, etc. This type of activity, of course, is of direct interest and concern to the motor vehicle administrator, for many states must approve performance and use of automotive equipment and devices.

In 1958 the Governors' Conference, Council of State Governments, at its 50th Annual Meeting, adopted a resolution commending the AAMVA activity in this area, and asking that AAMVA act as the coordinating agency for the states in work with the automobile industry for improvement of automotive safety features.¹

The AAMVA responded that it was willing "to do any and all things necessary to carry out the purposes and objectives of the (Governors' Conference) resolution."²

Another early project was development of standards for administration of vehicle inspection laws. This work was done in cooperation with the American Standards Association, the then National Conservation Bureau,³ and other organi-

zations, including the vehicle manufacturers, and a "Motor Vehicle Inspection Manual" (1) was published in 1940 as a guide to states.

Another example of early cooperation in research was the work done in the late 1930's at Yale University's Institute of Human Relations in development of a driver manual (2) and procedures for driver license examination (3). These projects were undertaken under the general supervision of Mark S. May, who then headed the institute.

Through the work of this institute, it was possible also to establish for the first time minimum standards for driver examinations, which set the stage for subsequent follow-up study to give the recommended standards now published and advocated for all jurisdictions throughout the membership (4).

As a special refinement in the area of driver regulation and control, a study of the point system in driver improvement was completed in 1958 at the Institute of Government, University of North Carolina.

Another development in this same area is the research now being undertaken by staff of the Automotive Safety Foundation into driver license laws of the states. AAMVA is cooperating with the Foundation on this important project, which is expected to produce valuable guidance to the states in determination of essential elements of good driver licensing laws.

Space does not permit mention of all research and study projects in which the motor vehicle administrators, through their organization, have had a part. Just briefly, though, several others should be cited, such as development of the recommended vehicle registration form in cooperation with the Bureau of Public Roads; study and research on the driver (5) at Northwestern University's Traffic Institute; development of driver vision standards (7) in cooperation with the American Optometric Association; as well as the current study on the purpose and proper use and specifications for motor vehicle license plates being conducted at the University of Illinois.

It is pleasing to note the increasing ac-

¹ "Report of Committee on Highway Safety." Governors' Conference, Bal Harbour, Fla., May 18-21, 1958.

² Resolution adopted at 27th Annual Meeting, American Assn. of Motor Vehicle Administrators, San Francisco, Calif., Sept. 16-19, 1958.

³ Now the Accident Prevention Dept., Assn. of Casualty and Surety Companies, New York City.

tivity directed to problems of the driver and his behavior on the part of the U. S. Public Health Service and the National Institute of Mental Health. Motor vehicle administrators certainly can look forward to some very real contribution to knowledge from that direction in the near future.

The motor vehicle administrators think they have done a lot through the years with the knowledge and the tools at their command, but any one of them would be the first to declare that what has been done has not been all they would have liked to see accomplished.

The state motor vehicle departments have stepped up their proficiency greatly, especially in the use of electronic equipment and other mass-production aids for issuance of driver licenses, registration plates, etc. Technologically, great strides have been made. But the sheer bulk of the work load in all functional areas, in which budget, manpower and equipment have been hard put to keep pace with growth of responsibility, has so pressed administrative officials that they have had little time and opportunity to pause for review and evaluation of their operations in light of the job that should be done.

The administrators know their jobs, and are thoroughly familiar with the various problems in the areas of their responsibility, but not one of them would claim to know all he would like to know in the interest of better and more effective performance.

Useful and adequate yardsticks are available for the present, but one must begin now to look to the future. The knowledge gained so far through research and study, and through the hard school of experience, is not going to be sufficient to see motor vehicle administration through the more demanding years of the future, which already are here with start of the new and expanded federal-aid highway construction program.

The motor vehicle commissioners and other official organizations recognize the need for stepped-up research in the field of administration and enforcement of motor vehicle laws if the states are to

meet fully their obligations for safeguarding and facilitating use of the motor vehicle and the improved highway system.

The AAMVA, as well as the Executive Committee of the International Association of Chiefs of Police, in 1958 adopted resolutions calling for such research. The following, quoted from the AAMVA resolution, is similar in thought to the resolution adopted by the police chiefs:

Whereas, in recent years the Association, in cooperation with other agencies, has taken steps to study and evaluate certain aspects of driver licensing and its point system and vehicle registration, these efforts must now be materially stepped up in all motor vehicle functions to give substance and validity to projected needs of the future, and

Whereas, the appraisal of each function bearing on motor vehicle ownership and use . . . will require the special talents of students of government and other research specialists, now be it therefore resolved:

The Association members and headquarters staff be urged to accelerate their efforts to enlist the assistance of universities, colleges and other qualified research agencies in conducting appropriate research projects in the motor vehicle field.⁴

Each of the functional areas mentioned earlier is in urgent need of assistance through research and study of its essential elements to answer questions that so far have not been answered satisfactorily.

For example, in licensing, regulation and control of drivers, which deal with the human element of the motor vehicle traffic problem, there are many unanswered questions, each important to the job to be done.

How far can regulation and control be carried and still have the public's support? What techniques and methods are most effective in influencing people into proper driver behavior? What should be the minimum age for drivers, and at what age does a driver get so old he no longer can be considered safe? What qualifications should be required of a

⁴Resolution adopted by American Assn. of Motor Vehicle Administrators, 27th Annual Meeting, San Francisco, Calif., Sept. 16-19, 1958.

driver license examiner? Are the current examination standards good enough?

What are the relative deterrent values of short-term suspension of driver licenses *versus* the long-term suspension of 30 days or more? Should standards for testing drivers of special type vehicles (tractor-trailer, buses, etc.) be higher than for passenger cars? Should all drivers be required to pass tests in operation of the vehicle under emergency conditions?

These are only a few of the questions that could be asked. The people who are accustomed to dealing in various areas of research on the human being could come up with a lot more, and they have. For example, in February 1958 a number of scientists, representing several disciplines, met in conference in Williamsburg, Va., to develop fresh approaches to the problems of traffic safety research. This meeting, sponsored by the President's Committee for Traffic Safety, was financed by grants from the National Institute of Mental Health, the U.S. Bureau of Public Roads, the Alfred P. Sloan Foundation, and the Automotive Safety Foundation.

This meeting concerned itself with three topics: A system approach to traffic flow and driver behavior, the psychology of driver behavior, and the social context of the automobile, its use and regulation. Many questions, all vital to the administrator's job, were raised, and conclusions were drawn which supported strongly what is being said in this paper; namely, that a lot more research effort is needed in the field of motor vehicle and driver regulation and control (8).

Motor vehicle administrators are convinced that if they ever are going to deal more effectively with the problem of the human being as a driver — if they ever are going to reach the highest possible degree of adequacy and fairness in their administration of law — they must have more definite and conclusive information about the human factors involved.

How about vehicle registration and the certificate of title? Here one is dealing with tangibles and processes more mechanical than the subject just discussed.

But the time has come to put those two functions to the test of thorough study to see whether what has been done in the states is all that can be done to get the most benefit from laws which are known to be good and useful.

Is information gathered through the registration forms the type most needed? Is the information that is procured put to best use, or is it being used for only a fraction of its potential value? What agencies, government and private, could put that information to good use in the public interest? Is the entire registration process serving the people of the state in the way it should? Just how does it serve, what does it really do for the people?

What factors must be considered in regard to a certificate of title law? Is the law and its administration providing the service it should for the protection and convenience of the public? What, actually, are the uses to which a certificate of title is put? Can it be made more useful, and, if so, how?

Some of these questions apply generally to accident reporting and records keeping. How much accident information is necessary to guide accident prevention programs properly? What percentage of accidents should be investigated in depth to determine underlying causative factors, in light of cost and manpower requirements? What standards should be applied in analysis of accident information? Is this information being passed on in usable form to other agencies which can put it to use? How can the entire system be improved?

Take the matter of reciprocity between states in all matters involving interstate movement of motor vehicles and drivers. Administrators have been dealing with questions of reciprocity for years and have not yet come up with all the answers. For example, there is a wide variance in state laws and administrative policies governing reciprocity on the interstate movement of commercial vehicles, such as trucks and buses.

What factors, and how much weight should be given to each, in consideration of reciprocal agreements between

the states on interstate use of commercial vehicles? What is fair and equitable in each area of the problem? What are the economics of reciprocal agreement on interstate truck traffic, for example? Can a set of acceptable standards be developed as a guide to the states? Can this area of controversy be laid to rest by mutual agreement between the states?

In August 1958 the 85th Congress passed the Beamer Resolution by joint action giving consent of Congress to the several states to negotiate and enter into compacts for the purpose of promoting highway traffic safety (9). The motor vehicle commissioners will encourage state action in that direction. They believe that such joint action by the states can lay the groundwork for the mutual agreement they need in all areas involving reciprocity, as well as go a long way toward meeting many of their other administrative problems.

The questions posed, and many others just as important to the motor vehicle administrators and to the people of their states, who have a right to expect the best that state government can give them, are some of those for which it is necessary to look to research and study to provide the answers.

The state official does not have the time, the manpower, the money, or the qualifications to do the kind of research needed in those fields. The officials must look to the universities and colleges, and to other agencies of research and scien-

tific study, just as has been done in other fields, for help in arriving at a solid base of factual knowledge for laws bearing on motor vehicle ownership and use, and for the refinement and upgrading of administration of those laws, in the best interests of the public.

REFERENCES

1. "Motor Vehicle Inspection Manual." Am. Assn. of Motor Vehicle Admin. (1940).
2. "Driver Manual." Am. Assn. of Motor Vehicle Admin. (1940).
3. "Driver License Examination Procedure." Am. Assn. of Motor Vehicle Admin. (1939).
4. "Minimum Driver License Examination Standards." Am. Assn. of Motor Vehicle Admin. (1940).
5. "Driver Improvement—The Point System." Inst. of Govt., Univ. of N. Carolina (1958).
6. BAKER, J. S., "Driver Improvement Through Licensing Procedures." Am. Assn. of Motor Vehicle Admin. (1950).
7. "Manual on Driver's Vision Test." Am. Assn. of Motor Vehicle Admin. and Am. Optometric Assn. (1949).
8. "Special Report on the Williamsburg Conference." *Traffic Safety* (June 1958).
9. Public Law 85-684, 85th Congress, H. J. Res. 221 (Aug. 20, 1958).

III. Research Needs of Operational Functions

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• THE GIGANTIC road building program on which the United States is embarked carries with it a challenge to every governmental agency concerned with the use of motor vehicles on the new facilities now being constructed.

The construction and reconstruction being accomplished are on a planned and

orderly basis; the program is a long-range effort which looks to the future, when traffic demands will be far in excess of what they are today. As a result of the country-wide activity, the nation is well on its way to obtaining a street and highway plant which will meet the needs for years to come.

In view of this situation, it is high time that the states start directing greater attention to the problems of use, which are destined to grow more burdensome and become more complex as motor vehicle traffic increases. It follows that every governmental agency charged with safeguarding and facilitating traffic movement over the larger and better facilities is faced with increased responsibilities.

Those agencies are going to be hard pressed to keep pace with the stepped-up demands unless a new, far-reaching attack is made on the problem. The answer lies in the concept on which the current road building program is founded—the long-range, factual approach. That same approach can be adapted to produce effective regulation and control of motor vehicle use.

In such an adaptation, every state function bearing on motor vehicle ownership and use should be scrutinized to determine, first, what should be done, then how. Those two determinations should cover not only current deficiencies, but also projections to take care of future needs. Throughout the effort, paramount consideration should be given to the public interest.

Such a thorough, factual study would yield a blueprint for action over the years. A number of governmental functions are involved, including accident records, courts, driver education, driver licensing, financial responsibility, highway operations, public information, vehicle registration and titling, and state police or highway patrol.

Where does such a study begin? The starting point is with the legislature, because each of the functions is performed by an agency which receives its authority—and operating funds—from the legislature. If possible, the study should be sponsored and directed by the legislature or a legislative committee. When so constituted, the results of the study are initially available to the lawmaking body, which has the power to correct the deficiencies brought out by the survey.

The concept of long-range studies of motor vehicle needs has the endorsement of the American Association of Motor

Vehicle Administrators, the Executive Committee of the International Association of Chiefs of Police, the Western Interstate Committee on Highway Police Problems of the Council of State Governments, and the Institute of Traffic Engineers, and a pioneering study of this type is under way in Minnesota.

In each of the functional areas cited, there are many questions which the study should answer. Although many of these functions have direct bearing on safety and efficiency of highway use, only one function, highway operations, is used here as illustrative.

The highway operational function includes all those activities performed by a highway agency after a facility is completed and opened to traffic, the prime objective being, of course, to provide safe, convenient and economical traffic movement.

There are two broad approaches open to the highway agency in solving the difficulties of furnishing a climate that will achieve the desired objective. One is constructing new facilities that increase capacity and safety; the other is improving the operational characteristics of existing streets and highways. The latter is accomplished through administration of the operational function and is one of the most important tasks facing highway agencies today.

Unfortunately, provision of a new facility does not necessarily, in itself, guarantee safe, convenient transportation. The low accident rates on the turnpikes, for example, are not the inevitable result of their superior design alone; rather, they emerge from a combination of that design and a well-rounded operations program.

In addition to how well facilities are planned and designed, the economic benefits which they give highway users also depend on how well they are used. Furthermore, public acceptance of the highway system (and the agency that builds it) rests on the ability of each user to pursue his individual desires in a safe and convenient fashion, as long as those desires are reasonable. On that fact is built the axiom that the best guarantee

of safety, economy, and public acceptance is co-equal use of new construction and proper operation.

Operation of a highway system involves three fundamental steps, as follows:

1. Over-all observation of the system to keep track of what is going on, and the location of hazards and bottlenecks. In short, a running inventory in terms of safety and efficiency, commonly called system surveillance.

2. Studies of places on the system where safety and efficiency are below par.

3. Action, taking many forms, ranging from hazard warnings, improved directions, and minor physical betterments, to the extensive improvements of new construction. Regulation of access, right-of-way, parking, speed, and turns and movements, either permanent or variable, are important, oft-used actions. All of these are performed in some degree in the name of safety and efficiency on every highway system.

Important research needs exist in all of the steps. Some are being met now. By and large, current research is concentrated on techniques—the how of the various steps. But the administration of these activities asks not so much how, but why, by whom, where, and—critically important—what legal authority, money, and manpower is needed to do each job right. These are largely questions of policy, but that does not eliminate the desirability of facts upon which to base the answers.

The highway administrator in planning long-range programs of highway development uses studies of physical needs as an important tool. The studies measure existing and future needs on the basis of traffic forecasts and established standards of service. There is no comparable administrative guide for the money and manpower needed to operate the highway system, simply because standards of performance never have been agreed upon.

The current project of a special subcommittee of the Committee on Traffic

of the American Association of State Highway Officials serves to illustrate the kind of research which is needed. After preparing a “charter” for administration and organization of the operational functions in state highway departments, this subcommittee is devoting efforts to the first step mentioned earlier—surveillance—seeking answers to the following questions:

1. What is surveillance and why must it be done?

2. What standards of performance can be set?

3. Where should it be done?

4. Who should do it?

5. How much legal authority, manpower, and money are needed?

This is the sort of scrutiny to which all of the tasks of highway operations should be subjected. Only by so doing can the task be defined and some dimensions be put on present and future needs.

Fundamental to the administration of the operations job is the legal authority to regulate use of the transportation system; therefore, study of that aspect of the job is a prime necessity. Current operation is being carried out under a body of law which was designed for rural two-lane highways. It is no more appropriate to modern transportation systems than are the vehicles and roads for which it was written.

Nor should it be surprising that state motor vehicle codes are not uniform. All too often they have been based primarily on personal opinion (and, just as personal opinion makes horse races, it results in differences in law). Factual information is needed on such fundamental questions as the division of authority to regulate traffic among the state, cities, and counties on the several highway systems. In many states responsibility for that regulation has been delegated to a hodge-podge of local jurisdictions having neither real interest in the task nor qualified personnel to perform it. Motor vehicle laws must catch up with reality; but before they do, they will have to spring from a base of fact.

Mentioned frequently these days are

variable regulations that would be changed mechanically or electronically on the basis of continuous instantaneous measurement of traffic flow. Is such a scheme possible under present law? What would be the enforcement requirements in the downtown area of a major city, for example?

Certainly the know-how exists to do these things; several cities use instantaneous measurements of traffic flow to control traffic signal systems. The question now is whether speed, turns, one-way streets, reversible lanes, and the like, also could be so regulated. And if legal authority were available, what would it cost to do it?

Individual speed regulation for each traffic lane has also been mentioned. What enforcement requirements would result from use of this device? What legal authority would be required?

Another fertile subject for research is regulation of traffic on freeways. The proposal to close certain freeway entrances to traffic during peak hours is one which warrants a great deal of study. Feasibility is the first question to be resolved. What becomes of those who are denied access? Can they be offered comparable service off the freeway? What enforcement demands would result from such a program? What legal authority is needed and by whom would it be exercised? Can a city deny access to a state highway? Can the state deny access where the original freeway agreement granted it? How far can any agency go in denying access to a highway to one class or segment of the motoring public in the interest of another class or segment?

Then there is the question of additional service to the freeway-using public. Services which formerly were readily available at the roadside simply are not present on a freeway. Should they be? And if so, in what magnitude? Some of the services most frequently mentioned include telephone, repair or tow car, firefighting equipment, and ambulance.

What role should responsible highway agencies play in providing these services? Should they provide them all? How about regulating them and fixing rates? Will they be provided in proportion to the need by others?

Even the question of the motorist's needs for food, fuel, and lodging could be studied fruitfully. How far should the highway agency go in directing motorists to off-the-road services such as these? What about jurisdictions where roadside advertising is unlawful? Akin to this is the question of rest areas. How often should they be provided and what services should be available?

Many operational measures hinge on the driver, his ability, his desires, his knowledge of his task and laws governing him, how he accepts certain regulations, and how he interprets or reacts to certain situations, instructions or commands. One of the most vexing problems confronting the highway administrator is predicting the reaction of the motorist to some new measure or design feature.

It now appears that an important new tool for research and study can be developed which may answer many questions of this kind. That tool would be a simulator which would recreate the driving task in the laboratory where variables can be controlled. For research of all motor vehicle functions dealing with the driver the possibilities of such a device are virtually unlimited. Much research is needed before the simulator will become reality, although the University of California has made encouraging progress. A laboratory in which to conduct research is certainly one of the most urgent current needs.

In summary, the critical research needs, from the viewpoint of administration of the operational functions, hinge on the need for long-range programs to guide future decisions. These must be based on realistic performance standards and their development must recognize the interdependence of all motor vehicle functions which a state performs.