HIGHWAY RESEARCH
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COMMITTEE ACTIVITY
Committee on Highway Safety
Department of Traffic and Operations
Highway Research Board

# REPORT ON RESEARCH NEEDS

## Research Problem Statements

Contents



HIGHWAY RESEARCH BOARD
NATIONAL RESEARCH COUNCIL NATIONAL ACADEMY OF SCIENCES - NATIONAL ACADEMY OF ENGINEERING
2101 CONSTITUTION AVENUE, N.W. WASHINGTON, D.C. 20418

## INTRODUCTION

A state-of-the-art report is urgently needed to identify significant findings from safety researches. The Bureau of Public Roads took a direct step forward to this end in the fall of 1965 when it requested the Highway Research Board to undertake through an Advisory Committee on Traffic Safety Research the development of a strategy for a broadly based survey of the state-of-the-art in highway traffic safety research and the preparation of recommendations for a concomitant study of the major research needs.

This group met and generally agreed that there is a considerable body of traffic safety information that is neither widely known, available, or applied. This information is also fragmented and incomplete. One of the objectives set forth by this group to achieve this purpose was to apply a systems analysis to the highway traffic safety problem. The system should include as subsystems those areas having a significant effect on traffic safety. The intent is to develop a conceptual framework for conducting a state-of-knowledge exploration as a means for relating hitherto fragmented knowledge and identifying gaps in present knowledge.

An approach to this and other objectives set forth will be, in part, consummated this fall when the Highway Research Board holds a National Conference on Highway Safety Research. The conference will stress the systems approach to safety. A series of typical traffic situations will be discussed from a variety of viewpoints to highlight the role of basic factors in accidents, and to relate cost effectiveness to the research attack proposed.

## NEEDED CURRENT RESEARCH

Although the foregoing discussed effort will do much to satisfy the needed knowledge to identify research areas, the present known areas of urgency were expressed quite pointedly by the numerous "Problem Statements" submitted to the Committee on Highway Safety during the past year. Areas covered by these statements are vital to the future safety research effort and should be made known now to those engaged in the planning and conduct of research programs.

## MAJOR CATEGORIES OF RESEARCH

Although the whole of the Highway Safety Research need cannot be met by conduct of research described in the problem statements, the following do identify ten major categories and statements of research in each group.

### Public Support and Understanding of Traffic Safety Efforts

Public Information as an Accident Preventative
How Effective is Public Support

### Highway Design Standards

Residential Street Widths
Test Sections of Optimum Design Criteria
Commercial Driveway Design
Median Characteristics and Design - Rural
Lane Drop at Interchanges
Crossover Spacing on Noncontrolled Access Roads
Median Characteristics and Design - Urban

### Driver Education - Performance

Instruction of Drivers for Variable Environments
Driver Information Needs
Cues Used and Needed in Driver Decisions
Pre and Post Driver Licensing Training Requirements

### Highway Capacity and Volume

Surface Smoothness and Roughness Related to Traffic Flow and Accidents
Warrants for Four-lane Divided Roads

### Traffic Control Devices

Warrants for Special Intersection Treatment
Warrants for Interchange Lighting
Optimum Traffic Signal Face Location
Identifying Hazards Within Roadway for Night Driving
Use of Green Arrows in Split-Phase Signal Operations
Driver Behavior Related to Traffic Control Devices
Need to Vary Speed Indications - Weather, Construction, Other
Value of Edge Lining
Wrong-Way Driving
Traffic Control and Routing for Construction and Maintenance
Pedestrian and Special Vehicle Use of Interstate Highways
Speed and Design Relationships - Rural
Signal and Sign Placement Relationships

Accident Analysis

A Model Traffic Accident Analysis System for Use by All Agencies
Fixed Objects and Accident Involvement
Improved Accident Exposure Rate Criteria
Accident Prediction by Intersection Types
Urban Accident Causation
Accident Rates for Turning Movements by Intersection Configuration
Accident Rates Adolescents (Non-licensed Drivers) Operating Farm Equipment
Disseminating Accident Data to Users
Accident Data Available to Public

Emergency Communications and Services

Motorists Needs on Controlled Access and Other Highways
Level of Police Supervision and Services

Safety Programs

Plan for a Comprehensive and Coordinated System Approach by Public Agencies and Private Enterprise

Vehicle Design

Advisory Indication for Fuel Supply
Accident Involvement by Make, Size, Design, and Weight of Vehicles in Traffic Stream
Air Pollution as a Contributor to Accidents
Seat Belt Usage
Driver-Vehicle Interaction When Tires Fail
Communicate Intention to Slow and Turn

Highway Materials

Skid-Resistant Surfaces and Measurements
Preventing Bridge Surfaces From Icing

The specific problem statements and suggestions for the type of research needed in each of these ten areas follow. No attempt to identify urgency or magnitude of the problems presented has been undertaken. Many statements are directed to the need for answers to day-to-day problems rather than to the more sophisticated, long-range, analytical solutions for achieving a reduction in human and economic loss through motor vehicle traffic accidents.

RESEARCH PROBLEM STATEMENT

Title: Public Information as an Accident Preventative

PROBLEM: The public is constantly presented with traffic safety information through the various media. To what extent does this information assist in preventing accidents?

PROBLEM AREA: Public support and understanding of traffic safety efforts.

OBJECTIVES: Determine the extent to which knowledge of presently available accident prevention information assists in the development of accident-avoiding behavior.

STATE OF KNOWLEDGE: There is little or no research available in this area.

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RESEARCH PROBLEM STATEMENT

Title: How Effective is Public Support?

PROBLEM: The public is frequently called upon to support traffic safety measures.

PROBLEM AREA: Public support and understanding of traffic safety efforts.

OBJECTIVES: Determine the public's awareness of the nature and the magnitude of the traffic accident problem as compared with their awareness concerning other problem areas, such as disease, crime, etc.

STATE OF KNOWLEDGE: There is little or no research available in this area.

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RESEARCH PROBLEM STATEMENT

Title: Residential Street Widths

PROBLEM: Optimum widths for minor residential streets.

PROBLEM AREA: Highway design standards.

OBJECTIVES: To provide design standards for width as a function of development density related to off-street parking supply.

URGENCY: A vast mileage of residential streets are paved each year, based on local standards. Many are purely arbitrary and inadequate. In one city, minor street midblock accidents represent 12% of all public property accidents of the last four years. One study has shown a strong relationship between accidents and width. Extensive accident research data is needed.

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RESEARCH PROBLEM STATEMENT

Title: Test Sections of Optimum Design Criteria

PROBLEM: There is a lack of test section(s) of road built in various parts of the country using ultimate (as presently conceived) standards of safe design. The present Interstate System design standards are a notable step safetywise above the Federal-aid primary road standards. With the imminent prospect of more people driving more cars more miles at higher average speeds, development of even safer design standards is necessary.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To gather accident data from section(s) of road designed and built specifically to reduce the chances of having an accident and to ameliorate the hazards if one should occur. These data to be used to compare similar experience on conventional Interstate System design. The information thus obtained can be used to determine direction for increased safety of future road construction.

STATE OF KNOWLEDGE: Work has been done to develop improved standards by the General Motors Proving Ground, the various state highway departments, and universities through the states.

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RESEARCH PROBLEM STATEMENT

Title: Commercial Driveway Design

PROBLEM: The best design for commercial driveways.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To provide design standards for width and radii, for spacing from intersections and between driveways, to develop optimum safety and efficiency.

URGENCY: Driveway type accidents represent a significant percent of all accidents. In one city, 10% of all accidents in the last four periods have occurred as a result of driveway access along the major route system. Existing state and local driveway regulations are generally based on opinion, rather than accident and traffic studies. Many of these regulations are extremely restrictive with respect to width and particularly radii. It is known that substandard radii at street intersections increases the accident rate. Driveways are actually private intersections, and in cases of high volume generators, carry higher ADT than many public street intersections. Research studies are needed to determine accident facts to dispell existing opinions, before policies and regulations can be changed.

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RESEARCH PROBLEM STATEMENT

Title: Median Characteristics and Design - Rural

PROBLEM: Develop better design of medians on conventional roads including minimum widths and types of intersections on divided facilities where the elevation of one roadway is higher than the other.

This type of facility frequently comes into existence where two-lane facilities are built into four-lane divided highways by constructing a parallel higher-designed two-lane facility. Such an arrangement frequently results in the accident experience on the old lane being worse than the new facility. Often the vehicles on the higher road (generally old lane) get into the two lower lanes even though the medians are relatively wide. Intersections on such divided roadways are difficult to maneuver because of the grade and restricted sight distance. Frequently vehicles go the wrong way because they either do not see the other lane or feel that it is another facility.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To provide a safe minimum distance between, divided roadways with different elevation and to bring the total intersection into better view in order to prevent wrong-way driving.

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RESEARCH PROBLEM STATEMENT

Title: Lane Drop at Interchanges

PROBLEM: Problems created by dropping lanes at interchanges should be thoroughly explored.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To minimize lane changes and merging of traffic to fewer lanes within the main travel ways of interchanges. It would appear the dropping of lanes would be more desirable between interchanges than within interchanges.

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RESEARCH PROBLEM STATEMENT

Title: Crossover Spacing on Non-controlled Access Roads

PROBLEM: To provide proper spacing of crossovers (median openings) on divided highways without controll access.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To provide a guide for minimum spacing of crossovers on divided highways in various widths of median in areas where roadside development is either residential or commercial and in rural areas where roadside development is scattered.

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RESEARCH PROBLEM STATEMENT

Title: Median Characteristics and Design - Urban

PROBLEM: Better design of medians for surface highways in urban areas.

PROBLEM AREA: Highway Design Standards.

OBJECTIVES: To provide a means of permitting good access to abutting property and at the same time achieving high capacity for through movements and maximum safety.

URGENCY: Accidents on surface highways in urban areas continue to be a major traffic operations problem. Accidents involving or possibly attributable to left turns to and from the highways at intersections and at non-intersection points represent an important element in the overall accident toll.

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RESEARCH PROBLEM STATEMENT

Title: Instruction of Drivers for Varying Environments

PROBLEM: Preparing the individuals to drive effectively in today's complex traffic has not been based on scientific data. There is a need to develop an experimental driver-training program aimed at promoting and maintaining accident-free behavior. This effort must be based on the best contributions of current training technology and on principles and insights obtained from the recent accident-research literature.

PROBLEM AREA: Driver Education - Performance

OBJECTIVES: To develop instructional packages (training and assessment) for promoting accident-free driving behavior for various driving conditions and population characteristics.

An immediately worthwhile study would be the teaching of cues critical to effective driving performance. The content would involve cues of importance (geometry of various driving situations; visual-perceptual principles; the perception of hazard, etc.) based on recent research.

STATE OF KNOWLEDGE: Training variables have not received systematic consideration in traffic-accident research. Training procedures for preparing drivers have been based on opinion and conducted without concern for validation. Apparent validity and utility have most often served as substitutes for verified data. Most of the available training information comes from statistics compiled from accident data. (For example, students trained in high school driver-education courses show better records than comparable students not so trained, etc.)

RESEARCH PROBLEM STATEMENT

Title: Driver Information Needs

PROBLEM: There are tremendous inconsistencies in the manner in which relevant information is presented to a driver. Sources of "immediate information," i.e., stop signs, turn signs, etc., vary in configuration and manner of use from one state to another. Sources of "long-term information," i.e., allowability of driving at dusk with parking lights, etc., often are simply nonexistent. The effect of these inconsistencies is to perpetuate a certain level of confusion in the highway system. A driver cannot develop consistent patterns of response to particular features of his driving environment. The resulting confusion certainly must contribute to the continuing accident rate.

PROBLEM AREA: Driver Education - Performance

OBJECTIVES: The development of a safe and efficient national highway system should be viewed as just that, a system-development problem. In any such development program, one must insure the proper flow of information through the system. Each system component--and this includes each individual operating in the system--must have the right information at the right time. An impairment of information transmission through a system ultimately can lead to complete failure of the system.

A taxonomy of information needs for highway drivers should be developed. This classification scheme should list:

1. Required classes of "immediate information."
2. Required classes of "long-term information."
3. Research results concerning the optimal manner of presenting information within each class.
4. Driver-training requirements relative to the use of the above information.

In addition to the above, a study should be made of the information available to drivers at the time of accidents. Such a study, focused upon the information-transmission characteristics of the system rather than the physiological or psychological characteristics of the driver, could shed considerable light on the causes of accidents.

RESEARCH PROBLEM STATEMENT

Title: Cues Used and Needed in Driver Sessions

PROBLEM: A significant number of accidents are attributable to the actions of drivers in situations where clear-cut rules and procedures are lacking. The quality of driver judgments in these situations where information-communication failures exist is the issue of concern. The research issue concerns the cues used by the driver in determining his course of action in an ambiguous situation.

PROBLEM AREA: Driver Education - Performance.

OBJECTIVES: To determine the cues utilized by drivers in making control actions (decisions) in situations lacking in essential elements of information; to determine the base level of moment-to-moment information needed for making correct decisions.

STATE OF KNOWLEDGE: Relatively little is known about what cues and information the driver uses in making judgments about right-of-way (involving two or more vehicles) in ambiguous situations. The research relevant to this area has been the studies on crossing maneuvers at intersections, and the length-of-gap drivers will accept in traversing intersections.

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RESEARCH PROBLEM STATEMENT

Title: Pre-and Post-Driver Licensing Training Requirements

PROBLEM: Accidents and dangerous driving behavior apparently stem from unfamiliarity and lack of experience on complex, high-speed roadways. Driver training and licensing examinations regarding general practices on high-speed roadways are inadequate. New drivers learn required skills on trial-and-error basis.

AREA: Driver Education - Performance

OBJECTIVES: To specify and disseminate general information and establish training requirements for use of modern highways (e.g., use of entrances and exits, safer merging and lane-changing practices, where to expect exits, signs, etc.).

RESEARCH PROBLEM STATEMENT

Title: Surface Smoothness and Roughness Related to Traffic Flow and Accidents

PROBLEM: Develop a method of measuring the smoothness or roughness of traffic flow in order that a relationship between the measurement and accidents could be established.

PROBLEM AREA: Highway Capacity and Volume.

OBJECTIVES: Promote efficiency and safety of a facility through the possible development of new warrants for operational measures and superior design for highways.

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RESEARCH PROBLEM STATEMENT

Title: Warrants for Four-Lane Divided Roads

PROBLEM: Investigation of the relationship between capacity and accidents on high-volume, two-lane roads as a warrant for constructing four-lane roads. Is congestion the only result of overcrowding two-lane rural roads? If the premises upon which capacity is based are true, then more attempted passing maneuvers under adverse conditions should increase accident potential.

PROBLEM AREA: Highway Capacity and Volume.

OBJECTIVES: To relate accident experience to traffic volumes on selected sections of two-lane roads.

URGENCY: Nearly 90 percent of the rural FAP system alone is two-lane highway. On much of this mileage, traffic volumes already are above or approach capacity. By 1975, travel on this system is expected to increase by 50 percent. Thus, travel on many more roads will approach critical traffic volumes. In 1963, over one-third of the rural accidents involved two or more motor vehicles colliding between intersections.

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RESEARCH PROBLEM STATEMENT

Title: Warrants for Special Intersection Treatment

PROBLEM: Does the relationship between accidents and traffic volumes at rural intersections warrant special intersection treatment? At what volumes of through road traffic and crossroad traffic does the accident experience warrant signalization, channelization, or separation?

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To provide highway administrators, designers, and traffic engineers with factual information to justify expenditures for special intersection treatment before highways are constructed or improved.

URGENCY: Excluding pedestrian accidents, 27 percent of rural accidents of all severities and 17 percent of rural fatal accidents occur at intersections. Most of these accidents involved two or more vehicles and, therefore should be susceptible to intersection treatment.

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RESEARCH PROBLEM STATEMENT

Title: Warrants for Interchange Lighting

PROBLEM: To develop warrants for lighting of interchanges on rural and urban conventional and full control-of-access facilities.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To assist in the reduction of accidents at one of the most prevalent locations on controlled-access facilities.

URGENCY: A very large percentage of the total amount of accidents on the Interstate System occurs at interchanges.

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RESEARCH PROBLEM STATEMENT

Title: Optimum Traffic Signal Face Location

PROBLEM: To determine the best location for traffic signal faces at signalized intersections.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To establish location (vertical and lateral) for maximum signal face observance with reference to accident frequency.

URGENCY: In one city, 30% of all public property accidents in the latest four year period have occurred at signalized intersections. There is reason to believe that signal head placement is an important factor. Current placement practices are based as much opinion and considerable compromise. Accident research is needed under controlled "before and after" conditions, on a broad basis.

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RESEARCH PROBLEM STATEMENT

Title: Identifying Hazards Within Roadway for Night Drivers

PROBLEM: How to effectively delineate or illuminate obstructions located within a roadway in order that a night driver might readily comprehend the object.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: Provide uniform delineation or illumination for obstructions which will be weatherproof and virtually maintenance free, and will actually define the obstruction. The present standard for obstruction approach pavement markings would supplement this type of identification.

The present method of delineating obstructions by reflective products such as pavement markings and delineators, fail due to adverse weather conditions, valdalism and accident damage. Large amounts of money are spent in merely maintaining such protective devices.

A significant amount of automobile and property damage would be reduced if these obstructions could be made readily discernible 100 percent of the time.

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RESEARCH PROBLEM STATEMENT

Title: Use of Green Arrows in Split-Phase Signal Operations

PROBLEM: Time available for traffic movement at intersection where heavy left-turn movements are experienced is highly restricted. Best use must be made of green arrows for split-phase signal operation.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: Provide uniform operation with minimal vehicular delay and minimal vehicle vs. vehicle and vehicle vs. pedestrian conflicts.

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RESEARCH PROBLEM STATEMENT

Title: Driver Behavior Related to Traffic Control Devices

PROBLEM: To relate traffic control devices to driver behavior and traffic accidents.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To evaluate in advance the effectiveness of traffic control devices rather than to field test them as is now being done. Effective traffic control devices play a fundamental part in the efficient and safe flow of traffic. Such knowledge could make the devices much more efficient and eliminate so much trial and error practices.

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RESEARCH PROBLEM STATEMENT

Title: Need to Vary Speed Indications — Weather, Construction, Other

PROBLEM: To study the need of reducing speed limits through signs on segments or entire routes on the Interstate System during hazardous weather or other driving conditions.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To reduce accident involvement and severity on the Interstate System. It appears the Interstate System may not experience the low severity rates claimed for it without more restriction than is now being exercised. It is felt the lowering of speeds under hazardous driving conditions would be in the interest of safety.

RESEARCH PROBLEM STATEMENT

Title: Value of Edge Lining

PROBLEM: To study the need for mandatory installation of edge lining on the Interstate System and other high-volume divided and undivided facilities.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To give the motorists assistance in driving especially during rainy, foggy, misty and nighttime operations. Most fatal accidents occur on rural roads during nighttime driving and while it is rainy, foggy, and misty weather.

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RESEARCH PROBLEM STATEMENT

Title: Wrong Way Driving

PROBLEM: Need to inform drivers that they are traveling the wrong way on a divided limited access highway. The areas of relatively narrow medians i.e., 30' or less presents one type of problem. However, the most pressing problem is that of wrong way drivers on facilities with widely separated roadways.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To provide some type of sign, marking, or other device that would effectively advise motorists that they are and/or have been traveling in the wrong direction.

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RESEARCH PROBLEM STATEMENT

Title: Traffic Control and Routing for Construction and Maintenance

PROBLEM: Develop standards for the necessary and appropriate traffic control devices for use in maintenance and heavy repair projects on the Interstate System.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To improve the safety of the motoring public and state personnel as maintenance operations on the Interstate System are so different and much more dangerous to the general public and state personnel than on conventional roads.

RESEARCH PROBLEM STATEMENT

Title: Pedestrian and Special Use of Interstate Highways

PROBLEM: Study the problem of prohibiting certain persons, vehicles, equipment, and animals from using the Interstate System and other control-of-access facilities.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To develop as much as possible a uniform list of those types of persons, vehicles, animals and equipment that should not be permitted to use the Interstate System.

At present, in many states there are no more restrictions on who or what can use the Interstate System than on the conventional roads - even secondary or county routes. There is a need for national thinking as to whether or not pedestrians (hitchhikers or walkers), persons riding bicycles, tricycles, scooters, horse-drawn vehicles, self-propelled machinery or equipment (including farm equipment), animals led, ridden or driven on hoof and possibly other dangerous operations should be permitted on the Interstate System.

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RESEARCH PROBLEM STATEMENT

Title: Speed and Design Relationships - Rural

PROBLEM: Need for establishing speed limits on rural highways (especially secondary routes) as related to the design of the road.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To develop a criteria that would establish speed limits by design rather than just a blanket statewide speed limit. Due to the increase in accidents on the rural-type highway there is a need for better traffic control devices in order to combat the accident problem.

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RESEARCH PROBLEM STATEMENT

Title: Signal and Sign Placement Relationships

PROBLEM: Best design and location of traffic-control signals and highway signing. Many well-established display principles are ignored in design, construction, and location of signals, signs, etc. For example, traffic lights are installed against noisy, visual surrounds of commercial and other incidental high-brightness lights; highway exit lighting often provides a glare source which impedes high-speed decision and performance. Suitable glare shields and backboards could prevent this.

PROBLEM AREA: Traffic Control Devices.

OBJECTIVES: To improve current signal design and installation practices through implementation of demonstrated human factors principles:

1. Identification of inadequacies (low signal-to-noise ratios, glare souces, etc.)

2. Modification of same.

Clearly presented and understood traffic-control information is vital to traffic safety. Research findings must be implemented to accomplish this.

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RESEARCH PROBLEM STATEMENT

Title: A Model Traffic Accident Analysis System For Use by All Agencies

PROBLEM: Develop a model accident analysis system for engineering, enforcement and educational purposes that would be adapted to state, county and municipal levels.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To acquaint all levels of our society with the peoblem and develop remedial measures as far as possible on a local and state level.

The small prospect of abating the traffic accident problem in the near future warrants the immediate and sincere efforts of the local, state and Federal Government.

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RESEARCH PROBLEM STATEMENT

Title: Fixed Objects and Accident Involvement

PROBLEM: To study the likelihood of accidents in terms of the proximity of fixed objects.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To establish safer offsets and to help to design safer structures that must be kept closer to the travel ways.

One of the greatest causes of death on rural highways is single-vehicle crashes striking fixed objects such as bridges, trees, utility poles, culverts, embankments, etc.

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RESEARCH PROBLEM STATEMENT

Title: Improved Accident Exposure Rate Criteria

PROBLEM: Develop more meaningful accident frequency rates.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: A better yardstick for measuring accident involvement and severity at intersections and between intersections both on conventional and Interstate routes and at intersections and interchanges and between intersections and interchanges is urgently needed. Present frequency rates do not measure accurately the total problem of involvement. The element of exposure is not included which probably plays a significant part in accident involvement both on urban and rural streets.

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RESEARCH PROBLEM STATEMENT

Title: Accident Prediction by Intersection Types

PROBLEM: To determine the accidents likely to occur for each of the numerous types of intersections and interchanges on urban and rural conventional roads and full control-of-access facilities.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To develop safer and more efficient intersections and interchanges. There is little doubt that the design of interchanges plays a significant part in accident prevention or occurrence as an extremely high percent of the total accidents occur at intersections and at interchanges.

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RESEARCH PROBLEM STATEMENT

Title: Urban Accident Causation

PROBLEM: To identify the major basic causes of traffic accidents in urban areas. There has been little concentrated effort to identify basic accident causes in urban areas as compared with the effort expended in traffic accident study on rural highways.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To establish major basic causes of traffic accidents, to develop procedures for identifying and treating traffic accident causitive factors, and to develop sound public information programs.

STATE OF KNOWLEDGE: Traffic accidents in urban areas represent a significant economic loss to the community. In one large city (Los Angeles), the cost of traffic accidents is estimated to be over $33.00 per capita annually. The total number of accidents and the accident rates (on some bases) are increasing. Municipal traffic agencies have not had the funds or necessary facilities adequate to study traffic accident causes and to inform the public as to the true traffic safety benefit of traffic regulations, traffic control devices or corrective measures. As a result, traffic management authorities are under pressure to install controls and regulations which may not contribute to traffic safety and which may help to shield exposure of basic causative factors.

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RESEARCH PROBLEM STATEMENT

Title: Accident Rates For Turning Movements by Intersection Configuration

PROBLEM: Turning movement accident rates for basic intersectional configurations need to be known. It would be helpful if the development of a general accident theory applicable to the design and optimum operation of at-grade intersections could be accomplished.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To determine the absolute and/or relative accident rates for various turning movements at four-way and "T" intersections.

STATE OF KNOWLEDGE: Over one-half of all motor vehicle accidents in urban places occur at intersections. Studies have shown that "T" intersections consistently have lower accident rates than do four-way intersections. Other studies have indicated that accident rates are more sensitive to cross-street volume than to changes in major street volume. Even though traffic volumes can be estimated with reasonable accuracy, it is not possible to estimate the number of accidents that are likely to occur at an intersection for various alternative designs, but it is highly desirable to to able to do this.

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RESEARCH PROBLEM STATEMENT

Title: Accident Rates of Adolescents (Non-Licensed Drivers) Operating Farm Equipment

PROBLEM: Unlicensed children, aged under 15 years, operate farm vehicles on rural highways. The extent to which such operators are involved in collision accidents with motor vehicles is, at present, unknown. According to available information, no state regulates movement of farm vehicles by young, unlicensed operators.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To determine accident rates of unlicensed farm vehicle operators under 15 years of age. To determine type of accidents, location of accidents and circumstances of accidents in an attempt to correctly evaluate the influence of the young.

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RESEARCH PROBLEM STATEMENT

Title: Disseminating Accident Data to Users

PROBLEM: The need for communicating accident prevention information to those in a position to make use of this information.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: Determine the extent to which presently available accident prevention information is known by selected groups of highway users. There is little or no research available in this area.

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RESEARCH PROBLEM STATEMENT

Title: Accident Data Available to the Public

PROBLEM: The need for a summary and preliminary evaluation of presently available traffic accident prevention information available to the public and supported by empirical evidence.

PROBLEM AREA: Accident Analysis.

OBJECTIVES: To develop a summary of accident prevention information relevant to the driver, highway, pedestrian and vehicle. Identify the "support" for each item of information, i.e., evidence, common sense, tradition, etc.

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RESEARCH PROBLEM STATEMENT

Title: Motorists Needs on Controlled Access and Other Highways

PROBLEM: Stopped vehicles on controlled access highways carrying large volumes of high speed traffic are hazardous to both the occupants and other motorists. Assistance in removing such hazards must be prompt.

At present, reliance is placed upon highway patrolmen, maintenance personnel or other motorists to call for help when they spot an accident, a car with a flat tire or other trouble. This leaves much to chance that the safety hazard will be eliminated promptly.

A more positive, easily available means of summoning aid in emergencies on controlled access highways is needed not only to reduce patrolling costs and provide better service to traffic but most of all to insure greater safety for highway users.

PROBLEM AREA: Emergency Communications and Services

OBJECTIVES: Evaluate on a cost-benefit basis various means of providing effective, emergency communication systems on controlled access highways to increase the safety of motorists. Such systems can be based upon highway department micro-wave systems, coaxial cable installations, on commercially available packaged facilities or on combinations thereof.

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RESEARCH PROBLEM STATEMENT

Title: Level of Police Supervision and Services

PROBLEM: To develop a standard or criteria for adequate enforcement and essential services on the Interstate System.

PROBLEM AREA: Emergency Communications and Services.

OBJECTIVES: To give adequate enforcement and services to those using the Interstate System. The Interstate routes generally are not as safe as the higher design toll facilities; one of the reasons is the closer surveillance, and more adequate enforcement given the toll facilities.

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RESEARCH PROBLEM STATEMENT

Title: Plan for a Comprehensive and Coordinated System Approach by Public Agencies and Private Enterprise

PROBLEM: There is need for a master plan with specific long range and short range goals to orient all governmental agencies and private enterprise toward a systematic approach to highway safety.

PROBLEM AREA: Safety Programs.

OBJECTIVES: To provide a systematic approach to this problem which will first define the related problems and bring into focus those disciplines to cope with its many facets. The primary approach will be to coordinate these efforts toward specific goals.

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RESEARCH PROBLEM STATEMENT

Title: Advisory Indication for Fuel Supply

PROBLEM: To aid in reducing the number of disabled vehicle stops on the Interstate System due to running out of gas.

PROBLEM AREA: Vehicle Design.

OBJECTIVES: Since a problem is caused by vehicles running out of gas on controlled-access facilities, the possibility of providing a small reserve fuel tank or a flashing light with buzzer on the dashboard of new vehicles that would be activated when and possibly until the gas level reached two gallons should be explored. Perhaps this would eliminate many unnecessary and dangerous stops on the Interstate System.

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RESEARCH PROBLEM STATEMENT

Title: Accident Involvement by Make, Size, Design, and Weight of Vehicles in Traffic Stream

PROBLEM: To determine more precisely by brand names the role of design, size and weight that various vehicles play in traffic safety in regards to involvement and severity both in urban and rural areas.

PROBLEM AREA: Vehicle Design

OBJECTIVES: To improve traffic safety through improving design, possibly more equal weights of vehicles, or at least point out to the public the hazardousness of such vehicles that are evident.

There appears to be some very strong evidence the design and lighter weights of the smaller passenger vehicles are contributing substantially to the increase in the annual traffic deaths. If the government can warn the public against the hazards of smoking, why not against the hazardousness of vehicles if such exists and can be established?

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RESEARCH PROBLEM STATEMENT

Title: Air Pollution as a Contributor to Accidents

PROBLEM: The effect of air pollution on Driver Characteristics and Safety.

PROBLEM AREA: Vehicle Design

OBJECTIVES: To ascertain the effects (if there exists) of air pollution on Driver characteristics and highway safety. Seemingly unaccountable highway accidents may be the result of polluted air reacting on the human system.

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RESEARCH PROBLEM STATEMENT

Title: Seat Belt Usage

PROBLEM: Legislation in many states requires the installation of safety devices in private automobiles. However the utilization of these devices is relatively unknown.

PROBLEM AREA: Vehicle Design

OBJECTIVES: To determine if there is a significant increase in the actual use of seat belts among owners of new automobiles in states which have laws requiring their installation in new vehicles as opposed to states which do not.

STATE OF KNOWLEDGE: The 1960's have seen a number of states passing state laws requiring seat belts in new automobiles sold within the state. Opponents of such legislation argue that the use of these devices cannot be legislated and that the mandatory inclusion simply increases the price of the vehicle.

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RESEARCH PROBLEM STATEMENT

Title: Driver-Vehicle Interaction when Tires Fail

PROBLEM: Nature of driver-car interaction when tires fail.

PROBLEM AREA: Vehicle Design.

OBJECTIVES: To determine why some drivers lose control when a tire fails and others do not and as a consequence what may be done to the vehicle to make such failure less a problem to drivers. What can be done for drivers to make them better able to cope with the situation?

STATE OF KNOWLEDGE: The extent of the tire failure problem is attested to by the accident records for toll roads and free ways. The Operation 66 data shows many accidents attributed to tire failure. There is little data on how drivers behave when tires fail or what makes some drivers successful in coping with tire failure and others not. There is even no agreement about on which wheel tire failure is most serious.

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RESEARCH PROBLEM STATEMENT

Title: Communicate Intention to Slow and Turn

PROBLEM: There is need for a device that communicates the slow-moving farm vehicle operator's intention to turn to drivers of faster moving vehicles approaching from the rear.

PROBLEM AREA: Vehicle Design

OBJECTIVES: Devise a signal system for slow-moving vehicles that is easy to use, inexpensive to install on both production and existing equipment, and can be seen from the rear by motor vehicle operator regardless of the type of equipment being towed.

STATE OF KNOWLEDGE: Estimates of 1964 slow-moving vehicle collision accidents with other motor vehicles include:

a. 7000 - 8000 total accidents (including property damage, fatal and non-fatal injury accidents)

b. 100 fatalities

c. $9,000,000 total cost (more than one-half of which is property damage)

Slow-moving farm vehicles travel on rural roads and normally turn into intersections, driveways, field entrances. In discussing the slow-moving vehicle problem, Harkness and Stuckey point out that 39% of the slow-moving vehicle-motor vehicle collisions occur at intersections and driveways. Of these accidents, more than 80% occur when the slow-moving vehicle is turning left.

The Farm Conference, National Safety Council, already recommends the use of a reflective bordered, florescent triangle to identify slow-moving vehicles for the motor vehicle operator. This (SMV emblem) was the result of research by Harkness and Stuckey. Other dimensions of the slow-moving vehicle - motor-vehicle problem are indicated by Harkness and Stuckey.

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RESEARCH PROBLEM STATEMENT

Title: Skid-Resistant Surfaces and Measurements

PROBLEM: To develop a better skid-resistant pavement surface and equipment for measuring slipperiness.

PROBLEM AREAS: Highway Materials

OBJECTIVES: To prevent skidding of vehicles particularly where the surface is wet. It is felt that if equipment could be developed that would permit accurate measurement of slipperiness at normal vehicle speed and a program were initiated that would afford constant review of road surfaces, skidding would be a much greater problem than is now realized.

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RESEARCH PROBLEM STATEMENT

Title: Preventing Bridge Surfaces from Icing

PROBLEM: To prevent the surface of bridges from icing before the adjacent pavement does.

PROBLEM AREA: Highway Materials

OBJECTIVES: To reduce accidents often caused by icy bridge decks. It is felt that many motorists, especially on the Interstate System, do not realize that such conditions exists. In some climatic zones the temperature changes can cause freezing and thawing of ice on very short notice often involving the unfamiliar motorists.

## DEPARTMENT OF TRAFFIC AND OPERATIONS

Harold L. Michael, Chairman
Associate Director, Joint Highway Research Project
Purdue University, Lafayette, Indiana 47907

Edward A. Mueller, HRB Staff Engineer
Highway Research Board, Washington, D. C. 20418

## COMMITTEE ON HIGHWAY SAFETY *

Charles W. Prisk, Chairman
Deputy Director, Office of Highway Safety
Bureau of Public Roads, U. S. Department of Commerce
Washington, D. C. 20235

Stanley A. Abercrombie, Assistant Executive Secretary, National Commission on Safety Education, National Education Association, 1201 16th St. N.W. Washington, D. C.

Earl Allgaier, Manager, Driver Education Division, Traffic Engineering and Safety Department, American Automobile Association, 1712 G St. N. W. Washington, D. C.

Dr. Otis L. Anderson, Assistant Manager, American Medical Association, One Farragut Square South, Washington, D. C.

John E. Baerwald, Professor of Traffic Engineering, University of Illinois, Urbana, Illinois

J. Stannard Baker, Director of Research and Development, Northwestern University, Traffic Institute, Evanston, Illinois

Joel N. Bloom, Manager, Industrial Engineering Laboratory, The Franklin Institute, 20th & Benjamin Franklin Parkway, Philadelphia, Pennsylvania

Murray Blumenthal, Director, Research Division, National Safety Council, 425 North Michigan Avenue, Chicago, Illinois

Paul C. Box, Director of Engineering, Skokie Engineering Department, 5127 Oakton Street, Skokie, Illinois

Robert Brenner, Engineer-Statistician, Department of Engineering, University of California, Los Angeles, California

Leon Brody, Director of Research, Center for Safety Education, New York University, Washington Square, New York, New York

Albert Burg, Assistant Research Psychologist, Institute of Transportation and Traffic Engineering, University of California, Los Angeles, California

B. J. Campbell, Cornell Aeronautical Laboratory, Inc., P.O. Box 235, Buffalo, N.Y.

Donald G. Capelle, Traffic Research Engineer, Automotive Safety Foundation, 200 Ring Building, 1200 - 18th Street N.W., Washington, D. C.

Arno Cassel, Senior Research Engineer, Operations Research Division, The Franklin Institute, 20th & Benjamin Franklin Parkway, Philadelphia, Pennsylvania

Joseph S. Champagne, Senior Traffic Engineer, Operations Services Department, The Port of New York Authority, 111 Eighth Avenue at 15th Street, New York, New York

* As of December 31, 1965

Carl Clark, Head, Life Sciences Section, Research Department, Martin Company 3078 Baltimore, Maryland

Justin DuCray, Agency Staff Officer, Highway Transportation Agency, 1120 N Street, Sacramento, California

Dorothy S. Edwards, American Institute for Research, 8555 16th Street, Silver Spring, Maryland

Robert I. Ehrlich, Manager, Transportation Research Group, Davidson Laboratory, Stevens Institute of Technology, Castle Point Station, Hoboken, New Jersey

John P. Eicher, Office of Research and Development, U.S. Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C.

Earnest W. Elliott, Administrator, Highway Development and Traffic Safety, Chrysler Corporation, Box 1919, Detroit, Michigan

Leon G. Goldstein, Chief, Research Grants, Accident Prevention Division, Bureau of State Services, U. S. Public Health Service, Washington, D. C.

A. Beecher Greenman, C/o Charles H. Sells, Inc., Babylon, Long Island, New York

William Haddon, Jr., Associate Director, Division of Chronic Disease Services, New York State Department of Health, Albany, New York

Daniel J. Hanson, Deputy Director for Traffic Engineering & Operations, D. C. Department of Highways, District Building, Washington, D. C.

J. Al Head, Chief, Planning and Standards Division, Office of Highway Safety, U. S. Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C.

J. T. Kassel, Accident Analysis and Safety Research, California Division of Highways, P. O. Box 1499, Sacramento, California

Charles J. Keese, Executive Officer, Civil Engineering Department, Texas Transportation Institute, Texas A & M University, College Station, Texas

Barry G. King, Science Advisor, Division of Accident Prevention, U. S. Department of Health, Education and Welfare, Public Service, Washington, D. C.

Gordon G. Lindquist, Chicago Motor Club, 66 East South Water Street, Chicago, Ill.

John W. McDonald, Director, Engineering and Technical Services, Automobile Club of Souther California, Los Angeles, California

Dr. Frederick L. McGuire, California College of Medicine, Los Angeles, California

R. L. Mellinger, Institute of Transportation and Traffic Engineering, University of California, Los Angeles, California

P. Stuart Meyer, GM Engineering Staff General Motors Technical Center, Warren, Michigan

J. P. Mills, Jr., Traffic and Planning Engineer, Virginia Department of Highways, 1221 East Broad Street, Richmond, Virginia

Karl Moskowitz, Assistant Traffic Engineer, California Division of Highways, P.O. Box 1499, Sacramento 7, California

Walter C. Oram, Senior Highway Engineer, Paving Bureau, Portland Cement Association, 33 West Grand Avenue, Chicago, Illinois

Dr. James F. Parker, Jr., Bio Technology, Inc., 3219 Columbia Pike, Arlington, Va.

Thomas H. Rockwell, Associate Professor of Industrial Engineering and Project Supervisor, Systems Research Group, Engineering Experiment Station, Ohio State University, Columbus, Ohio

Santo Salvatore, Research Psychologist, Office of Research and Development, Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C.

Dr. Lawrence E. Schlesinger, Director, Driver Behavior Research Project, George Washington University, Washington, D. C.

David M. Schoppert, Alan M. Voorhees & Associates, 1420 New York Avenue, Washington, D. C.

John W. Senders, Bolt, Beranek & Newman, Inc., 50 Moulton Street, Cambridge, Massachusetts

Ross T. Shoaf, Assistant City Engineer, City of San Francisco, Department of Public Works, San Francisco, California

John N. Snider, Systems Research Group, The Ohio State University, Columbus, Ohio
David Solomon, Principal Research Engineer, Traffic Systems Division, U. S. Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C.
G. D. Sontheimer, Director of Safety, American Trucking Associations, Inc., 1616 P Street N. W., Washington, D. C.
Kenneth A. Stonex, Automotive Safety Engineer, Technical Liaison Section, Engineering Staff, General Motors Corp., GM Technical Center, Warren, Michigan
Vergil G. Stover, College of Engineering, University of South Carolina, Columbia, South Carolina
S. S. Taylor, General Manager, Department of Traffic, 1000 City Hall, Los Angeles, California
William C. Taylor, Traffic Research Engineer, Ohio Department of Highways, 450 E. Town Street, Columbus, Ohio
Ray P. Teele, Physicist, Photometry and Colorimetry Section, National Bureau of Standards, U. S. Department of Commerce, Washington, D. C.
Kenneth J. Tharp, Associate Professor, Department of Civil Engineering, State University of New York at Buffalo, Buffalo, New York
Ralph Westwood, Director, Traffic Records Program, American Association of Motor Vehicle Administrators, 404 Madison Building, Washington, D. C.
Ross G. Wilcox, Executive Secretary, Safe Winter Driving League, 520 N. Michigan Avenue, Chicago, Illinois
R. M. Williston, Chief of Traffic, Connecticut State Highway Department, Wethersfield, Connecticut