

THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM  
ORGANIZATION AND STATUS

by  
W. A. Goodwin, Program Engineer\*

The National Cooperative Highway Research Program will receive its fifth group of research problems in November 1965. The four previous groups resulted in 90 research projects on subjects of immediate interest to the Program's sponsor, the American Association of State Highway Officials. These projects are addressed to broad areas of research ranging from administration to maintenance and are oriented to provide answers at an early date on the many acute problems facing highway administrators and engineers.

The national program was initiated in June 1962 to provide for a continuing program of highway research. It is sponsored by member departments of the American Association of State Highway Officials on a continuing basis from Federal-aid planning and research funds. Administration and coordination of the research contracts are provided by the National Academy of Sciences-National Research Council through its Highway Research Board.

Research problems are initiated on an annual basis by AASHO, and the flow of events from problem initiation to research results comprises many steps. Each year's program has its beginning with the initiation of problem areas by (a) the chief administrative officer of any participating member department, (b) the chairmen of subcommittees under AASHO's Standing Committee on Administration, (c) the chairmen of operating committees under AASHO's Standing Committee on Standards, (d) the Executive Committee of AASHO, and (e) the Federal Highway Administrator. The problems received from these sources are forwarded to AASHO's Research Activities Committee for its consideration during the fall meeting of the Association. This committee screens each problem to determine (a) if the problem area is of mutual interest to the States and whether it can be handled more effectively under a cooperative program than by an individual State highway department, and (b) if the proposed problem represents an immediate research need in the highway field. The committee also develops, where not already provided, a description of each problem area to include its scope and extent, estimated cost, and time schedule for completion. At the conclusion of this screening process, the surviving problems are transmitted to AASHO's Committee on Continuing Research Program Evaluation for further action. This committee

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\* The opinions and conclusions expressed or implied are those of the author. They are not necessarily those of the Highway Research Board, the National Academy of Sciences, the Bureau of Public Roads, the American Association of State Highway Officials, or the individual States participating in the Program

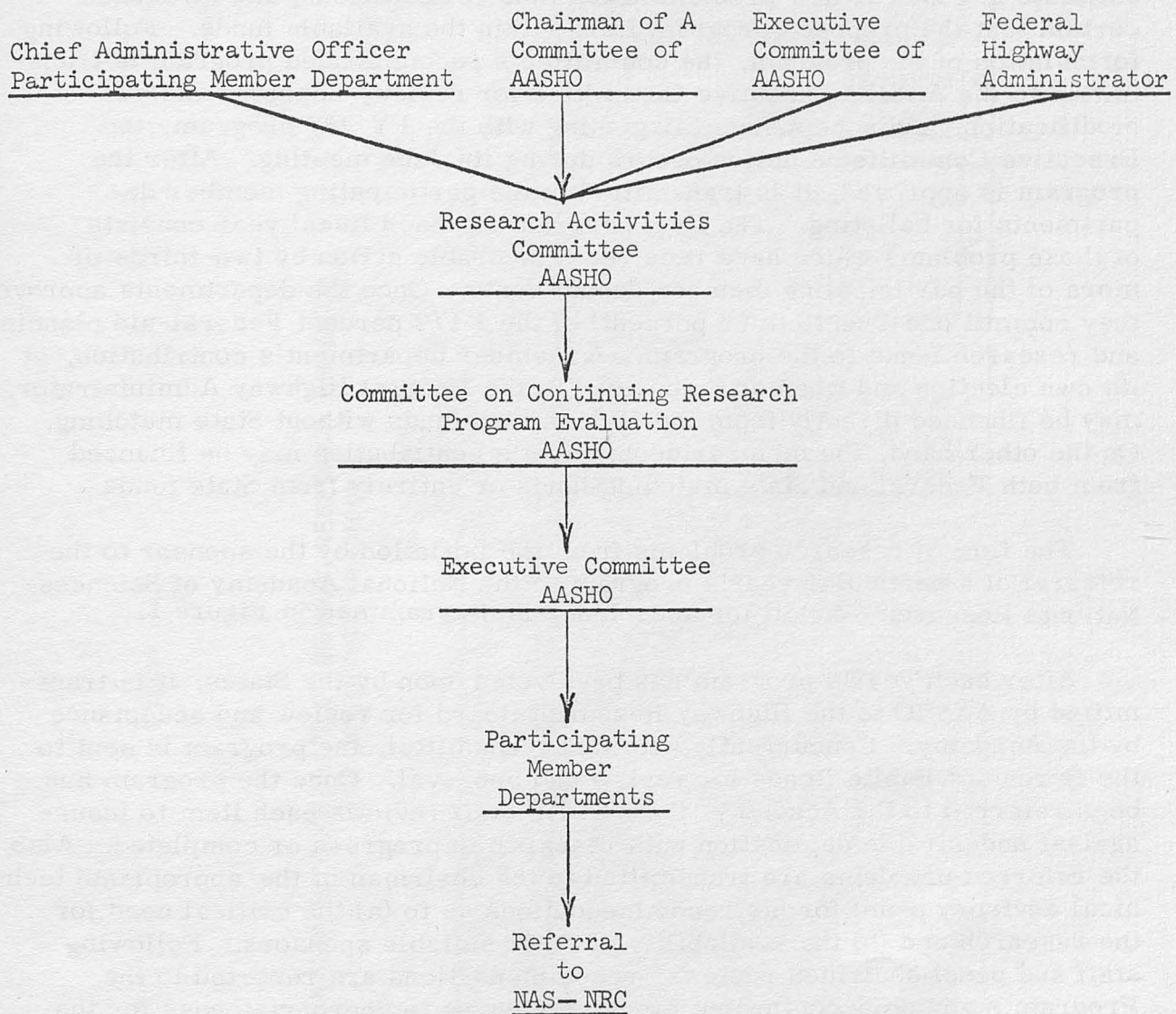


Figure 1

Program Initiation to Referral - AASHO

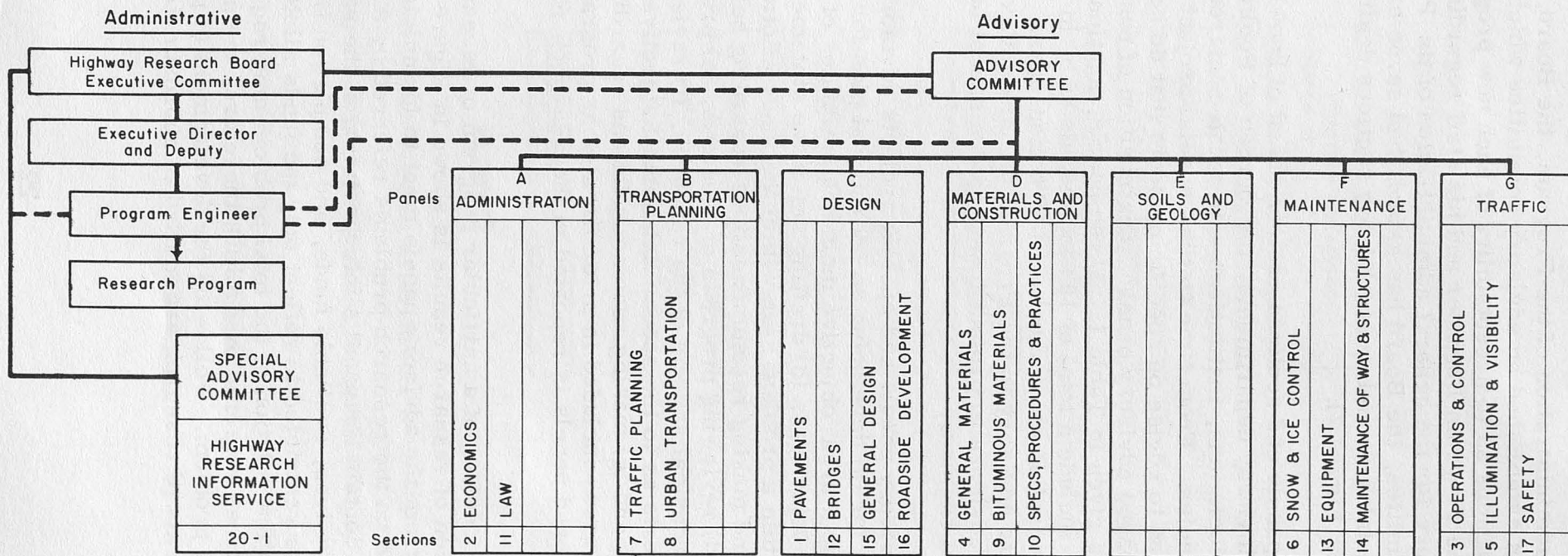
(a) screens the research problems for duplicate action of similar efforts already undertaken or previously completed in which the results were considered adequate and sufficiently conclusive; (b) formulates an annual program consisting of new problem areas and, when appropriate, continuations of problem areas established in prior fiscal programs; (c) provides estimate of cost for new problem areas plus continuations; and (d) makes certain that the proposed program falls within the available funds. Following formulation of the program, the committee's recommended program is transmitted to the AASHO Executive Committee for review, approval and/or modification, and acceptance. Beginning with the FY '67 program, the Executive Committee's action occurs during its June meeting. After the program is approved, it is transmitted to the participating member departments for balloting. The final program for each fiscal year consists of those problems which have received a favorable action by two-thirds or more of the participating member departments. Once the departments approve, they commit one-twentieth (.5 percent) of the 1 1/2 percent Federal-aid planning and research funds to the program. A member department's contribution, at its own election and when so authorized by the Federal Highway Administrator, may be financed directly from the Federal-aid funds without State matching. On the other hand, the member department's contribution may be financed from both Federal and State matching funds or entirely from State funds.

The flow of research problems from the initiation by the sponsor to the referral of a particular year's program to the National Academy of Sciences-National Research Council for acceptance is diagrammed in Figure 1.

After each year's program has been voted upon by the States, it is transmitted by AASHO to the Highway Research Board for review and acceptance by the Academy. Concurrently with this transmittal, the program is sent to the Bureau of Public Roads for review and approval. Once the program has been referred to the Academy, the NCHRP staff reviews each item to insure against undesirable duplication with research in progress or completed. Also, the referred problems are transmitted to the chairman of the appropriate technical advisory panel for his recommendations as to (a) the critical need for the research and (b) the availability of other suitable sponsors. Following staff and panel chairman reviews, recommendations are reported to the Program's advisory committee for its review as to appropriateness for the research items to be identified with the National Academy of Sciences-National Research Council. The committee's recommendations are transmitted by the Executive Director of the Highway Research Board to the Executive Secretary of the Division of Engineering and Industrial Research and ultimately to the President of the Academy. Problem areas unacceptable by the Academy are returned to the AASHO Executive Committee with the reason for nonacceptance and, when appropriate, a recommendation for their disposition.

Figure 2

### NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM Organizational Structure



In the administration of the Program, the Board, as mentioned earlier, has established an advisory committee which reviews and makes recommendations as to acceptability of each new program and provides advice to the Program Engineer and his staff regarding matters of policy and procedure for the general administration of the Program. In addition to this committee, the Board has established seven broad-based advisory panels containing a number of advisory sections dealing with specific areas of research (Figure 2).

These panels and sections are composed of knowledgeable persons from State highway departments, the Bureau of Public Roads, universities, national associations, institutions with related interest, industry, and other related agencies. From time to time special project advisory committees are appointed to advise on specific projects that do not conveniently fit under the broad-based advisory panels. Distribution of panel membership by affiliation is given in Table 1. These panels, sections, and special project committees include a total of 168 individuals who, in a one-year period, may collectively contribute as much as 1,500 man-days. Committee and panel members are advisory to the Program and are not expected to act as consultants or advisors to project investigators except as appropriate through the program engineer.

The advisory panels and special projects advisory committees are responsible for (a) developing an operational plan for the attainment of each major problem area objective including estimates of total cost and time to achieve the objectives, (b) drafting definitive statements of objectives for projects within a problem area within the funds allotted, (c) reviewing research proposals and making recommendations regarding selection of research agencies, (d) reviewing progress of research, (e) providing counsel and advice regarding technical aspects of the research, (f) reviewing and evaluating project reports as to the accomplishment of objectives and suitability for publication, and (g) making recommendations regarding continuation of studies in problem areas included in prior fiscal year programs. Membership on these committees and panels is reported in the Yearbook for the Highway Research Board.

The processing of a particular program of research projects through the dissemination of research results is shown in Figure 3. Beginning with each year's program the advisory panels meet to formulate research project statements based on the research problems referred by AASHO. These project statements contain the panel's interpretation of the referred problem, the project objectives, available funds, and completion time. The scope of the objectives is restricted to reflect only the funds allotted by the sponsor. In some cases the solution of the total problem may require considerably more funds than those referred by AASHO; therefore, the panels recommend further work on the problem. Following the development of project statements, announcements of research are mailed to approximately 2,000 potential research

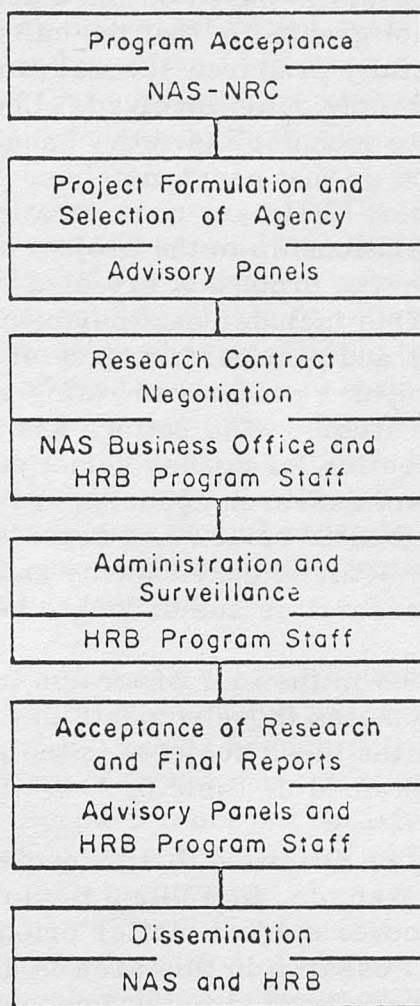


Figure 3

Flow Diagram for Each Program After Referral to the  
National Academy of Sciences—National Research Council

agencies. The response to these announcements and the submittal of research proposals are indicated by Table 2, which shows that the number of proposals ranged from six per project for the FY '63 program to twelve per project for the FY '66 program. The number of proposals received on an individual project has in some cases been as high as 25.

The receipt of proposals is based on fixed deadlines, and extensions to these deadlines are not granted in that the calendar of activities, including panel meetings, is carefully prepared several months in advance in order to meet the schedule of all individuals involved. Upon receipt, proposals are mailed to the appropriate technical advisory panel for review and evaluation. Forms are also provided so that panel members will prepare their evaluations in a uniform manner. Primary consideration is given to the agency's research plan and its relationship to the project objectives. When sufficient information is available, the proposals are also rated as to the capability of the research agency. This includes past performance, research facilities, technical qualifications, and past performance of the research investigators. Each panel member returns a preference rating sheet containing the top three proposals in rank order. The ratings are summarized for discussion at the advisory panel meeting for agency selection. Following the meeting, panel recommendations of research agencies are transmitted to the AASHO Executive Committee for their review and consideration. After the committee responds, the contracts between the Academy and the research agencies are consummated and the research is authorized to begin.

The projects included in the four programs to date are given in Tables 3, 4, and 5. Table 3 contains those subjects in the area of traffic and planning research, Table 4 contains those subjects in the physical research areas, and special projects are contained in Table 5.

In the tables it may be observed that projects are subdivided into broad fields and areas. For example, in Table 3 the projects in area two in the field of administration cover subject matter oriented toward economic and engineering economy. Research in this area is assigned to nine projects. The first five projects are directed to the impact of motor-vehicle transportation on the community and consequences of decision-making in highway transportation. Projects involve guidelines for the determination of community consequences and the criteria for highway benefit analysis. Factors dealing directly with the vehicle, such as the running cost of motor vehicles as affected by highway design and traffic and the analysis of motor vehicle data as related to highway design classes and design elements, are being considered. Another project is oriented to the subject of road-users costs in urban areas. In this study, construction, maintenance, and operational costs are being compared to external economic effects for various types of low-class roadways. In making analysis of highway improvement consequences there is a greater need for information concerning characteristics of diverted

and generated traffic because traffic volume on new and improved facilities is found to increase more than can be attributed to normal growth of existing traffic; therefore, a study on evaluation of diverted and generated (induced) traffic is under way. A recent study which is not yet under contract involves the effect of highway landscape development on nearby properties.

Another area of work in the field of administration relates to highway laws and involves rules of compensability and evaluation in highway land acquisition and the theory and practice in inverse condemnation. In the case of the latter, it is expected that a manual for highway lawyers and administrative officials presenting defenses on theory will be developed.

The research under way in the field of traffic is presently centered around the areas of operations and control and illumination and visibility. In traffic operations and control there are ten research projects which range from the subject of development of criteria for evaluating traffic operations to application of vehicle operating characteristics to geometric design and traffic operations. Three of the ten studies pertain to communication systems. One relates to ways and means of communicating with drivers; another revolves around sensing and communication between vehicles; and the third relates to the means of locating disabled or stopped vehicles and methods of communicating with a central location. Intersectional capacity and traffic signal systems are also being researched along with such problems as the highway noise and safety at highway-rail grade crossings.

In the subject of illumination and visibility three of the projects relate to the operating characteristics of freeways and involve driver response, driver discomfort, traffic flow, driver behavior, and accidents. The three remaining studies are addressed to the subject of driver needs. One project is looking into the visual information needed by drivers at night; another is on the subject of economics of roadway lighting. The third project is on the subject of pavement delineation materials.

In the field of traffic another section of highway safety has been added. A project which is about to get under way deals with the development of improved methods for reducing traffic accidents.

The 14 subjects being researched under the area of transportation planning include seven projects in the area of traffic planning which cover a variety of subjects including the influence of land use on urban travel patterns and the multiple use of lands within highway rights-of-way. Factors and trends in trip lengths are also being investigated along with traffic attraction of rural outdoor recreational areas. One of the more recent projects in this area is addressed to motorists' needs and services on interstate systems. The subject of weighing vehicles in motion is also being researched as an aid to traffic planning.



In urban transportation the seven projects are looking at many of the interesting problems affecting an individual. For example, individual preferences for various means of transportation along with individual preferences for alternative dwelling types and environments are being considered. As a further aid in urban transportation, social and economic factors affecting travel are also being researched. Certain transportation aspects of landuse controls are being investigated and the assignment of individuals to modes of transportation is also coming under study.

Subject matter relating to highway design is covered under areas of pavements, bridges, general design, and roadside development. In the area of pavements eight projects have been awarded. These projects in part relate to translating the findings from the AASHO Road Test to local conditions in various regions in the United States. The development of procedures for comparing the AASHO Road Test findings with performance of existing and newly constructed experimental pavements has been completed. Work is continuing in factors influencing pavement performance both on the regional and local level. Research is also under way in extending the road test performance concepts. A study is under way in this area to develop methods of detecting variation in load-carrying capacity of pavements during spring thaw periods. Two recently added projects are oriented towards understanding the factors involved in the design of asphalt pavements and skid resistant requirements for pavement surfaces.

In general design two projects are about to get under way. One relates to the design of roadway guardrails; the other, to the control of erosion in roadside drainage channels.

Problems facing the highway engineer in the area of bridges are reflected in the four projects assigned to date in this area. One project is currently under way while three will be under way by early 1966. These projects cover subject matter such as deformation of steel beams, distribution of wheel loads, thermal characteristics of highway bridges, and the development of waterproof roadway joints for bridges.

In the area of roadside development one project concerns the effects of deicing compounds on vegetation and water supplies. The agency for this project has been recently selected and the research will get under way in late fall.

In the field of materials and construction there are 17 projects assigned. Six are related to the area of general materials, three to bituminous materials, and seven to the area of specifications, procedures, and practices. The projects in general materials are oriented to the subject of beneficiation of aggregates, with the exception of one dealing with protective coatings for highway structural steel. In the beneficiation of aggregates the subject matter ranges from evaluating the effectiveness of stabilizing agents to learning more

about the strength of bases and subbases as affected by frost and moisture. The project on synthetic aggregates for highway uses has been completed and the report has been published.

The work under way in the bituminous materials is primarily related to the asphalt durability and its relation to pavement performance. Subject matter relates to the influence of adhesion and the rheological characteristics of asphalt. The other project relates to sealing materials for pavement joints and cracks.

Of the seven projects assigned in the FY '64 program to the area of specifications, procedures, and practices two have been completed and the final reports are being edited for publication. The subject matter in this area is directed to construction control, sampling methods, rapid test methods for control, nondestructive testing and the use of ultrasonic devices in construction.

There are eleven projects in the field of maintenance. These are divided into subjects of snow and ice control, equipment, and maintenance of way and structures. Of the nine projects in the area of snow and ice control, five have been completed and the reports have either been published or are in the final review stage. Eight of these nine projects were assigned in the FY '63 program and are related to the subject of protective coatings to prevent deterioration of concrete by deicing agents and to the development of economical and effective chemical deicing agents, along with non-chemical methods of preventing or removing snow and ice accumulation on highway structures. In addition, a study of effects of deicing agents on concrete bridge slabs when subjected to loading and unloading and other environmental conditions is also under research. In the area of equipment a rather interesting study is under way involving equipment rental rates. One of the aspects of this study is to determine uniform methods and procedures for establishing construction rental rates. A study in the area of maintenance of way and structures involves upgrading the unit maintenance cost index and development of interstate maintenance requirements. This research will involve an intensive study into typical maintenance operations in several States for the purpose of satisfying the need for a definitive system of determining maintenance requirements.

There are two projects in the program which are not assigned to any particular field, but are of interest to the broad spectrum of research. One of these is the development of a highway research information system. The system is to provide for "any desired breadth and depth of coverage of highway research information sources for the abstracting, indexing and storage of selective information and for the retrieval and dissemination of such stored information according to the varied interests of those who use the service." The input to the system comes essentially from the professional engineers of the Board who are on the Research Correlation Service staff. These men

select articles, classify them into subject areas, and designate the type of abstract to be stored. It is expected that about 5,000 publications will be put into the system every year. Another special study of vital importance to the Program is the project on research needs in highway transportation. The objective is to develop a coordinated program of short- and long- range research needs in the field of highway transportation. The program is to be formulated in such a manner as to permit updating with minimal effort and is to serve as a framework for all highway research in which the States participate.

The distribution of research agencies selected to conduct the 75 projects in the FY '63, '64 and '65 programs is given in Table 6. Table 7 contains the number of projects divided into the areas of traffic and planning research and physical research. In the four programs to date there are 42 projects directed to subject matter in traffic and planning, funded for a total allocation of approximately \$4 1/2 million. On the physical research side the four programs include 46 projects with a total funding of approximately \$3 1/2 million. The 90 projects in the total study are funded in an amount of \$8,626,089.

Final and interim reports have been received as the research progresses to the reporting stage. Of the 48 such reports that have been received as of this date, 13 have been final reports. The 35 interim reports are for those studies which are not completed, but it is desirable to publish a substantial report on the progress of the work to date. Final reports will also be received and published for these projects.

The National Cooperative Highway Research Program is a rather distinctive program. It provides a pooled research effort among the States on research subjects that reflect nationwide interest. It is believed that the research findings will find their way more quickly into policies, practices, procedures, specifications and standards of the State highway departments because of the nationwide scope of the problems.

TABLE 1

Distribution of Panel Membership with Respect to Affiliation

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<u>Affiliation</u>	<u>Number of Members</u>	<u>Positions Involved</u>
State highway departments	58	79
Bureau of Public Roads	26	41
Special transportation and other government agencies	14	21
Colleges and universities	32	44
Institutions, associations, foundations, etc.	13	18
Industry and consultants	16	20
Highway Research Board	<u>9</u>	<u>11</u>
Total	168	234

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TABLE 2

Number of Research Agencies Requesting  
Research Project Statements and Number of Proposals Received

Fiscal Year Program	Number of Agencies Requesting Project Statements	Number of Proposals Received per Project
'63	48	6
'64	50	9
'65	64	12
'66	92	12

Traffic and Planning Research

Traffic and Planning Research

Projects for FY '63, '64, '65 and '66

TWO: ADMINISTRATION - ECONOMICS

Project	2-1	Criteria for Highway Benefit Analysis	University of Washington
"	2-2 *	Guidelines for the Determination of Community Consequences	University of Washington
"	2-3	Analysis of Motor Vehicle Accident Data as Related to Highway Classes and Design Elements	Cornell Aeronautical Laboratory
"	2-4	The Value of Highway Travel Time, Comfort, Convenience, and Uniform Driving Speed	Texas A & M University
"	2-5	Running Cost of Motor Vehicles as Affected by Highway Design and Traffic	Catholic University of America
"	2-6	Warranted Levels of Improvement for Local Rural Roads	Stanford University
"	2-7	Road User Costs in Urban Areas	Catholic University of America
"	2-8	Estimation and Evaluation of Diverted and Generated (Induced) Traffic	Northwestern University
"	2-9	Effect of Highway Landscape Development on Nearby Property	Project Not Awarded

THREE: TRAFFIC - OPERATIONS AND CONTROL

Project	3-1	The Development of Criteria for Evaluating Traffic Operations	Cornell Aeronautical Laboratory
"	3-2	Surveillance Methods and Ways and Means of Communicating with Drivers	Cornell Aeronautical Laboratory
"	3-3	Sensing and Communications Between Vehicles	Ohio State University
"	3-4	Means of Locating Disabled or Stopped Vehicles and Methods of Communicating with a Central Location	Airborne Instruments Laboratory
"	3-5	Improved Criteria for Designing and Timing Traffic Signal Systems	Planning Research Corporation
"	3-6	Effect of Regulatory Devices on Intersectional Capacity and Operation	De Leuw, Cather and Company
"	3-7	Establishment of Standards for Highway Noise Levels	Bolt Beranek and Newman, Inc.
"	3-8	Factors Influencing Safety at Highway-Rail Grade Crossings	Alan M. Voorhees and Associates
"	3-10	Application of Vehicle Operating Characteristics to Geometric Design and Traffic Operations	Project Not Awarded

FIVE: TRAFFIC - ILLUMINATION AND VISIBILITY

Project	5-2(1)	Effects of Illumination on Operating Characteristics of Freeways - Traffic Flow, Driver Behavior, and Accidents	Yale University
"	5-2(2)	Effects of Illumination on Operating Characteristics of Freeways - Driver Response, Visibility, and Visual Discomfort	Ohio State University
"	5-2(3)	Effects of Illumination on Operating Characteristics of Freeways - Driver Discomfort	The Institute for Research
"	5-3	Visual Information Needed by Driver at Night	Ohio State University
"	5-4	Economic Study of Roadway Lighting	The Franklin Institute
"	5-5	Nighttime Use of Highway Pavement Delineation Materials	Southwest Research Institute

SEVEN: TRANSPORTATION PLANNING - TRAFFIC PLANNING

Project	7-1	The Influence of Land Use on Urban Travel Patterns	Louis E. Keefer
"	7-2	Traffic Attraction of Rural Outdoor Recreational Areas	IIT Research Institute
"	7-3	Weighing Vehicles in Motion	The Franklin Institute
"	7-4	Factors and Trends in Trip Lengths	Alan M. Voorhees and Associates
"	7-5	Predicted Traffic Usage of a Major Highway Facility Versus Actual Usage	Yale University
"	7-6	Multiple Use of Lands Within Highway Rights-of-Way	Project Not Awarded
"	7-7	Motorists' Needs and Services on Interstate Highways	Project Not Awarded

EIGHT: TRANSPORTATION PLANNING - URBAN TRANSPORTATION

Project	8-1	Social and Economic Factors Affecting Travel	Vogt, Ivers and Associates
"	8-2	Factors Influencing Modal Trip Assignment	IIT Research Institute
"	8-3	Individual Preferences for Various Means of Transportation	University of Pennsylvania
"	8-4	Criteria for Evaluating Alternative Transportation Plans	Northwestern University
"	8-5	Transportation Aspects of Land-Use Controls	Victor Gruen Associates
"	8-6	Individual Preferences for Alternative Dwelling Types and Environments	Project Not Awarded
"	8-7	Exploration and Evaluation of Intergovernmental Mechanisms	Project Not Awarded

ELEVEN: ADMINISTRATION - LAW

Project	11-1	Roles of Compensability and Valuation in Highway Land Acquisition	The University of Wisconsin
Project	11-2	Theory and Practice in Inverse Condemnation	Regional and Urban Planning Implementation, Inc.

Project Completed  
9-30-65

Table 4

## Physical Research

Projects for FY '63, '64, '65 and '66Area and Title

<u>Area and Title</u>		<u>Agency</u>
<u>ONE:</u>	<u>DESIGN - PAVEMENTS</u>	
Project	1-1(1), 1-1(2)* Development of Procedures for Comparing the AASHO Road Test Findings with Performance of: 1(1) Existing Pavements and 1(2) Newly Constructed Experimental Pavements	Highway Research Board
"	1-2 Comparison of Different Methods for Evaluating Pavement Conditions	Purdue University
"	1-3(1) Factors Influencing Pavement Performance - Regional	Purdue University
"	1-3(2)* Factors Influencing Pavement Performance - Local	Northwestern University
"	1-3(3) Factors Influencing Pavement Performance	University of California
"	1-4(1) Extension of Road Test Performance Concepts	Duke University
"	1-4(2) Extension of Road Test Performance Concepts	Purdue University
"	1-5 Detecting Variations in Load-Carrying Capacity of Flexible Pavements	Cornell Aeronautical Laboratory
"	1-6 Standard Measurements for Satellite Program - Measurement Team	Texas A & M University
"	1-7 Development of Interim Skid Resistance Requirements for Highway Pavement Surfaces	Pennsylvania State University
"	1-8 Factors Involved in the Design of Asphalt Pavement Surfaces	Materials Research & Development
<u>FOUR:</u>	<u>MATERIALS AND CONSTRUCTION - GENERAL MATERIALS</u>	
Project	4-1 Development of Appropriate Methods for Evaluating the Effectiveness of Stabilizing Agents	University of Illinois
"	4-2 A Study of Degrading Aggregates in Bases and Subbases with Production of Excessive Amounts of and/or Harmful Types of Fines	Purdue University
"	4-3(1) Development of Methods to Identify Aggregate Particles Which Undergo Destructive Volume Changes When Frozen in Concrete	Virginia Polytechnic Institute
"	4-3(2) Development of Methods to Identify Aggregate Particles Which Undergo Destructive Volume Changes When Frozen in Concrete	Pennsylvania State University
"	4-4 * Synthetic Aggregates for Highway Uses	Battelle Memorial Institute
"	4-5 A Study of the Mechanism Whereby the Strength of Bases and Subbases Is Affected by Frost and Moisture	Michigan Technological University
"	4-6 Protective Coatings for Highway Structural Steel	Steel Structures Painting Council
<u>SIX:</u>	<u>MAINTENANCE - SNOW AND ICE CONTROL</u>	
Project	6-1 * Development of Economical and Effective Chemical Deicing Agents to Minimize Injury to Highway Structures and Vehicles	IIT Research Institute
"	6-2 * Nonchemical Methods for Preventing or Removing Snow and Ice Accumulations on Highway Structures	Roy Jorgensen and Associates
"	6-3 * Development and Evaluation of Protective Coatings to Prevent Deterioration of Concrete Structures by Deicing Agents	Battelle Memorial Institute
"	6-4 * Evaluation and Development of Methods for Reducing Corrosion of Reinforcing Steel	University of Illinois
"	6-5 Study of Physical Factors Influencing Resistance of Concrete to Deicing Agents	Ohio State University
"	6-6 To Evaluate Existing Methods and/or Develop Improved Methods for the Measurement of Certain Properties of Concrete	IIT Research Institute
"	6-7 Estimation of Disintegration in Concrete Structures	Bertram D. Tallay Associates
"	6-8 * Evaluation of Methods of Replacement of Deteriorated Concrete in Structures	University of Illinois
"	6-9 Potential Accelerating Effects of Chemical Deicing Damage by Traffic and Other Environmental Induced Stresses in Concrete Bridge Decks	

Physical Research

Projects for FY '63, '64, '65 and '66

<u>NINE: MATERIALS AND CONSTRUCTION - BITUMINOUS MATERIALS</u>			
Project	9-1	Asphalt Durability and Its Relation to Pavement Performance	American Oil Company
"	9-2	Asphalt Durability and Its Relation to Pavement Performance - Adhesion	Montana School of Mines
"	9-3	Evaluation of Pavement Joint and Crack Sealing Materials and Practices	Rensselaer Polytechnic Institute
<u>TEN: MATERIALS AND CONSTRUCTION - SPECIFICATIONS, PROCEDURES, AND PRACTICES</u>			
Project	10-1 *	Development of Guidelines for Practical and Realistic Construction Specifications	Miller-Warden Associates
"	10-2	Evaluation of Construction Control Procedures	Miller-Warden Associates
"	10-3	Effects of Different Methods of Stockpiling and Handling Aggregates	Miller-Warden Associates
"	10-4	Rapid Test Methods for Field Control of Construction	Clemson University
"	10-5	Density and Moisture Content Measurements by Nuclear Methods	Research Triangle Institute
"	10-6	Measurement of Pavement Thicknesses by Rapid and Nondestructive Methods	IIT Research Institute
"	10-7 *	Potential Uses of Sonic and Ultrasonic Devices in Highway Construction	Ohio State University
<u>TWELVE: DESIGN - BRIDGES</u>			
Project	12-1	Deformation of Steel Beams Related to Permitted Highway Bridge Overloads	University of Missouri
"	12-2	Distribution of Wheel Loads on Highway Bridges	Project Not Awarded
"	12-3	Development of Waterproof Roadway Joints for Bridges	Project Not Awarded
"	12-4	Thermal Characteristics of Highway Bridges	Project Not Awarded
<u>THIRTEEN: MAINTENANCE - EQUIPMENT</u>			
Project	13-1	Equipment Rental Rates	Ernst & Ernst
<u>FOURTEEN: MAINTENANCE - MAINTENANCE OF WAY AND STRUCTURES</u>			
Project	14-1	Upgrading of Unit Maintenance Cost Index and Development of Interstate Maintenance Requirements	Bertram D. Tallamy Associates
<u>FIFTEEN: DESIGN - GENERAL DESIGN</u>			
Project	15-1	Guardrail Design	Project Not Awarded
"	15-2	Design to Control Erosion in Roadside Drainage Channels	Project Not Awarded
<u>SIXTEEN: DESIGN - ROADSIDE DEVELOPMENT</u>			
Project	16-1	Effects of Deicing Compounds on Vegetation and Water Supplies	Project Not Awarded

\* Project Completed

9-30-65



Table 5

Special Projects  
for FY '63, '64, '65 and '66

TWENTY: Special Projects  
Project 20-1 Highway Research Information Service  
20-2 Research Needs in Highway Transportation

Highway Research Board  
Project Not Awarded

TABLE 6

Agency Distribution of FY '63, '64, and '65 Projects

	<u>No.</u>	<u>Percent</u>
Universities	36	48
Research institutes	20	27
Consulting firms	16	21
Commercial research firms	2	3
Industrial firms	<u>1</u>	<u>1</u>
Total	75	100

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TABLE 7

DISTRIBUTION OF PROJECTS

<u>Traffic and Planning</u>	<u>No. of New Projects</u>	<u>Total Allocations *</u>
FY '63	15	\$ 850,000
FY '64	14	1,687,589
FY '65	5	966,000
FY '66	<u>8</u>	<u>1,160,000</u>
	42	Total
		\$4,663,589
<u>Physical Research</u>	<u>No. of New Projects</u>	<u>Total Allocations *</u>
FY '63	19	\$ 775,000
FY '64	13	817,500
FY '65	8	890,000
FY '66	<u>6</u>	<u>1,130,000</u>
	46	Total
		\$3,612,500
<u>Area 20 - Special Projects</u>	<u>No. of New Projects</u>	<u>Total Allocations *</u>
FY '65	1	\$ 125,000
FY '66	<u>1</u>	<u>225,000</u>
	2	Total
		\$ 350,000
Grand Total	90	\$8,626,089

\* Includes allocations for Referred Projects, Area-Wide Additions, and Continuations as well as Contingency Funds allowed as of September 30, 1965

10-20-65  
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